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Report

A Pilot Project – Preparing for an Assessment of Environmental Impacts from Onshore and Offshore Phosphate Mining Activities in Namibia

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A Pilot Project – Preparing for an Assessment of Environmental Impacts from Onshore and Offshore Phosphate Mining

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ABSTRACT

The Namibian exclusive economic zone is rich in natural resources, including exploited living resources that support a rich and well-managed fishery sector, and alluvial diamonds that support a marine mining industry. Non-exploited resources include sediments rich in marine phosphates. This area also represents an important recreational area for Namibians and foreign tourists. Recently there has been an increased interest in marine phosphates as raw material for the fertilizer industry, and several areas on the Namibian continental shelf have been listed for industrial minerals, including phosphate. This is a new industry with little knowledge on and no experience regarding impacts on the marine ecosystem from marine bulk seabed phosphate mining. Concerns that have been raised by Namibian stakeholders are effects from marine phosphate mining on sustainable fisheries, food safety, marine protected areas, and other marine species and effects on tourism. This has been recognized by the Namibian Ministry of Fisheries and Marine Resources; and a temporary moratorium on bulk seabed mining activities for industrial minerals, base and/or rare minerals was issued by the Namibian Cabinet in September 2013. The Namibian Cabinet requests a scientific foundation to be able to make an informed political decision on the management of the Namibian coastal waters. The aim of this Pilot Project is to prepare an environmental study on onshore and offshore phosphate mining activities (Main Project). Technical specifications for the Main Project are given and include pre-phosphate mining environmental studies (baseline study), field studies, experimental and toxicological studies, and ocean modeling. The Main Project will assess possible impacts from phosphate mining on the marine ecosystem; and give input for regulations and development of a control and auditing system for marine onshore and offshore mining activities.

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APPENDICES

1 Introduction

Namibian coastal waters are a part of the Benguela Current Large Marine Ecosystem (BCLME). The BCLME has a complex oceanography and is a highly productive ecosystem. As a part of the BCLME the Namibian exclusive economic zone is rich in natural resources, which support a rich and well-managed fishery sector and a diamond mining industry. Non-exploited resources include sediments rich in marine phosphates. In 2050 the world population is expected to have passed nine billions, and in this context FAO predicts a need to increase the food supply with 50%. To be able to achieve this, FAO call attention to an increased food supply from the oceans in addition to terrestrial food production. Terrestrial phosphorus has been extracted for industrial production of fertilizers for years; and will in near future become a limiting factor for this industry. As a consequence there has lately been an increasing interest for easily accessible marine phosphates.

The Namibian Ministry of Mines and Energy has listed more than 46 areas on the Namibian coastal shelf for exploration of industrial minerals from the seabed. Two phosphate mining licenses are given, but seabed mining cannot start before environmental clearances are considered. The potential for utilizing the rich marine phosphate reserves in Namibia is large, but will depend on the establishment of a sustainable management of all marine based resources in Namibian coastal waters. This is essential to ensure co-existence between different interests and stakeholders, to the benefit of all Namibians. To our knowledge industrial mining of marine phosphate has yet not been established in any coastal economic zones; thus the present knowledge on the impacts this industry may have on the marine ecosystems is lacking. Concerns regarding the lack of knowledge have been raised in Namibia, especially with respect to the management of local stocks of both commercial and non-commercial fish species as well as shellfish and other important marine species. This has been recognized by the Namibian Ministry of Fisheries and Marine Resources; and a temporary moratorium on bulk seabed mining activities for industrial minerals, base and/or rare minerals was issued by the Namibian Cabinet in September 2013. The moratorium is lasting for 18 months with an addendum for an extension.

The Namibian Ministry of Fisheries and Marine Resources has in this context engaged SINTEF Fisheries and Aquaculture (SINTEF), together with the Norwegian Institute of Marine Research (IMR), to perform a pilot project where the objective is to define the content (i.e. technical specifications) and the costs of a future environmental study (Main Project) as a documentation of the situation in the coastal waters off Namibia before environmental clearances are given to the mining industry. The results from the proposed Main Project would result in identification of the expected cumulative and long-term impacts if marine phosphate mining will be allowed and capacity building within Namibia, and provide input for local regulatory control of such a marine mining industry. The delivery in the Pilot Project describes the content and the costs of an environmental study, as well as suggestions for financial bodies for further communication with regard to possible co-funding of the Main Project. The Main Project will benefit from and contribute to local expertise and infrastructure.
Socio-economic studies are not a part of the proposed Main Project. However, the Main Project will provide information for a future socio-economic study.

2 Work program

The different activities within the work program are highly interconnected and closely linked to each other (Figure 1).

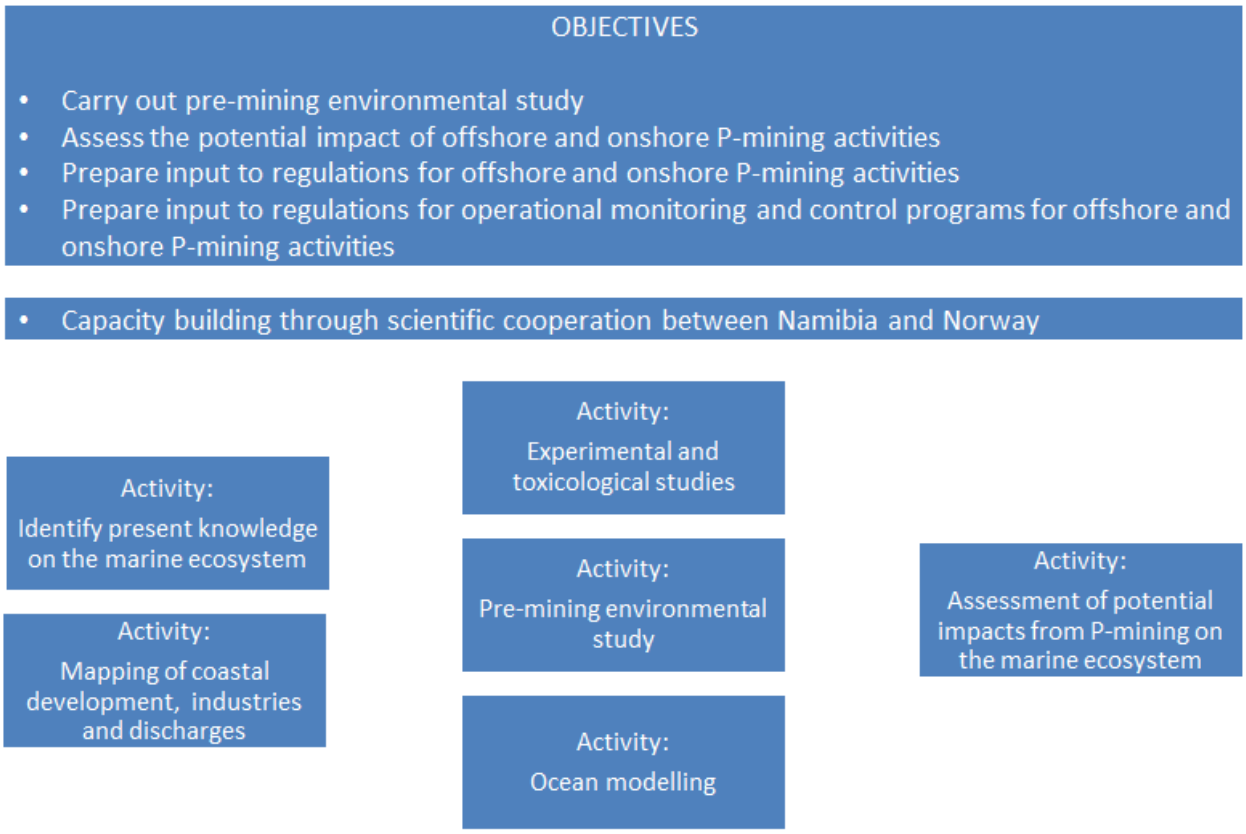


Figure 1 Conceptual description of the objectives and the activities in the Main Project. There is a high degree of interaction between the different activities and their contribution to the objectives of the Main Project.

2.1 Identify present knowledge on the marine ecosystem

Objective: Establish baseline information on the marine ecosystem in the coastal waters off Namibia based on existing data. The results will be essential input in sections 2.3, 2.6 and 2.7.

Throughout the years several surveys have been conducted in the coastal waters off Namibia including past and ongoing monitoring activities performed by national authorities and through research projects conducted in collaboration with international research institutions. Sources of information so far identified are documented in Appendix L and include the Ministry of Fisheries and Marine Resources, the Benguela Current Commission (BCC), the Norwegian NANSCLIM and the Danish ECOFISH project, the German research projects including GENUS (Geochemistry and Ecology of the Namibian Upwelling System), and any other relevant national and regional projects, as well as white papers, grey literature and scientific papers in peer-reviewed journals. Long-term data are of special interest since they will contribute to an increased understanding on the pre-phosphate mining situation. Not all data are easily accessible, hence there is a need to assemble and analyze all available data to contribute to the information and knowledge on the present state

of Namibian coastal waters. It is also of great importance to establish the "state of knowledge" concerning the geology of the Namibian shelf phosphorite deposits (including extent, thickness, composition, mineralogy, age, geochemistry, grain size).

In this work package data from different sources will go through quality assurance. According to the suitability of data, the collected and identified data will be evaluated to identify knowledge gaps. These data might also be essential for the establishment of monitoring stations to be included in the pre-phosphate mining environmental study as described in Chapter 2.3.

2.2 Coastal development, industries and discharges

Objective: Establish baseline information on Namibian industries and their economic significance, ongoing and future plans for the use and development of Namibian coastal areas. The results will be essential input in sections 2.3, 2.6 and 2.7.

Several industries have their revenue either fully or partly from marine activities in the Namibian coastal zone, examples of such industries are salt mining, tourism, diamond mining, mariculture and fisheries. An overview of different business sectors, their particular interests and needs and their economic significance will be evaluated against economic interests and possible environmental impacts from the proposed phosphate mining industry. But this is a separate task and should be included in a socio-economic study – thus not in the Main Project,

To be able to describe and evaluate the present environmental situation in Namibian coastal areas, discharges to the sea from different activities and effluent sources from onshore and offshore industries will be mapped, if data allow. Emissions to air and potential impact on the local environment and climate will also be taken into account when considering the cumulative impacts on the environment including a future scenario with phosphate mining on the Namibian continental shelf.

2.3 Pre-phosphate mining environmental study

Objective: Documentation of the current (i.e. pre-phosphate mining) environmental situation in the coastal waters off Namibia through goal-oriented field surveys. The results will be essential input in sections 2.5, 2.6 and 2.7.

The Namibian shelf is located in one of the most productive upwelling regions of the world. The presence of dissolved-oxygen-deficient waters (hypoxia) over open-shelf waters makes a ubiquitous feature of this upwelling and represents a natural perturbation to the coastal marine ecosystem and to its fisheries sustainability.

We propose a pre-phosphate mining study supported by an *in situ* monitoring program to evidence the status of the Namibian marine ecosystem prior to the inception of the prospected phosphate mining, with the focus on (1) the development of the ecosystem health indicators with a skill to discern the natural from anthropogenic pressures and (2) to provide inputs for the modeling studies predicting such pressures under various environmental scenarios (sect. 2.6).

A wealth of data is already collected on the Namibian system: these ranges from 1995 to present. The aim of the added monitoring over a 2-year period will be to collect data to complement the range of parameters

needed to describe the ecosystem functioning and services, from the physical forcing, through water and sediment quality, to responses in biota to environmental pressures. The ship-based survey grid will be based on the historically developed hydrographic sampling lines. We suggest at least four surveys in order to resolve the seasonal variability and to provide data from locations that are desirable for this specific study but to date are poorly sampled or not sampled according to the desired parameters. Thus the sampling program will be carefully designed to meet these criteria. The program will also include fixed stations fitted with inverted current profiling systems (Acoustic Doppler Current Profiler - ADCP) or oceanographic buoys, to perform a continuous monitoring of currents and hydrography. The *in situ* observations will be supplemented with analyses of satellite-based data, to monitor evolution of hydrographic and productivity patterns over the shelf on time continuous spatio-temporal scales. The dedicated observations apart, the proposed study will build on the existing monitoring activities presently being carried out by the NatMIRC and the associated international projects (e.g. GENUS or PREFACE) and it is hoped to promote collaboration with the scientists involved in these research programs. In particular, this study will assist in the conduct of the covered hydrographic monitoring lines and fixed moorings; in conducting the routine marine survey monitoring surveys carried out by MFMR and will incorporate these results into the analyses.

The different activities included in the pre-phosphate mining environmental study are divided into sub-activities covering impacts: 1) from off-shore potential mining activities; 2) from on-shore potential mining activities (i.e. land-processing units); and 3) on marine protected areas (MPAs). The monitoring programs for these sub-activities have to be adjusted according to the information required on each.

2.3.1 Oceanography

Monitoring the status of hypoxic waters is central to the oceanographic observations in the Namibian ecosystem context. The variability in hypoxia has partly an advective origin, being triggered by intermittent seasonal intrusions of low-oxygen water from the tropics (Monteiro et al. 2008). Additionally *in situ* decay of high surface production has resulted in thick diatomaceous mud deposits on the shelf and perennially low oxygen values at the seafloor. The seasonal changes in the penetration of low-oxygen water into the Namibian shelf as well as the mapping of the hypoxic and anoxic conditions over this shelf will be conducted by standard CTDO (Conductivity-Temperature-Depth-Oxygen) unit deployment on a dense grid of stations. Validation of all collected data will be essential. The CTDO probe will be fitted with the state-of-the art dissolved oxygen sensor, SBE43, resistant to hydrogen sulfide environments. Factory-calibrated set of the sensors will be fitted prior to each survey. Water bottle samples will be collected and processed for dissolved oxygen after each station. The salinity samples will be preserved and processed at NatMIRC after each survey.

Currents will be measured using the vessel-mounted ADCP unit (the 150 kHZ Ocean Surveyor unit in the case RV Dr. Fridtjof Nansen and RV Mirabilis). Whilst the two principal current systems on the Namibian shelf are: the equatorward flowing coastal jet and poleward counter-current along the shelf break there are both seasonal variations in the strengths of the currents as well as smaller scale variations in water movements which are important to consider if plume modeling is to be successful. Currents are largely driven by wind -induced upwelling and therefore exhibit strong variations on daily spatio-temporal scales. A post processing methodology to reduce this bias (e.g. Chaigneau et al. 2013) will be applied to the collected raw data. The result will serve to obtain the maps of circulation and seasonal transport estimates. Tidal and inshore currents play an important role regarding effluent dispersal from the shore processing localities.

Continuous underway measurements of sea surface temperature and salinity will be conducted by means of a vessel-mounted thermosalinograph. The data will be cross-calibrated against the sensors mounted on the CTDO unit; the result will be gridded to obtain the surface distribution maps over the surveyed area.

Satellite imagery Level 3 products (maps) will be used in order to determine the variability on continuous spatio-temporal time scales, both during and between the survey periods. The principal products used in the oceanographic applications will include: ASCAT - Ocean Surface Winds (resolution 25 km), AVISO – sea surface height and geostrophic surface currents (resolution 25 km) and MODIS Aqua and Terra – sea surface temperature (resolution 4 km). The data will be received on board and analyzed in combination with the *in situ* data.

Fixed moorings will be deployed in order cover the continuous record of the oceanographic variability in the water column at specified locations. The observational system will include instrumentation to measure currents and seawater properties (temperature, salinity and dissolved oxygen) at fixed horizons, as well as bottom and subsurface mounted ADCP units to record continuous current profiles.
The oceanographic component of this program will be integrated with the present observational strategy implemented by MFMR. This will include coordination in planning the surveys grids and mooring deployments, as well as sharing of the data from the existing monitoring lines.

2.3.2 Water column; nutrients, primary and secondary production

Offshore bulk phosphate mining might influence abiotic factors (i.e. light conditions/turbidity and nutrient loads and ratios) important for primary production. The objective of this activity is therefore to describe the seasonal variation of chemical and biological conditions in the water column in the coastal waters off Namibia pre-phosphate mining and will provide a basis for future monitoring and auditing programs if these should be necessary in connection with any bulk seabed phosphate mining

The station grid should be determined by the location of the phosphate deposits, coastal currents, bathymetric features and upwelling areas. Transects for regular monitoring of Namibian coastal waters already established by MFMR will, if suitable, be incorporated in the study. We suggest that the transects to monitor the water column should start in close proximity to the coastal line with measurement transects perpendicular to the shore. The transects will cross marine phosphate deposit areas.
The monitoring programs for possible on-shore mining activities and MPAs will include the establishment of sampling stations both up- and down-streams the main current direction in the respective areas. Moreover, the ocean models, SINMOD or equivalent, will be run to give indications on areas of special interests to be included in the monitoring program.
To meet this objective we suggest a work program that includes field surveys collecting samples for analysis of:

- Hydrographic profiling using the CTD with additional sensors (temperature, salinity, oxygen, Chlorophyll A, turbidity and light)
- Inorganic nutrients (ammonia, nitrate, total nitrogen, orthophosphate, total phosphate, and silica)
- Chlorophyll a
- Total organic carbon
- Phytoplankton samples for analysis of cell densities and biodiversity
- Zooplankton analysis and sampling to obtain information about annual variation in biodiversity, biomasses, reproduction as well as vertical and geographical distribution of the different species and stages.
- Microorganisms

The phytoplankton samples will be collected from the photic zone at pre-selected depths and from net samples for species composition and abundance estimation. Zooplankton will be sampled with a Multinet sampler from pre-selected depth intervals. Analyses of samples will be carried out in accordance with international standards at accredited test-laboratories. The sampling program is scheduled for two years with a bimonthly sampling program.

2.3.3 Benthic surveys and collection for biological and sediment samples from the seafloor for analysis

The objective of this activity is to describe the biological and chemical conditions of the sediments in the coastal waters of Namibia for the purpose of obtaining knowledge of the present state and to assess what the consequence would be of removing/disturbing the benthic communities and surface sediment layers. To meet this objective we suggest a work program that includes field surveys collecting sediment samples. The station layout should be based on background information from bathymetric maps and coastal currents and located alongside with the hydrographical stations to include the analysis of:

- Flora and fauna in the littoral zone down to 20 m depth especially in the MPA and in connection with land-processing units
- Biodiversity in soft bottom sediments.
- Abundance of benthic invertebrates including meiobenthos
- Microbiology in soft bottom sediments.
- Video documentation of surface features
- Review of benthic data from the area.
- Identification of areas of special interest.
- Total organic carbon (TOC) in sediments
- Grain size
- Micropollutants in sediments
- Heavy metals in sediments
- Radiation from sediments
- H_2S and methane

The sampling regime should reflect any seasonal changes to the system especially in and near the hypoxic zones that coincide with phosphorite distribution. Sampling will follow the OSPAR[1] guidelines for sediment sampling. The samples should be analyzed in an accredited laboratory.

Method standardization

Creating regional standards for carrying out environmental surveys based on internationally accepted practices with the view of harmonizing survey methodologies through the adoption of best practice.
A sampling device called ”Video-grab” designed for sampling according to OSPAR will be used. This technology includes collection of sediment samples, hydrographic measurements and observation with high resolution cameras. The “Video-grab” has been successfully used for environmental baseline studies and monitoring. In Ghana, Angola and in the joint Development Zone between Namibia and São Tome é Principe this equipment can be installed on R/V Mirabilis or on R/V Dr Fridtjof Nansen for use in Namibian waters.

2.3.4 Contamination in biota

The objective of this activity is to describe the current situation (i.e. pre-phosphate mining) on contamination in biota, including seafood, in the coastal waters off Namibia. Sessile organisms like mussels and seaweeds are suitable indicators for onshore activities, while both commercial and non-commercial fish and shellfish

[1] http://www.ospar.org/

species will be used as indicators for both onshore and offshore mining activities. Biota to be sampled include: seaweed, mussels, oysters, deep-sea crab, rock lobster, pilchard, orange roughy, hake, monk fish and horse mackerel.

The current level of heavy metals, selected organic pollutants and radio nucleotides in biota will be analysed to provide thorough coverage of the present situation, in conjunction with any recent analyses that are available from sourced data. The data collected during this activity will be important for seafood safety evaluation and contribute to the establishment of a pre-phosphate mining baseline on the contamination in biota, and give input to chapter 2.7 and 2.8. Furthermore, the results from this activity are also of interest for the experimental and toxicological studies described below (Section 2.4). To meet this objective we suggest a work program that includes field surveys collecting biota for analysis of:

- Dry weight
- Organic pollutants
- Heavy metals
- TBT
- Radiation

Analyses will be conducted according to marine environmental international standards.

2.3.5 Marine living resources and ecosystem wide impacts

Being a part of the Benguela Upwelling System - one of the major boundary upwelling regions of the world, the Namibian shelf is rich in marine living resources and the place of intense exploitation of its fisheries. Its ecosystem experienced an unprecedented period of a regime shift in the 1970s, when the principal pelagic fishery of sardine (*Sardinops sagax*) collapsed, commencing a string of trophic interactions, attributed to overfishing, which resulted in a change of both, species composition and biomasses of the dominant marine living resources. Figure 2 from van der Lingen et al. (2006) demonstrates that the principal changes affected the prey fish and top predator levels, from the dominance of small pelagics (sardine) and top predation by for example seabirds (gannets) in the 1960s to the emergence of pelagic/bearded gobies (*Sufflogobius bibarbatus*) as prey and species of jellyfish became plentiful in the system. A decrease in the predator - seabird populations followed. Demersal resources (hake, *Merluccius capensis* and *M. paradoxus*) and midwater fish (horse mackerel, *Trachurus trachurus*), as well as some top predators such as fur seals (genus *Arctocephalus)* exhibit stable population levels, except for interannual variations and shifts in their distribution ranges. In the light of recent studies (Utne-Palm, et al. 2010, Salvanes et al. 2014) it appears that the depletion in dissolved oxygen levels may also have been a factor contributing to the observed pelagic ecosystem shift.

Catches of most of the important fish resources in Namibia have remained approximately stable in recent years. Catches of hake and horse mackerel has increased slightly and today these two resources dominate the Namibian catches.

One of the principal tasks in the environmental study should be to identify/confirm presently the spawning, nursery and foraging areas of commercially important fish species in both temporal and spatial scales, and evaluate their vulnerability to possible effects of the prospected mining operations. To do this, all collected and available information (from 2.1) will be analysed before more sampling is planned.

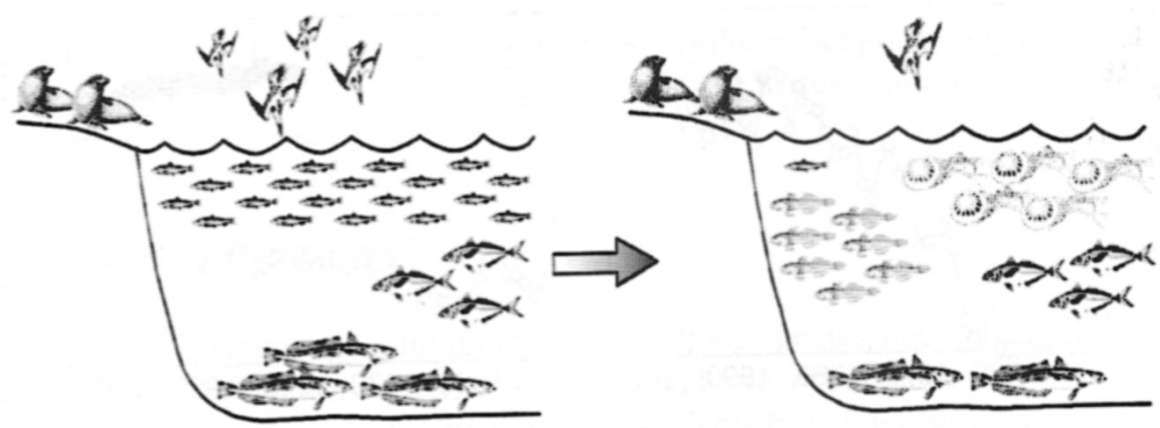


Figure 2 Changes in ecosystem structure and relative abundance of dominant living resources in the northern Benguela. The status during 1960s (left) and during 2000s (right). The icons represent small pelagic fish, horse mackerel, hakes, goby, jellyfish, Cape gannets and Cape fur seals. The figure is copied from van der Lingen et al. (2006).

2.3.6 Mammals and seabirds

Marine mammals and seabirds are valuable to trace changes in behavior and condition induced by possible environmental changes in marine systems. For example, habitat use and feeding habits can be affected by changes in water chemistry, turbidity, primary production and noise levels. In order to be able to assess possible effects on the populations from both inshore and offshore it is necessary to

- Obtain and review data-series on sea mammals and birds, particularly in the MPA.
- Consult local expertise.
- Monitor seals, whales, dolphins and seabirds during already planned cruise activities and especially within the MPA
- Extend and intensify existing observations and monitoring programs.

2.4 Experimental and toxicological studies

Objective: Establish scientific knowledge on potential impact from phosphate mining on the marine ecosystem, including ecologically important fish and shellfish species, through laboratory studies. The results will be essential input in sections 2.6 and 2.7.

Namibia is a large seafood producing country. It is therefore prudent to make sure that seafood quality, safety and market reputation is not negatively influenced by industrial discharges to the sea and coastal areas. In addition to the food safety of commercial species it is important to look for effects at the lower trophic levels that represent food organisms for the commercial fish stocks. Both planktonic organisms from the water column and benthic organisms from the seafloor and sediments should be tested. Effects on early life stages or effects on recruitment are other important aspects that must be considered and tested.

Samples of fish and samples from different trophic levels in the water column, benthos and sediments will be collected from the ecosystem cruises on R/V Mirabilis, R/V Dr. Fridtjof Nansen and other vessels. The samples will be analysed both at internationally accredited laboratories and local laboratories. There will be

analysis of components that are suspected to affect food safety. Eco-toxicological studies of effluent water and selected scenarios including effluent waters and identified chemical compounds, on selected key organisms at various life-stages (including egg, larval and juvenile life stages) will take place in bio-test laboratories with running seawater in Namibia.

IMR, NIFES and the University of Bergen have long experience from these types of effect studies on live marine organisms and fish. A Biotest laboratory for effect studies on crude oil and industrial chemicals has been in operation at IMR for decades. It is proposed that this kind of laboratory will be implemented and operational in the Ministry of Fisheries laboratories in Namibia. Capacity building will be an important part of field studies, establishment and operation of a test laboratory and the analyses.

Risk assessment of production chemicals used by the offshore mining industry:

- Carry out a literature assessment of production chemicals planned to be used in every step of phosphate extraction and processing.
- For many production chemicals used by the mining industry, such as flocculants and flotation chemicals, there is a general lack of knowledge on accumulation in marine organisms and potential impact on wildlife and consumers. Depending on the types of compounds that are planned to be used (if any) in the extraction and processing of phosphate, a preliminary risk assessment should be conducted focusing on uptake, accumulation and elimination in species important for the regional fisheries industry. Relevant species that should be considered are the important species for Namibian fisheries, both directly (harvested species) and indirectly (food web and prey species).
- Production chemicals without an eco-toxicological test certificate and compounds suspected to have an impact on key species in the ecosystem will require special tests. Cytotoxicity tests with cell culture and toxico-kinetic studies on uptake will be set up in laboratories in Namibia. Tests on behaviour, physiological effects, uptake, accumulation and elimination of production chemicals and process effluents expected from phosphate mining, will be set up in Namibia.
- Long term tests will be conducted on relevant species in flow through systems with running seawater in Namibian laboratories. Analysis of the edible parts of fish, crustaceans and shellfish will give information if some chemicals or components in the effluent accumulate or in other way affects the quality of the seafood. From the results of these studies, threshold values and tolerance levels can be identified. These will be available for establishing regulatory levels and form the basis of monitoring systems if needed in the future.

2.5 Ocean modeling

Objective: Assessment of potential environmental impacts from mining operations based on the results from oceanographic, and particle and sedimentation models.The results will be essential input in sections 2.6 and 2.7.

Monitoring programs are expensive and time consuming activities, and cannot feasibly provide the requested amount of data for analysing wave conditions, currents and biological production, or to evaluate the spread and sedimentation of particles or chemical components in an area. Models can be valuable tools describing the situation in a larger area based on measurements from field surveys and oceanographic monitoring platforms. A dynamic physical model will give three dimensional distributed data on hydrography (temperature and salinity) and currents in space and time. These data are needed as input to a particle and sedimentation model to be used for examination of dispersal of particles from dredging activities.

2.5.1 Biological and physical oceanographic modeling

Sea water current and hydrography data are obtained by running the coupled physical-biological ocean model SINMOD (Slagstad & McClimans, 2005) or equivalent. The hydrodynamic model is based on the primitive Navier-Stokes equations, and operates on grid points of varying density or resolution. Vertically, the model can be set up to give higher resolution in the upper or lower parts of the water column. Through nesting, high resolution model setups use boundary values produced by lower resolution setups, thereby absorbing large scale properties generated outside the local model domain. In this project, a nested setup will simulate the license area using boundary values provided by the MyOcean Ocean Monitoring and Forecast model and atmospheric data from European Centre for Medium-Range Weather Forecasts (ECWMF).

Sub tasks are:

- Setup of a large scale ocean model in 20km horizontal resolution. This model will cover the whole South Atlantic Ocean.
- Implementation of boundary conditions for the large scale model based on the MyOcean Ocean Monitoring and Forecast model.
- Provision of and atmospheric data from European Centre for Medium-Range Weather Forecasts (ECWMF).
- Downscaling to two medium scale 4 km and 800 m, and a fine scale 160 m horizontal resolution model covering a selected area, and an area covering pipeline transfer of the slurry from the vessel to identified shore areas (suggested areas for 800m and 160m models indicated on Figure 3).
- Simulation and validation of the large scale, medium scale and fine scale models.

To be able to increase the outcome of the pre-phosphate mining environmental studies the ocean model will be used to:

- Suggest the number and type of measurement platforms needed. Relevant platforms types are ADCP stations and oceanographic buoys. Measurement platforms including chemical and biological sensors may also be necessary.
- Optimal positioning of the measurement platforms. This will be calculated by numerical optimization methods that utilizes model data and measurement data of variability in the measured variables.
- Measurement campaign. This task will involve deployment of the measurement platforms, and collection, storing, preparation and transfer of measurement data.
- Filtration, analysis and evaluation of measured data.

Data assimilation will be used to improve the model estimates by correcting the model errors. Measurements of current, temperature and salinity are candidate data for this task. Sub tasks are:

- Setup of the assimilation module of SINMOD, or equivalent model, for the fine scale model.
- Simulation, verification, assimilation tuning and validation of the fine scale model.

Key chemical components and biological species that are specific for the project area will be considered included and sub tasks would be:

- Literature review. Earlier and ongoing model studies for the relevant phosphate deposit area in Namibia that are available will be utilized.
- Model definition and implementation.
- Simulation, verification, model tuning and validation.

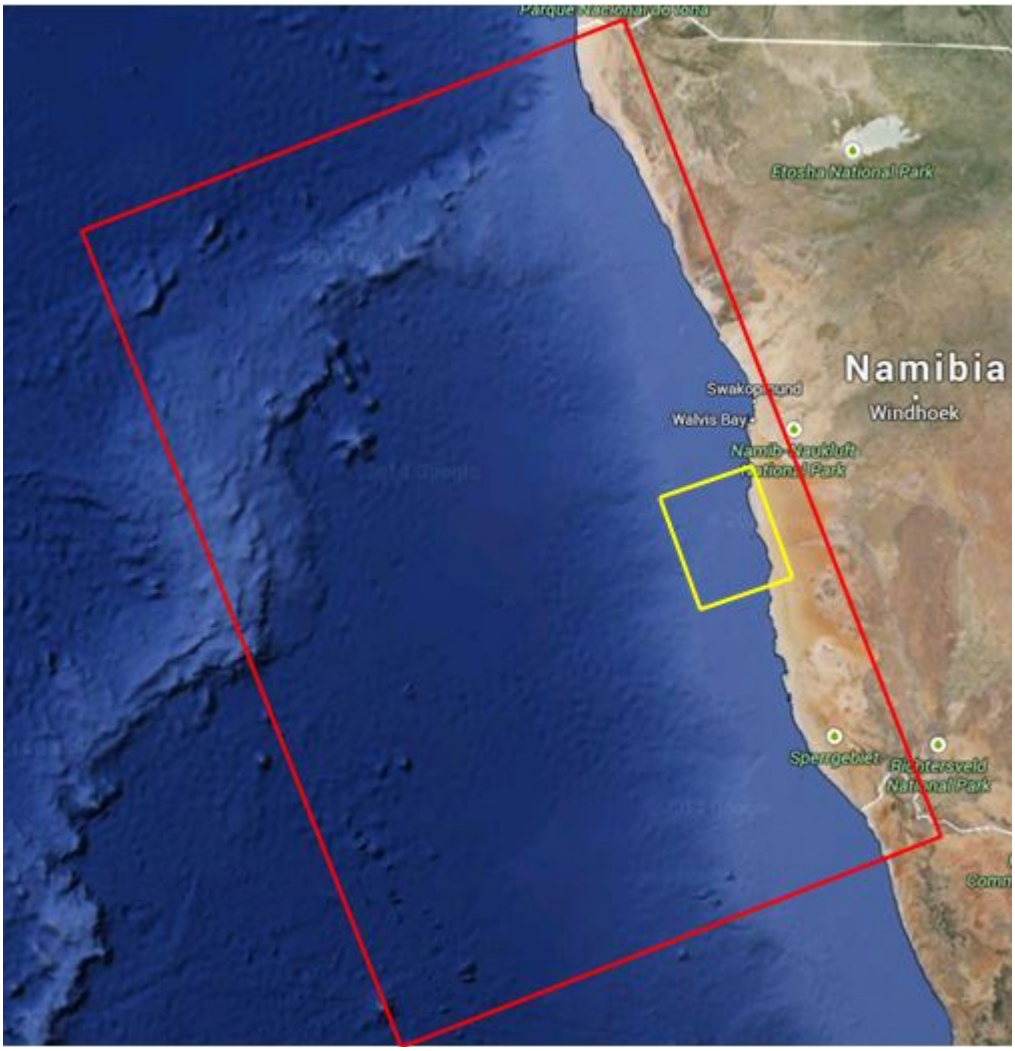


Figure 3 **Approximate area covered by the planned 800m model (red) and160 m model (yellow). The position of the 160 m model is flexible within the larger area.**

2.5.2 Particle and sedimentation modeling

Tailings, fine-grained waste-solids produced during mineral processing, are the main waste product from extraction of valuable minerals and metals from mineral ores. The proximity of mineral resources to vulnerable water bodies creates a real environmental challenge. One of the main tools used to overcome the sheer volume of tailings produced during mining is to dispose them at the seafloor as submarine mine tailings placements (STPs).The Norwegian mining industry has acquired a substantial amount of experience with respect to the technical solutions for STPs. Suspension and excavation of the natural sediment occurs under operational dredging and may result in a significant change of the environment through the change of grain size, turbidity in the water column and the effect of pore-water components and oxygen levels in the water.

A way to quantify both the effects of operational dredging as well as the dispersal of tailings and spread of STPs at the seafloor is through the use of models. An example is the Dose-related Risk and Effects Assessment Model (DREAM). DREAM is a Lagrangian-based three-dimensional transport model that has

been developed by SINTEF over the past 20 years. The model was originally developed to answer questions related to the spreading and impact caused by drilling discharges from offshore oil and gas operations, has been extended and applied to near-shore discharges recently (Coastal DREAM). Due to the model's general construction, it has great potential with regards to simulating long-term deposition of sediments from the mining industry in the sea, and answering questions concerning how far from the disposal site sediments will spread, and the specific nature and toxicity of the particles or chemical components in the water column and on and in the sediments. SINTEF's DREAM model or equivalent can be used to realistically predict transport and fate of mining discharges through different variables (3D water column concentrations and spatially resolved thickness of the deposited matter) simulating the deposition and spreading of tailings, and therefore can potentially provide necessary input to biological/environmental impact assessments for STPs. DREAM is well-established in its application to offshore petroleum-related discharges (including drill cuttings), and can predict these variables over time. In addition, a sub-model for impact on the sediment (toxicity, oxygen depletion and burial) is available. This part of the DREAM model includes effects from bio-turbation and partition of chemicals between pore-water and sediment. From this information, indicators or integrated factors can be constructed to enable a quantitative and consistent method for impact and risk assessment.

A particle and sedimentation model, DREAM or equivalent, will be developed and set up for the following suggested scenarios:

- Simulation of regular releases from dredging activities (trailing suction hopper dredge causing re-suspension of sediments at the dredge head and discharge of lean water[2] from the dredger's hoppers at the operation location).
- Simulation of accidental releases of phosphate matrix (and fuel oil) during transport (dredger overspill, discharge of vessel waste water, optionally oil spill modeling with OSCAR or equivalent model (for ship fuel)).
- Simulation of accidental releases from leakages in the installation (discharge of the slurry from the pipeline or directly during transfer from vessel to shore).
- Simulation of deposition of screened shell grit (at low tide mark).
- Waste water deposition from the onshore processing plant to the sea.

This task includes:

- Adaption of model to capture moving releases
  For modeling of first scenario above DREAM or equivalent model will be further developed to capture a moving release site along a given line. This development requires implementation and adaption of the underlying software code.
- Gathering of the required input data, parameterization and setup
  Required input for the simulations is the release amount, the chemical and physical properties of the released matter, the release location and the ambient conditions.

Important scenarios will be analyzed. Candidate scenarios are:

- Simulation of regular releases from dredging activities.
- Simulation of accidental releases during dredging activities
- Simulation of accidental releases from leakages in the installation.
- Simulation of shell grit (for environmental sustainability).
- Simulation of waste deposition from land.

[2] Lean water: While loading the hopper barge with dredged material, the already loaded sediment within the hopper sinks to the bottom of the barge and separates from the water that was loaded together with the dredged material. The remaining water is called 'lean mixture' or 'tailings' and contains reduced sediment concentrations

This task includes:

- Simulation and verification of the case results[3].
- Interpretation of the simulation results with respect to the environmental impact (simulated concentrations vs. background).

2.5.3 Wave height modeling

Any operation at sea poses a potential risk towards the marine ecosystem and should as such be subject to a risk assessment. Marine operations, including dredging activities, rely on weather and wave conditions; thus threshold levels for when offshore operations can be carried out safely (i.e. without endangering the marine environment) have to be established. To do this it is necessary to have knowledge on weather and wave conditions in the area where offshore and onshore phosphate mining activities will take place. Wave and wind statistics will be valuable input in chapter 2.7and 2.8, and will for example include:

- Frequency distribution
- Extreme statistics for significant, maximum and crest wave height
- Spatial and temporal variability
- Seasonal and inter-annual variability
- Direction roses

World Wave Atlas (WWA) is developed by Fugro OCEANOR or equivalent, and provides accurate wind and wave climate statistics for any country or region worldwide. Please refer to Appendix M for further description of this activity.

2.6 Assessment of potential impacts from P-mining on the marine ecosystem

Objective: Give an overall assessment of potential impacts from phosphate mining on the marine ecosystem.

The project has contributed to a huge amount of information on the past and data on the present situation in the coastal waters off Namibia. These data will be discussed and evaluated to give an overall assessment of the potential cumulative and long-term impacts from phosphate mining on the marine ecosystem. Furthermore, the implementation of different countermeasures and their effects will be discussed. The discussion and assessment of these data will be the basis for the conclusions and recommendations on a possible co-existence of fisheries and marine phosphate mining that will be given.

2.7 Recommendation for the future: Regulations and management systems for onshore and offshore P-mining operations and discharges

Objective: Prepare input to Namibian authorities for the development of regulations and management systems, including operational monitoring programs, for onshore and offshore phosphate mining activities.

If Namibia decides to allow marine phosphate mining there is a need to establish regulations on beforehand. The regulations have to be based on an up to date knowledge on the marine ecosystem and impacts from

[3] This relates to the model development for including moving releases, a feature that the model does not capture per today.

mining on the ecosystem as a whole; and the findings from the pre-phosphate mining baseline studies (including field surveys), the experimental laboratory studies and the results from the modeling activities will be the basis for understanding which parts of the ecosystem that will be vulnerable towards mining operations and discharges. Especially will the results from the experimental laboratory studies and the modeling activities be important for the development of threshold limits for components of concern to be implemented during marine phosphate mining operations.

To be able to utilize the large quantities of marine phosphates located on the Namibian continental shelf it is necessary to develop a regulation and management system which is based on up to date scientific knowledge. A well-functioning legal and management system will contribute to a possible co-existence between different industries and activities; and enable value creation in different sectors. However, concerns for a healthy ecosystem, fish recruitment, seafood supply and for seafood safety have been raised. If these concerns should be reality, it will influence areas like tourism, sport fishing, food supply, ecosystem health, different trophic levels, sea mammals and seabirds included.

Threshold limits will also be important when establishing discharge permits and national control regimes for components of concern, as well as regulating during which conditions critical operations are permitted. Regulations have to be action based; i.e. if discharges exceed national threshold levels national authorities must have legal permission to stop mining related activities until the industry has applied counter measures. In this work package we will make use of the experiences from the development of Norwegian regulations for the oil and gas industry, salmon industry and discharges to sea from industrial and wastewater treatment plants.

2.8 Recommendation for the future: Monitoring and control of mining operations and discharges if co-existence is going to be achieved

Objective: Prepare input to an operational monitoring program for onshore and offshore phosphate mining activities.

If phosphate seabed bulk mining should occur there is a need to establish and implement a monitoring and control system on beforehand. This is especially important to achieve a future co-existence between other industries (fisheries, mariculture, tourism etc) and phosphate mining. Below we describe some tasks and concerns that have to be taken in consideration during this work.

Environmental Assessment

Creating coastal/offshore environmental baseline as a reference point for monitoring, that would provide an overview of environmental status and trends over time as a result of offshore industry and other activities (fisheries etc.). The monitoring programme is intended to show whether the environmental status on the coast and continental shelf is stable, deteriorating or improving as a result of the operators' activities. In addition to identifying trends, the results should as far as possible provide a basis for projections for future developments.

The "baseline" will be established based on quality controlled historic data and collection and analyses of new samples as described under previous paragraphs, to assess and monitor the environmental quality. Heavy metals, selected organic compounds and chemicals used or discharged by industrial or other anthropogenic activities in an area should be sampled for analysis. There should also be sampling and analysis of biodiversity. Environmental monitoring of marine industrial activities should include monitoring of the water column and of benthic habitats (sediments and soft- and hard-bottom fauna). The monitoring results can be used by operators and authorities as a source of information and as basis for making decisions on new measures to be implemented offshore and in coastal areas including legislation and policies both for

authorities and companies. The results can also be used to develop and report on national environmental indicators, creation or improving sensitivity maps and provision of advice on environmental best practises.

National/Regional Monitoring Plans
There is a concern that the offshore and coastal industrial activity may have negative impact on the marine resources resulting in reduced recruitment to fish stocks or loss of marine biodiversity. The problems with pollution and transport of pollutants are complex and trans-boundary. Marine industrial activities are not only limited to the territories where it takes place. It may also represent a problem shared with other countries in the marine ecosystems that will require a regional coordination approach. With possible impact on ecosystems and possible influence on different users of the sea it is important to monitor and document the environmental conditions in a certain area according to a standardized and quality assured method to inform development of national regional standards and measures .
Environmental monitoring of the water column will be broken down into condition monitoring and impact monitoring. For the regional condition monitoring, samples of fish and other marine organisms from catches in different areas will be collected and analysed to document whether fish are affected by pollution from the offshore mining sector or from other users of the sea. Analysis of a variety of pollutants can easily be added. This kind of monitoring can give valuable information about status and seasonal variation of pollutants in selected marine organisms
Impact monitoring can be done using *in situ* cages with live fish, mussels and passive absorbing membranes deployed in gradients from dredging and or discharge point for “process water" in the open sea. This method can also easily be applied on a variety of pollutants from different sources. (*Results from experiments in oil production areas show moderate effects for certain biomarkers in cages close to the point of discharge. A gradient related to distance from the discharge point has also been identified.)*

Method standardization
Creating regional standards for carrying out environmental surveys based on internationally accepted practices with the view of harmonizing survey methodologies through the adoption of best practice.
A sampling device called ”Video-grab” designed for sampling according to OSPAR will be used. This technology includes collection of sediment samples, hydrographic measurements and observation with high resolution cameras. The “Video-grab” has been successfully used for environmental baseline studies and monitoring. In Ghana, Angola and in the joint Development Zone between Namibia and São Tome é Principe this equipment can be installed on R/V Mirabilis or on R/V Dr Fridtjof Nansen for use in Namibian waters.

2.9 Capacity development

Objective: Strengthen the scientific cooperation between Namibia and Norway through bilateral exchange of students and researchers, as well as use of Namibian facilities.

Capacity development will be an essential part of all activities in the Main Project (i.e. described in this document); the aim is to enable a local scientific based management of the Namibian Exclusive Economic Zone after the Main Project is terminated. Capacity development and competence transfer will pervade all the activities of the Main Project. We propose this will include:

- Exchange of know-how related to activities in the Main Project
- Use of Namibian research facilities including laboratories and research vessels
- Establishment of laboratory facilities for experimental and toxicological studies. The Main Project will contribute to and facilitate practical implementation.

- Namibian students on master and PhD level will be encouraged to carry out parts of their thesis at Norwegian universities in co-operation with SINTEF, IMR and NIFES.

2.10 Reporting and dissemination

Objective: Keep the project owner, steering committee and stakeholders informed on results and progress in the Main Project

Progress reports will issued every six months; these will include a short status on the progress according to scheduled time frames and preliminary results from different activities. Regular meetings will be held in Namibia; this might include a yearly meeting with stakeholders and two meetings with the local steering committee and project owner. To ensure information flow and transparency a web site will be established.

2.11 Project organisation and administration

Objective: Ensure that the Main Project will be conducted in a successful way and give Namibia the expected outcome.

The responsibility of the project organization is to ensure that the Main Project is carried out in accordance with the planned time frame and available resources; and to ensure the deliveries. The project organization will also focus on quality assurance from day one. Another important task is to ensure that health, safety and environmental (HSE) aspects are taken into account during all activities in the Main Project.
The project manager is responsible for communicating and reporting to the project owner and the local steering committee; regular contact will be achieved by monthly telephone conferences or when required. The project manager will in cooperation with the local project coordinator organize workshops and meetings in Namibia. The responsibility for establishment and maintenance of the web site lies within the project organization.
A successful project depends on a close involvement of Namibian bodies and institutions: MFMR, MET, MME, MAWF, MWT, NatMIRC, UNAM.

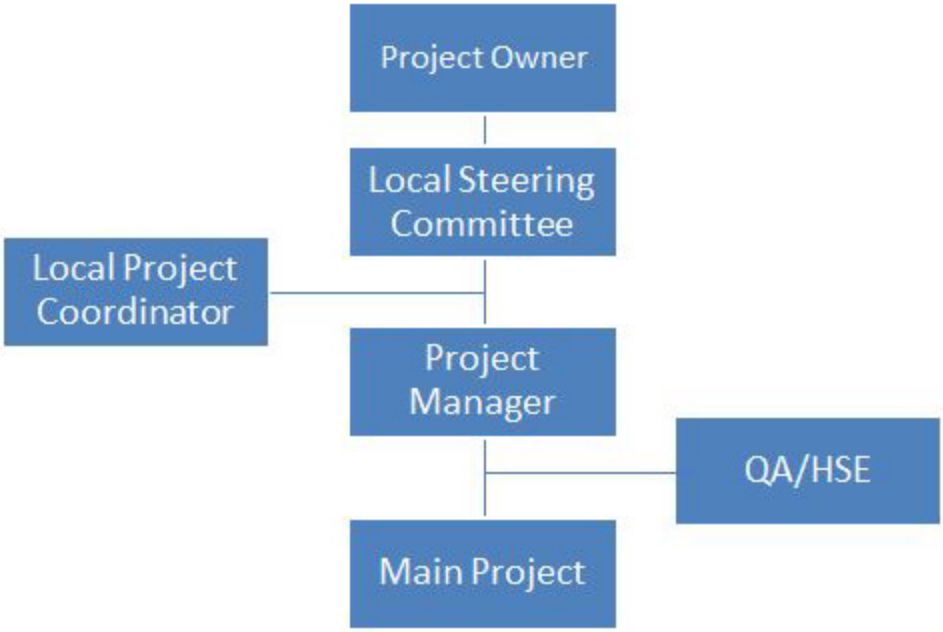


Figure 4 **Organisation structure of the Main Project.**

3 Time schedule

Proposed time schedule for the Main Project, the enumeration of the activities corresponds to the different sections in chapter 2:

	Year 1				Year 2				Year 3			
Acitivity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Identify present knowledge on the marine ecosystem												
2. Coastal development, industries and discharges												
3. Pre-mining environmental study												
4. Experimental and toxicological studies												
5. Ocean modelling												
6. Assessment of potential impacts from P-mining on the marine ecosystem												
7. Input to regulations and management systems for mining operations and discharges												
8. Input to monitoring and control of mining operations and discharges												
9. Capacity building												
10. Reporting and dissemination												
11. Administration												

The different activities within the work program are highly interconnected and closely linked to each other.

4 Budget and financing

The enumeration of the activities corresponds to the different sections in chapter 2:

	Year 1	Year 2	Year 3	Subtotal per activity (kNOK)
Activity				
1. Identificy present knowledge on the marine ecosystem	550			550
2. Coastal development, industries and discharges	550			550
3. Pre-phosphate mining environmental studies	20405	20405		40810
4. Experimental and toxicological studies	7590	7590		15180
5. Ocean modelling	1375	1375		2750
6. Assessment of potential impacts from phosphate mining on the marine ecosystem		1232	4928	6160
7. Input to regulations and management systems for mining operations and discharges			3025	3025
8. Input to monitoring and control of mining operations and discharges			3850	3850
9. Capacity building	1320	1320	660	3300
10. Reporting and dissemination	282	282	845	1409
11. Administration	4818	3614	3614	12046
Subtotal per year (kNOK)	36890	35818	16922	
GRAND TOTAL (kNOK)				**89630**

The following financial bodies have been identified as possible co-founders of the Main Project:

- The World Bank
- UNIDO
- FAO
- UNEP
- BCC

5 Contributing organisations

SINTEF Fiskeri og havbruk AS (SFH) is an institute in SINTEF, Scandinavia's largest independent, non-profit research company with approximately 2000 employees doing contract research within a long range of disciplines. SFH is located in Trondheim, Norway and has 120 employees. Under the vision "Technology for a better society" SFH is working for a knowledge-based bio marine industry. SFH goal is to meet market demands for technological research and development on renewable marine resources. SINTEF has a close cooperation with the Norwegian University for Science and Technology (NTNU) with respect to research, education (i.e. master degrees, PhD's and post-doctoral fellowships) and laboratories.

Institute of Marine Research (IMR) is with a staff of 750 the largest marine research institution in Norway and the second biggest in Europe. The institute plays a leading role within the areas of marine ecosystem management, marine resources, marine environment, coastal zone management and aquaculture. As a governmental institution, its main objective is to provide scientific advice to the authorities, industry and the general public, in addition to development cooperation in research and resources management.
The Institute has an excellent infrastructure, including six research vessels, two research stations for experimental biology and aquaculture, and a wide range of biological and chemical laboratories.
The Institute of Marine Research is an important adviser to international organisations and commissions and cooperates with a large number of universities and research institutions worldwide. The Centre for Development Cooperation in Fisheries focuses on research and management to achieve maximum and sustainable benefits from marine resources in developing countries.

National Institute of Nutrition and Seafood Research (NIFES) in Norway has a long history of monitoring seafood safety with regard to toxic substances. The institute has the last years performed six large baseline studies for important commercial fish species. For the metal part, multi-element analysis (ICP-MS) will be used to monitor the levels of heavy metals in seafood. For mining chemicals, appropriate analytical instruments will be used. NIFES has well-equipped labs to conduct analyses on a broad spectre of inorganic and organic chemicals. This task will benefit from NIFES' established analytical pipelines, unique databases and extensive experience with seafood surveillance and toxico-kinetic assessments.

6 Namibian Administrative, Legal and Policy Requirements

6.1 Project Application and Stakeholder Consultation

The application for environmental clearance for the undertaking of the 'Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, Specifically Phosphates, off the Namibian Coast' was submitted on 14 February 2014 and registered with the Ministry of Environment and Tourism on 24th April 2014. The proof of registration is in Appendix A.

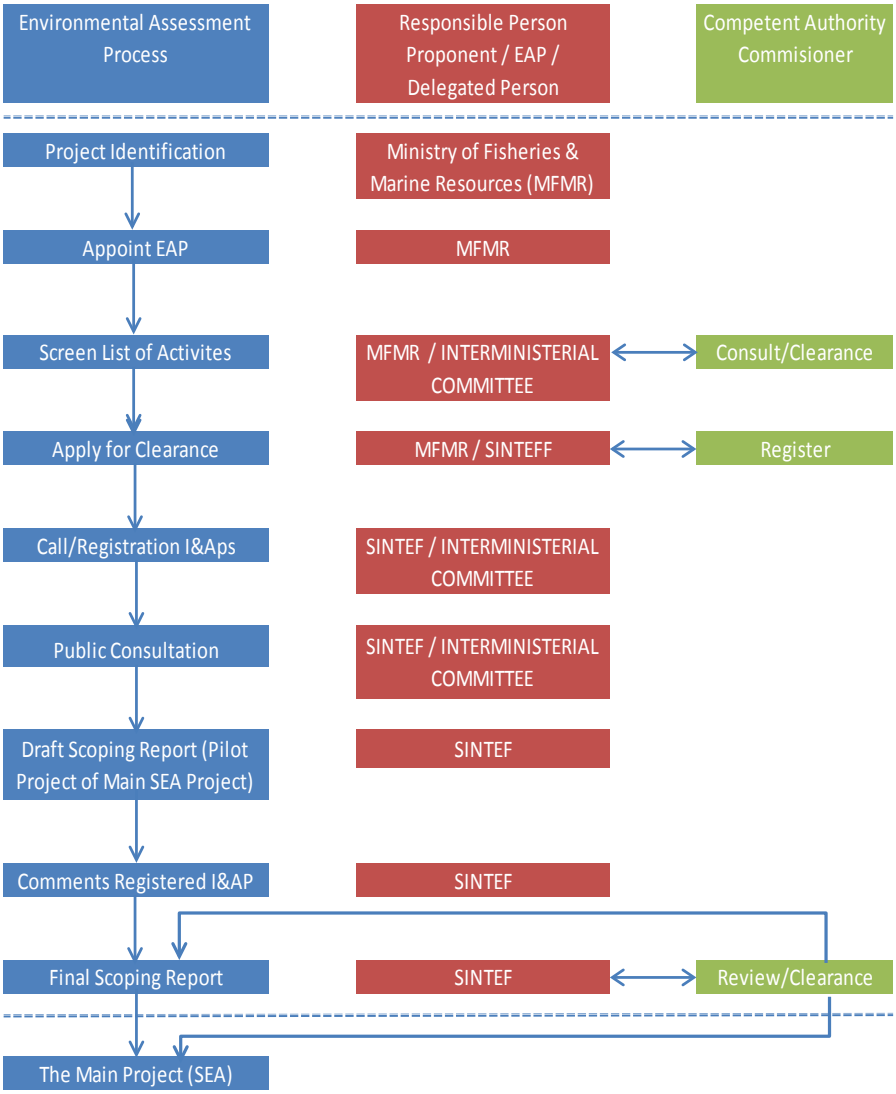
Public consultation followed as described below, according to, Government Notice No. 30, Environmental Impact Assessment Regulations: Environmental Management Act 2007, in Government Gazette No.
4878.

a) Conduct a public consultation process in accordance with **regulation 21 of GG No. 4878 of 2012**. The draft procedures and guidelines for environmental EIAs and EMPs, Government Notice No. 1 of2008 (Directorate of Environmental Affairs, 2008),
b) Open and maintain a register of all interested and affected parties in respect of the application in accordancewith**regulation22of GG No. 4878 of 2012**.
c) Consider all objections and representations received from interested and affected parties following the public consultation process conducted, in terms of paragraph (a), and subject the proposed application to scoping by assessing-
(i) the potential effects of the proposed listed activity on the environment;
(ii) whether and to what extent the potential effects can be mitigated; and
(iii) whether there are any significant issues and effects that require further investigation;
d) Prepare a scoping report; and
e) Give all registered interested and affected parties an opportunity to comment on the scoping report in accordance with **regulation 23 of GG No. 4878 of 2012.**

The register of Interested and Affected Parties is in Appendix F. Institution, Industry and Public meetings were held in Lüderitz and Swakopmund in June 2014. Letters of invitation (See Appendix D) and a background information document (BID) (See Appendix C) were provided to the prospective attendees. Adverts in the national press for the public meetings were posted: proofs of these adverts are in Appendix D. I&APs registered before the meetings and attendance at the meetings was recognised as an intention to be registered. The attendance lists for the six meetings can be found in Appendix G (scanned copies of registers available on request). The list of persons, companies and institutions contacted prior to the meetings are in Appendix E. Where, an email address or fax number failed to provide the invited with a notice to attend or provide input in abstention, it is understood that the adverts served as sufficient notification of the public meetings.

The goal of the meetings was to inform all stakeholders of the intention of the proponent, the Ministry of Fisheries & Marine Resources, to have a 'Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, Specifically Phosphates, off the Namibian Coast' carried out to contribute information towards an informed decision regarding the mining of phosphates from the Namibian seabed. The meetings were recorded using a digital video recorder. The minutes were transcribed from the video footage. Where attendees were indistinct in their speech and did not introduce themselves clearly it was sometimes difficult to record their concerns and comments accurately. The focus of the meetings was to generate discussions regarding the content of the scientific investigations that should in the opinion of the I&APs be included in the work packages for the Main SEA Project. The input from the attendees of the meetings did not always focus on the scientific investigations presented. This can be seen from the transcripts of the meetings minutes in Appendix H. Responses are included in the

minutes. Comments and concerns received after the meetings are in Appendix I. Responses to these comments and concerns are in Appendix J. A summary of the comments and concerns related to the focus of the meetings is provided in Appendix I. Comments and concerns related to process and socio economic concerns for instance are not deliberated.



6.2 Namibian Administrative, Legal and Policy Requirements

To protect the environment and achieve sustainable development, all projects, plans, programs and policies deemed to have adverse impacts on the environment require an EIA according to Namibian legislation. The following legislation pertains to the Main Project and the proposed work packages are of particular relevance to the whole marine ecosystem of Namibia.

6.2.1 Environmental Management Act of Namibia (2007)

In terms of section 58 of this Act, the Environmental Management Act came into force on the 6th of February 2012, as determined by the Minister of Environment and Tourism (Government Notice No. 28 of 2012). Under section 56 of the Environmental Management Act, 2007 (Act No.7 of 2007), the Minister has made the regulations for Environmental Impact Assessment as set out in the Schedule of Government Notice No. 30 (2012). These regulations require that all projects, plans, programs and policies that have a detrimental effect on the environment must be accompanied by an EIA. Under section 27 of the Environmental Management Act, 2007 (Act No. 7 of 2007), and after following the consultative process referred to in section 44 of that Act, the Minister lists in the Annexure to the above mentioned Schedule, activities that may not be undertaken without an environmental clearance certificate (Government Notice No. 29 of 2012). The Act and Regulations need to be given due consideration, particularly to achieve proper waste management and pollution control:

Cradle to Grave Responsibility
This principle provides that those who manufacture potentially harmful products must be liable for their safe production, use and disposal and that those who initiate potentially polluting activities must be liable for their commissioning, operation and decommissioning.

Precautionary Principle
There are numerous versions of the precautionary principle. At its simplest it provides that if there is any doubt about the effects of a potentially polluting activity, a cautious approach must be adopted.

The Polluter Pays Principle
A person who generates waste or causes pollution must, in theory, pay the full costs of its treatment or of the harm, which it causes to the environment.

Public Participation and Access to Information
In the context of environmental management, citizens must have access to information and the right to participate in decision making.

6.2.2 Water Act 54 of 1956

The Directorate of Resource Management within the Department of Water Affairs (DWA) is currently the lead agency responsible for management of marine pollution from land. Management and prevention of water pollution is based on a *permit system* administered by the DWA.

6.2.3 Aquaculture Act (2002)

The Act states in Section 26 with regards to water quality monitoring that:

"(1) The Minister must, for the purpose, of aquaculture, cause a water quality monitoring system to be established and maintained to provide timely information to licensees of the occurrence or imminent occurrence of any pollution or natural phenomenon which may have a harmful or detrimental effect on the aquatic environment or any aquaculture product.

(2) Where any area of Namibian waters in which aquaculture is conducted is affected by any pollution or natural phenomenon, the Minister must immediately order the testing of the water of the affected area and of the aquaculture products farmed in or with such water to determine:-

(a) whether aquaculture activities can be undertaken and continued; and

(b) in consultation with the Minister responsible for public health, whether the aquaculture products farmed therein are fit for human consumption;

(c) in consultation with the Minister responsible for trade prevent the sale or marketing of aquaculture products that are unfit for human consumption.

(3) If the results of the tests ordered by the Minister under subsection (2) show that: -

(a) the water quality of the affected area is unsuitable for the continuation of aquaculture; or

(b) the aquaculture products farmed therein are not fit for human consumption, the Minister must immediately, by notice in at least two newspapers circulating in the country, order the closure of the aquaculture facility and may prohibit the sale or marketing of aquaculture products farmed therein."

6.2.1 Territorial Sea and Exclusive Economic Zone of Namibia Act 3 of 1990

The Territorial Sea and Exclusive Economic Zone of Namibia Act aims to:
"*determine and define the territorial sea, internal waters, contiguous zone, exclusive economic zone and continental shelf of Namibia; and to provide for matters incidental thereto*."

6.2.2 Dumping At Sea Control Act 73 of 1980

This Act is still in force and is currently administered by the Ministry of Environment and Tourism. An application for a permit or exemption must be submitted to the Minister via the permanent secretary. This Act stated that *"Loading and dumping (is) prohibited or restricted (and that)*

(*1) any person who:–*

(a) dumps any substance mentioned in Schedule 1 (Appendix 1);

(b) (i) dumps any substance mentioned in Schedule 2;

(ii) loads any such substance onto any vessel, aircraft, platform or other man-made structure at sea for dumping; or

(iii) deliberately disposes at sea of any vessel, aircraft, platform or other man-made structure, except under the authority of and in accordance with the provisions of a special permit under section 3; or

(c) (i) dumps any other substance; or

(ii) loads any such substance on to any vessel, aircraft, platform or other man-made structure at sea for dumping, except under the authority of and in accordance with the provisions of a general permit under section 3, shall be guilty of an offence, unless the substance in question was dumped for the purpose of saving human life or securing the safety of the vessel, aircraft, platform or other manmade structure at sea in question or any other vessel, aircraft, platform or other manmade structure at sea or of preventing damage to the vessel, aircraft, platform or other man-made structure at sea in question or to any other vessel, aircraft, platform or other man-made structure at sea, and such dumping was necessary for such purpose or was a reasonable step to take in the circumstances."

Reference to permits states that:

(1) After consultation with a Standing Committee consisting of persons appointed by the Minister for purposes of this section, the Secretary may on application and after taking into account the factors set out in Schedule 3, grant–

(a) a special permit authorizing–

(i) the dumping, on such conditions as the Secretary may think fit to attach to such permit, of any substance mentioned in Schedule 2;

(ii) the disposal at sea, on such conditions as the Secretary may think fit to attach to such permit, of any vessel, aircraft, platform or other man-made structure;

(b) a general permit authorizing the dumping, on such conditions as the Secretary may think fit to attach to such permit, of any substance other than that mentioned in Schedule 1 or 2.

(2) An application for any such permit shall be made in such manner and contain such information as may be prescribed by regulation.

(3) If any person to whom any such permit has been granted is convicted of an offence referred to in section 2, the Secretary may cancel such permit or amend it by restricting the dumping or disposal authorized by it."

6.2.3 Marine Resources Act (No. 27 of 2000)

The Ministry of Fisheries and Marine Resources administers this Act. An application to the Minister via the Permanent Secretary for a permit or exemption should be submitted for the dredging of sediments and the disposal of effluents into the marine environment. The relevant sections are provided below:-
Section 47 (1) provides: *"No person shall use an explosive, poison or noxious substance to kill or disable any marine animal, and firearms shall be used for such purpose only as may be prescribed."*
Section 52 (4) of this Act provides the following:

(d) Any person who, in a marine reserve, without having been granted permission to do so under section 51(3), dredges or extracts sand or gravel, discharges or deposits waste or any other polluting matter, or constructs or erects any building or structure or in any way disturbs, alters or destroys the natural environment, shall be guilty of an offence and liable on conviction to a fine not exceeding N$500,000.

And/or

(e) discharges in or allows to enter or permits to be discharged in Namibian waters anything which is or may be injurious to marine resources or which may disturb or change the ecological balance in any area of the sea, or which may detrimentally affect the marketability of marine resources, or which may hinder their harvesting shall be guilty of an offence and liable on conviction to a fine not exceeding N$500,000.

Government Notice No. 5111(No. 316 of 2012) - Regulations relating to Namibian islands' marine protected area: Under section 61 of the Marine Resources Act, 2000 (Act No. 27 of 2000) read with section 51 of that Act, the Minister has made the regulations set out in the Schedule. Zonations – 4

(1) The Namibian Islands' Marine Protected Area consists of an all-encompassing buffer zone, further sub-zoned into four degrees of increasing protection. The approved conditions enforceable in each zone are contained in the management zonations for the Namibian Islands' Marine Protected Area.
(2) Zone 1 represents the buffer zone with generalized and fewest restrictions, applicable to all islands, islets, rocks and areas specifically mentioned, as stipulated in Part 6.
(3) Enforceable conditions for Zone 2 apply to near-shore and on-shore mining areas up to a water depth of 30m.
(4) Zone 3 restrictions are enforceable to a perimeter of 120 m (or less in specified cases in the approved management zonations) around each island, islet or rock.
(5) Zone 4 represents areas of priority conservation and highest protection status and is in force on the islands, islets, rocks, rock lobster sanctuaries and line fish sanctuaries.

Prohibition on trawling in the MPA: 'Trawling activities may not be undertaken in the Namibian Islands' Marine Protected Area.'
Regulations related to mining are stipulated for specific areas and only 1% of the EPL's registered area may be mined annually (See the regulations for details).

6.2.4 The Minerals (Prospecting and Mining) Act (Act 33 of 1992, Government Gazette 564, Number 199)

By definition the sea and seabed within the territorial sea referred to in section 2 of the Territorial Sea and Exclusive Economic Zone of Namibia Act, 1990 (Act 3 of 1990), the exclusive economic zone referred to in section 4 of that Act and the continental shelf referred to in section 6 of that Act, are included in land mining activities.

Waste in this Act is defined to include any waste rock, tailings, slimes or other residue derived from any prospecting operations, mining operations or processing of any mineral or group of minerals.

Restrictions on exercise of rights by holders of mineral licences include:
(1) The holder of a mineral licence shall not exercise any rights conferred upon such holder by this Act or under any terms and conditions of such mineral licence
(f) which in any way will interfere with fishing or marine navigation, without the prior permission of the Minister granted, upon an application to the Minister in such form as may be determined in writing by the Commissioner, by notice in writing and subject to such conditions as may be specified in such notice.'

Section 92 of the Act provides Exercise of powers of Minister to grant or refuse mining licences:
(2) Notwithstanding the provisions of subsection (1)(a), the Minister shall not grant an application by any person for a mining licence -
(b) if, at the time of the application, such person is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order;
(c) unless the Minister is on reasonable grounds satisfied -
(ii) that the proposed programme of mining operations to be carried out and the expenditure to be expended in respect of such operations will ensure
(bb) adequate protection of the environment;
(3) The Minister shall not grant an application referred to in subsection (1)(b), if at the time of the application –
(c) the person applying for such mining license is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order.'

6.2.5 Atmospheric Pollution Prevention Ordinance of Namibia (No. 11 of 1976)

Part 2 of the Ordinance governs the control of noxious or offensive gases. The Ordinance prohibits anyone from carrying on a scheduled process without a registration certificate in a controlled area. The registration certificate must be issued if it can be demonstrated that the best practical means are being adopted for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process.

6.2.6 Hazardous Substances Ordinance (No. 14 of 1974)

The Ordinance applies to the manufacture, sale, use, disposal and dumping of hazardous substances, as well as their import and export and is administered by the Minister of Health and Social Welfare. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings

6.2.7 Public Health Act (No. 36 of 1919)

Under this act, in section 119:
"No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health."

6.2.8 Labour Acts

The labour act of 1992 (act 6) and the new labour act of 2007 (act 11) contain regulations relating to the Health, Safety and Welfare of employees at work. These regulations are prescribed for among others safety relating to hazardous substances, exposure limits and physical hazards.

6.2.9 Regional Councils Act, Act 22 of 1992

This sets out the powers, duties, functions, rights and obligations of Regional Councils (section 28). Of relevance to the coastal area are the powers to undertake, with due regard to the powers and functions of the National Planning Commission (NPC), and any other law relating to planning:
"the planning of the development of the region for which it has been established with a view to – the physical, social and economic character of such region; the distribution, increase and movement and the urbanization of the population in such region; the natural and other resources and the economic development potential of such region; the existing and planned infrastructure, such as water, electricity…in such region; the general land utilization pattern; the sensitivity of the natural environment".
This provides the legal basis for the drawing up of Regional Development Plans (RDPs) for the Regions. Although initiated and guided by the NPC the Regional Councils play a central role in developing RDPs

6.2.10 Local Authorities Act, 1992 (Act No. 23 of 1992)

The Act aims to provide for the determination, for purposes of local government, of local authority councils; the establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters.

6.3 International Agreements and Conventions

6.3.1 Benguela Current Convention (2013)

This Convention was signed by the governments of South Africa, Namibia and Angola, referred to hereafter as the Parties. It was signed on the 18th March 2013. Namibia ratified this Convention on the 2nd July 2013.
Recognizing the unique character of the Benguela Current Large Marine Ecosystem (BCLME), the richness and complexity of its biological and physical functioning, its significance for the socio-economic development and for the well-being of the people depending on it and the threats to it;
Recalling the Interim Agreement between the Government of the Republic of Angola and the Government of the Republic of Namibia and the Government of the Republic of South Africa on the Establishment of the Benguela Current Commission signed by January 2007;
Further recalling the relevant provisions of the United Nations Convention on the Law of the Sea of 10 December 1982, the relevant provisions of the United Nations Convention on Biological Diversity of 5 June 1992, the relevant provisions of the United Nations Framework Convention on Climate Change of 21 March 1994, including implementation agreements under these conventions, as well as other global and regional instruments concerning conservation and management of marine resources, abatement of pollution, safety at sea, and protection of the environment;
Conscious of the need to avoid adverse impacts on the marine environment, protect biodiversity, maintain the integrity of the marine ecosystem and minimize the risk of long-term or irreversible effects by human activities;
Convinced of the need to take concrete actions collectively to ensure effective long-term trans-boundary cooperation and the integrated sustainable management and the protection of the marine resources;

Recognizing the importance of stable institutional arrangements to ensure the implementation of an ecosystem approach to the management of resources and of human activities affecting the Benguela Current Large Marine Ecosystem;
Seeking to address the challenges identified by them in the Benguela Current Large Marine Ecosystem;
Convinced of their joint responsibility as custodians of this globally significant large marine ecosystem to conserve and manage it for the benefit of present and future generations;

The Parties have agreed as follows: (only the relevant sections have been copied below)

Article 2: Objective
'The objective of this Convention is to promote a coordinated regional approach to the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem, to provide economic, environmental and social benefits.'

Article 3: Area of Application
(l) *The area of application for this Convention comprises all areas within the national sovereignty and jurisdiction in accordance with the United Nations Convention on the Law of the Sea of 10 December 1982, bounded by the high water mark along the coasts of the Parties*.

Article 4: General Principles
(1) *The Parties shall be guided by the following principles:*
- *(a) The cooperation, collaboration and sovereign equality principle;*
- *(b) Sustainable use and management of the marine resources;*
- *(c) The precautionary principle;*
- *(d) Prevention, avoidance and mitigation of pollution;*
- *(e) The polluter pays principle; and*
- *(f) Protection of biodiversity in the marine environment and conservation of the marine ecosystem.*

(2) *In giving effect to the objective of this Convention and to the principles in paragraph (1), the Parties shall-*
- *(a) Take all possible steps to prevent, abate and minimize pollution and take the necessary measures to protect the marine ecosystem against any adverse impacts;*
- *(b) Undertake environmental impact assessment for proposed activities that are likely to cause adverse impacts on the marine and coastal environments;*
- *(c) Apply management measures based on the best scientific evidence available;*
- *(d) Establish mechanisms for inter sectorial data collection, sharing and exchange thereof;*
- *(e) Where possible, reverse and prevent habitat alteration and destruction;*
- *(f) Protect vulnerable species and biological diversity; and*
- *(g) Take all possible steps to strengthen and maintain human and infrastructural capacity.*

Article 8: Functions of the Commission
In giving effect to the objective of this Convention, the Commission shall-
- *(c) agree on, where necessary, measures to prevent, abate and minimize pollution caused by or resulting from*
  - *(i) dumping from ships or aircrafts;*
  - *(ii) exploration and exploitation of the continental shelf and the seabed and its subsoil; and*
  - *(iii) land-based sources.*

6.3.2 The Stockholm Declaration on the Human Environment, Stockholm 1972

Namibia adopted the Stockholm Declaration on the Human Environment on 28 August 1996. It recognizes the need for:

"a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment".

Among the proclamations are, in short:

- *Natural resources must be protected*
- *Wildlife must be protected*
- *Pollution must not exceed the environment's capacity to clean itself*
- *Oceanic pollution that is damaging must be prevented*
- *Rational Planning must prevent or resolve conflicts between environment and planning*

6.3.3 Convention on Biological Diversity, Rio de Janeiro, 1992

In 1992 in Rio de Janeiro, at the United Nations Conference on Environment and Development, Namibia signed the Convention on Biological Diversity (CBD). This was ratified in 1997. Under article 14 of the convention EIAs must be conducted for projects that may negatively affect biological diversity.

6.3.4 United Nations Law of the Sea Convention (1982)

Namibia ratified the convention in 1994 and is thus obliged to protect and preserve the marine environment. This includes the prevention, reduction and control of pollution of the marine environment.

6.3.5 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (London Convention, 1972)

The Convention also aims at control and prevention of marine pollution. It contains special guidelines for dredged material known as the Dredged Material Assessment Framework. It provides guidelines for dredging and disposal operations to minimize environmental damage. Namibia must still ratify the convention.

7 Alternatives to the Project

Alternatives to this project are considered under three scenarios:

i) The project is fully implemented as outlined. This will provide an assessment of cumulative and long-term impacts that can be expected from phosphate mining along the Namibian coast by carrying out state-of-the art methodology. Included are sensitivity levels of the ecosystem to the mining activity, that will allow the Government to take scientifically-informed decisions regarding impacts from bulk seabed mining for industrial minerals (specifically phosphates) in Namibia. Should this type of mining be allowed the Government should first be prepared with a regulatory framework, and the results of the project will provide recommendations for national policy and regulatory programmes to be developed for this type of marine mining.

ii) The project is implemented in part; the outcome is depending on what parts are chosen to be conducted. Since all tasks, except 2.1 and 2.2, are scientific work it is not possible to predict the outcome of this alternative.

iii) The project is not implemented, so that the possible impacts, including cumulative and long-term impacts from bulk seabed mining for industrial minerals on other marine-based industries in Namibia that presently serve the Namibian nation, are not researched and remain unknown.

8 Bibliography

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Appendix A

Registration of the Strategic Environmental Assessment with MET

14-2/0001

Saima + Fred

REPUBLIC OF NAMIBIA

MINISTRY OF FISHERIES AND MARINE RESOURCES

Telephone : (061) 2053007
Facsimile : (061) 224566
Enquiries : U. HIVELUAH

Private Bag 13355
WINDHOEK

14 February 2014

Mr Teofilus Nghitila
The Environmental Commissioner
Ministry of Environment and Tourism
Private Bag 13346
WINDHOEK

Dear Mr Nghitila

Attached, I hereby forward our application for registration of the Strategic Environmental Assessment (SEA).

Your usual understanding and consideration is highly appreciated.

Yours Sincerely,

MINISTRY OF FISHERIES & MARINE RESOURCES
OFFICE OF THE PERMANENT SECRETARY
2014 -02- 14
Private Bag 13355
WINDHOEK

MRS ULITALA HIVELUAH
PERMANENT SECRETARY

ANNEXURE 1

FORMS

Form 1

REPUBLIC OF NAMIBIA

ENVIRONMENTAL MANAGEMENT ACT, 2007

(Section 32)

APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE

NAMIBIA REVENUE N$5

NAMIBIA REVENUE N$100

NAMIBIA REVENUE N$100

NAMIBIA REVENUE N$100

MINISTRY OF ENVIRONMENT AND TOURISM
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
2014 -04- 24
RECEIVED

PART A: DETAILS OF APPLICANT

1. Name: (person or business) *Ministry of Fisheries and Marine Resources*

2. Business Registration / Identity No. (if applicable)

3.Correspondence Address: *Private Bag 13355, Windhoek, Namibia*

4.Name of Contact Person: *Ms. Ulitala Hiveluah*

5. Position of Contact Person: *Permanent Secretary*

6. Telephone No.: *061 2053007*

7. Fax No.: *061 224566*

8. E-mail Address : (if any) *uhiveluah@mfmr.gov.na*

☐Tick (☐) the appropriate

MINISTRY OF ENVIRONMENT AND TOURISM
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
2014 -04- 24
RECEIVED

PART B: SCOPE OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE

1.The environmental clearance certificate is for:

☐ *A Strategic Environmental Assessment SEA of the cumulative impacts on the marine ecosystem from seabed mining of industrial minerals, specifically phosphorites, off the Namibian coast.*

2. Details of the activity(s) covered by the environmental clearance certificate: [Note: Please attach plans to show the location and scope of the designated activity(s), and use additional sheets if necessary:

Title of Activity: *Investigation of cumulative impacts on the marine ecosystem from mining of phosphorites off the Namibian coast*

Nature of Activity: *The necessary procedures and studies needed to compile the Strategic Environmental Assessment SEA referred to in Section B1 including the Strategic Environmental Management Plan SEMP*

Location of Activity: *Namibian marine waters within the EEZ*

Scale and Scope of Activity: *The scale and scope will be defined according to Terms of Reference agreed upon by the Ministry and the contracted Environmental Assessment Practitioners EAP.*

PART C: DECLARATION BY APPLICANT

I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental clearance certificate may be suspended, amended or cancelled if any information given above is false, misleading, wrong or incomplete.

Signature of applicant | Ulf Tala M. Hueluth (Full Name in Block Letters) | Permanent Secretary (Position)

on behalf of: the Ministry of Fisheries and Marine Resources

13/02/2014
Date

Appendix B

Terms of Reference

Terms of Reference: SEA for seabed mining off the Namibian coast:

Scoping phase

1. Aim of the Strategic Environmental Assessment

The Strategic Environmental Assessment (SEA) shall be conducted to provide a Strategic Environmental Management Plan (SEMP) for the sustainable co-existence off the entire Namibian coast of fishery industries and marine phosphate mining industry. The SEA shall start with a Pilot Study according to the signed contract with the proponent, that will be incorporated into the Scoping Study, that shall be followed by a full SEA. The SEMP aims at providing guidance for decision making by the Ministry of Mines and Energy (MME) and Environmental Clearance of EIAs by the Environmental Commissioner (Ministry of Environment and Tourism: MET).

2. Legal basis

The SEA is based on the Environmental Management Act (EMA, 2007), particularly the sections 23-27 and the EMA Regulations (Government Gazette 4878, 2012), specifically on public consultation (sections 21-24). Requirements for the Scoping report are provided in section 8 of the EMA Regulations of 2012. On aspects without provision in Namibian law the Good Practice Guidance for SEA in Development Cooperation (OECD DAC 2006) may be followed.

3. Tasks in the Scoping phase

For the scoping phase of the SEA an independent Norwegian organisation SINTEF Fisheries and Aquaculture, hereafter referred to as SINTEF, has been contracted as the Environmental Assessment Practitioner (EAP). In the scoping Pilot Project SINTEF and IMR will ensure that all relevant issues needed to describe the pre-mining situation will be included in the planning of the Main Project.

The Pilot Project will:

- Develop the Main Project and give the Main Project a scientific content, identifying knowledge gaps.
- Calculate the costs of the Main Project

Thus the Main Project will deliver scientific information and results which to date do not exist, but will be obtained during conduction of the Main Project. The Main Project will cover all seasons and will include field studies and experimental studies.

The Scoping Study will identify the work packages to be carried out in the Main Project that will be relevant to assessing the cumulative and long term impacts of seabed phosphate mining on the marine environment.

A project organization of the Main Project will be suggested by the Pilot Project.

SINTEF/IMR will co-operate with National Organs of State, regional scientific institutions, business interests and public in the region. The start and end of the Main Project will be proposed in the scoping exercise.

4. EAP: SINTEF, Norwegian Institute of Marine Research IMR, Norway

Roar Solbakken: Project leader, *SINTEF Fisheries and Aquaculture*
Karl Tangen: Senior scientist, *SINTEF Fisheries and Aquaculture*
Johanne Arff: Senior scientist, *SINTEF Fisheries and Aquaculture*
Bjørn Serigstad: Senior scientist, *Institute of Marine Research*

Other SINTEF consultants may provide additional expertise as deemed necessary.

5. The Pilot Study will be finalized to include the requirements outlined for a Scoping Study.

Appendix C

Background Information Document

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

BACKGROUND INFORMATION DOCUMENT

PURPOSE OF THIS DOCUMENT

This document provides information on the Strategic Environmental Assessment (SEA) of impacts on the marine ecosystem from potential bulk seabed mining of industrial minerals, specifically phosphorites, off the Namibian coast.

An essential part of the SEA is to solicit participation by institutional and public Interested and Affected Parties (I&APs). The first consultative stakeholder meetings will be held between the 2nd and the 10th of June 2014.

Public meetings are scheduled for:

- Lüderitz at the Nest Hotel on 3 June 2014 at 17:30, and in
- Swakopmund at the Swakopmund Hotel & Entertainment Centre on 5 June 2014 at 17:30.

Interested and Affected Parties are invited to register in writing with the Project Office:

The Administrator
Namibia Seabed Environmental Assessment Project
National Marine Information and Research Centre
P. O. Box 912
Swakopmund
Namibia
Fax: +264 64 404385
E-mail: seabed.ea@gmail.com
Web-reference:
http://www.nodc-namibia.org under NAMSEAP

Please use the attached Registration Form. Registered I&APs will be kept informed as the study develops. All relevant documentation will be available from the web-site.

WHY A STRATEGIC ENVIRONMENTAL ASSESSEMENT?

In environmental terms, the benefits and costs from exploitation of both living resources and non-living mineral commodities, directly affect the wellbeing of the Namibian nation. In order to manage the living and mineral assets of the nation responsibly and sustainably into the future, the Government of Namibia is taking a precautionary measure by carrying out a science-based assessment of the consequences of phosphate recovery from the ocean, on the marine ecosystem.

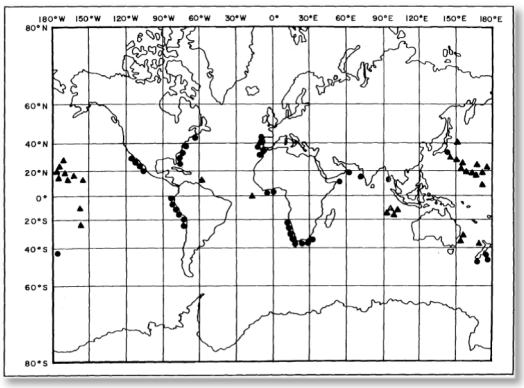
To allow time for these necessary scientific studies to be conducted, a moratorium was put in place by Cabinet Decision in September 2013. No environmental clearances have been granted for marine mining of industrial minerals in Namibian waters, and therefore mining for phosphates has not yet begun. In compliance with the moratorium, no licensing or environmental clearances for phosphate mining are presently issued.

The SEA will allow for assessment of the long-term impacts on the marine ecosystem of potential bulk seabed mining for industrial minerals, specifically phosphates. This information will contribute to sustainable utilisation of the Namibian marine resources.

The focus and scope of this environmental assessment is on investigating the cumulative impact of bulk seabed mining on the marine ecosystem of the Namibian coast, bearing in mind that the living ecosystem provides sustainable goods and services that are presently of great value to the country and will remain so if managed responsibly.

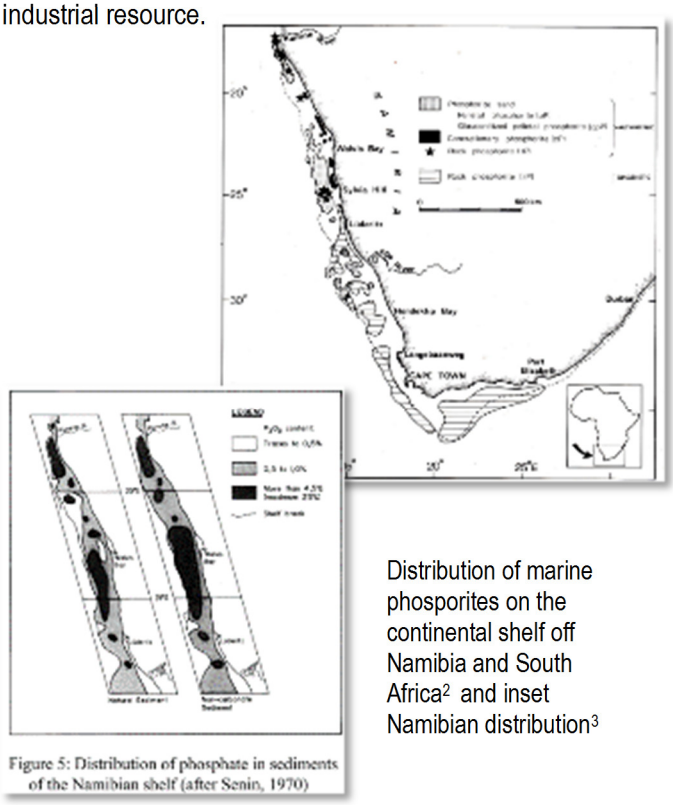
The results of the study will be used by the Government to inform decision-making on marine mineral resource extraction. This study does not address the socio-economic aspects associated with services from either living marine resources or marine phosphate (phosphorite) recovery. However, it is acknowledged that such studies would be greatly beneficial to the decision-making process.

The phosphorus component used to manufacture commercial fertilizer is presently obtained from land-based phosphate deposits. The existence of several coastal and marine deposits around the world has been known for decades, though none has yet been mined.



Distribution of phosphorites along continental shelves ● and from seamonts ▲ [1]

Marine phosphate deposits off the Namibian coast have been targeted in recent years as a potential industrial resource.



Distribution of marine phosporites on the continental shelf off Namibia and South Africa[2] and inset Namibian distribution[3]

The productive Northern Benguela Upwelling system supports living marine resources that include harvested stocks of pelagic, mid-water and demersal fish, crustaceans and seals, and farmed shellfish. Marine fisheries are well-established along the whole Namibian coast within Namibia's Exclusive Economic Zone, and provide considerable income and employment to the nation. Namibia is a strong proponent of the Ecosystem Approach to Fisheries.

[1] Thiel H, Angel MV, Foell EJ, Rice AL, Schriever G 1998: Environmental risks from large-scale ecological research in the deep sea: a desk study. European Commission:Marine science and technology. Office for Official Publications of the European Communities XIV, 210 pp. ISBN 92-828-3517-0

[2] Bremner JM, Rogers J 1990: Phosphorite deposits on the Namibian continental shelf. In: Cook PJ, Shergold JH (eds) Phosphate deposits of the world. Cambridge University Press, Cambridge, pp 143–152

[3] Schneider GIC, Schreuder CP 1992: Phosphate in The Mineral Resources of Namibia. Geological Survey of Namibia

THE ENVIRONMENTAL ASSESSMENT PROCESS

Following the Cabinet directive that a SEA should be conducted, the Ministry of Fisheries and Marine Resources has been tasked as proponent for the scoping study. A technical committee nominated from key Ministries - Fisheries and Marine Resources, Mines and Energy, and Environment and Tourism is steering the process.

No specific legislation regulates the SEA process in Namibia, therefore the Namibian Environmental Impact Assessment (EIA) steps are to be followed, in terms of the Environmental Management Act (2007)[4], as outlined by the Directorate of Environmental Affairs in the Ministry of Environment and Tourism.

The Ministry of Fisheries and Marine Resources appointed an international Environmental Assessment Practitioner SINTEF to guide the Scoping Phase of the assessment.

Environmental Assessment Steps to be Followed:

Screen List of Activities
Designate EAP
Apply for Clearance
Call / Registration I&APs
Public Consultation
Draft Scoping / SEMP Report
Comments Registered I&APs
Final Scoping / SEMP Report
Draft SEA / SEMP Report
Comments Registered I&APs
Final SEA / SEMP Report

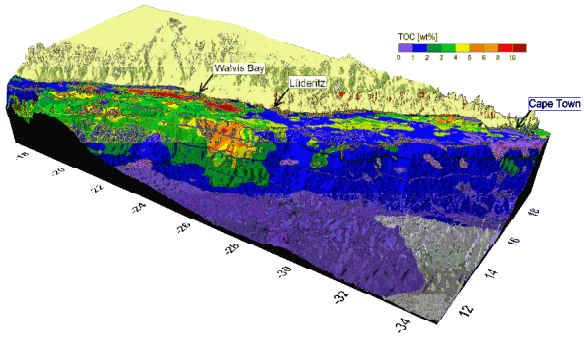
You are here

BACKGROUND INFORMATION TO HELP INFORM THE SCOPING PROCES

Namibia is rich in both biological and mineral resources. As such, it is inevitable that at some time there will be overlap in the areas where these resources are distributed and targeted for exploitation, as is the case presently with living marine resources and mineral marine phosphorites. What is not known, however, is how exploitation of both in Namibian waters will affect the functioning of the marine ecosystem as we presently know it.

The marine ecosystem

Namibia lies within the northern part of the Benguela upwelling system - one of the four global eastern boundary upwelling systems, which are characterized by wind-driven upwelling of nutrient-rich water that fuels high biological production and resulting deposit of organic-rich sediments on the seabottom. The wide, deep continental shelf and slope comprises soft organic-rich sediment.



The sediment rich in total organic carbon (TOC) off the Namibian coast[5]

Because the biological production in the overlying seawater water contributes to the sediment, and sediments contribute soluble nutrients into the seawater, the seabed is an integral and active component of the ecosystem. Animals, including fish, live there. In the sediment intense microbial activity controls processes of organic-carbon decay and remineralisation. Oxygen concentrations in the sediments are largely anoxic and contain hydrogen sulphide as a breakdown product.[6] [7]

The Biological Marine System

At the basis of the marine food chain are the billions of micro-organisms, including bacteria, which flourish in seawater: these are distributed throughout the water and sediments. Biological productivity in the ocean begins with the microscopic plant cells called phytoplankton or microalgae.

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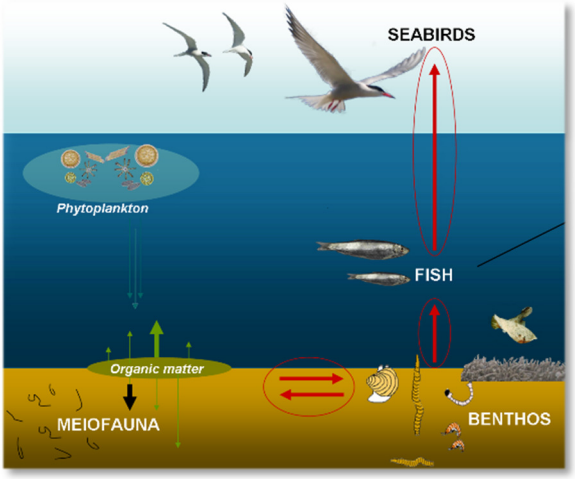
[4] Environmental Management Act : Act no. 7 of 2007, Government Gazette no. 232 of 27 December 2007 and regulations thereunder

[5] Inthorn M et al. 2006: Compilation of organic carbon distribution and sedimentology in the surface sediments on the continental margin offshore southwestern Africa. doi:10.1594/PANGAEA.351146 *Supplement to:* Inthorn M, Wagner T, Scheeder G, Zabel M 2006: Lateral transport controls distribution, quality and burial of organic matter along continental slopes in high-productivity areas. *Geology*, 34(3), 205-208, doi:10.1130/G22153.1

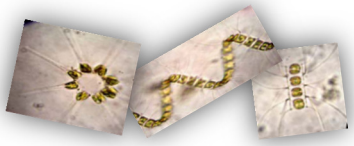
[6] Ferdelman TG, Fossing H, Neumann K, Schulz HD 1998: Sulfate reduction in surface sediments of the south-east Atlantic continental margin between 15º 38' S and 27º 57'S (Angola and Namibia). Limnol Oceanogr., 44, 650-661

[7] Brüchert V, Jørgensen BB, Neumann K, Riechmann D, Schlösser M, Schulz H 2003: Regulation of bacterial sulfate reduction and hydrogen sulfide fluxes in the central Namibian coastal upwelling zone. Geochimica et Cosmochimica Acta, 67, 4505-4518

The seabed is an integral component of the marine ecosystem[1].



In general terms this primary production determines the biological productivity of the area. Primary production off Namibia is considered to be amongst the highest in the world)[8]. This is due to the Benguela upwelling current.



From the microscopic basic building blocks, the complex marine food webs develops within a 3-dimensional liquid environment where there are few solid boundaries to physical, chemical or biological interactions.

The biological marine system off Namibia contributes many goods and services to the nation:

Existing industry

Fisheries and Mariculture

Fishing industries are based on quota-catch of assessed commercial stocks of Hake, Monkfish, Horse mackerel, Sardine, Rock lobster, Deep-sea crab, and Seals. Sole and Kingklip are important by-catch species.

Mariculture industries are based on shellfish species of Oysters, Abalone and Mussels.

[8] Carr M-L 2002: Estimation of potential productivity in Eastern Boundary Currents using remote sensing. Deep-Sea Research II 49, 59–80

All fishery activities are regulated in terms of the Marine Resources Act (2000)[9] and regulations thereunder; with aquaculture activities regulated by the Aquaculture Act (2002)[10] and regulations thereunder. Conservation measures for capture fisheries include the prohibition of trawling in water depths of less than 200m, and for hake, in less than 300m south of latitude 25ºS. Midwater trawling is not allowed in waters shallower than 200m Harvest of migratory species such as Tuna is internationally regulated.

The contribution to the economy by marine fisheries

The contribution of marine fisheries to Namibia's Gross Domestic Product remains stable at around 4%. Fishery products are sold around the world: to Africa, the European Union, China, Japan, USA, Australia and others. Harvested from unpolluted Namibian waters, the products easily comply with stringent food safety requirements of importing countries.

The fisheries sector employs directly approximately 13000 people most of whom are Namibians. Indirect support services to the fishery industry include: vessel and fish processing factory maintenance; engineering companies; NAMPORT harbour fees; fuel bunkerage; road-, sea- and airfreight transport; municipalities through electricity and water costs; and ships agency and stevedoring.

Coastal Tourism and Conservation

Tourists to the coast are important contributors to the economy of the country. Attracted to the ocean and natural unspoilt beauty of the marine environment, tourists enjoy beaching, bathing and water sports in unpolluted water, recreational angling, boat-based and land-based sightseeing tours.

Thirty three species of cetaceans are found in Namibian waters, including whales from Antarctica. Turtles are found in northern warmer waters.

The Namibia Islands' Marine Protected Area spans nearly a million hectares of sea area in southern Namibia, and promotes protection of seabird breeding sites on the small islands.

[9] Marine Resources Act: Act 27 of 2000, Government Gazette no. 2458 of 27 December 2000 (and regulations thereunder)
[10] Aquaculture Act: Act no.18 of 2002, Government Gazette no.2888 of 30 December 2002 (and regulations thereunder)

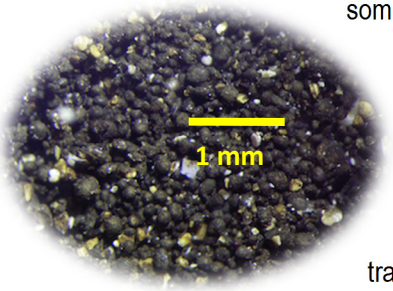
Upcoming proposed industry

Marine phosphate mining

The regulation of industrial mineral mining activities in Namibia is by the Ministry of Mines and Energy, in terms of the Minerals Act (1992)[11] and regulations thereunder.

Phosphate occurrences observed on the shelf occur as

i. Small rounded to spherical grains less than 0.3mm in diameter in all sediment types with an average phosphate content of 22%
ii. Phosphatised organic remains
iii. Phosphate nodules and concretions occurring usually in diatomaceous sediments and oozes often contaminated with hydrogen sulphide. In some of these formations the P_2O_5 content can be as high as 30 %[12].



Mining activity would involve removal of surface sediments, and transfer of this bulk to the coast for onshore processing and beneficiation.

The potential contribution to the Namibian economy by marine phosphate mining would depend on several aspects not presently known, importantly driven by market demand and the global commodity price.

Direct employment for phosphate recovery and processing in Namibia would be determined by the scale of mining and processing. Indirect support services to this marine mining industry would include vessel hire and maintenance, engineering companies, NAMPORT harbour fees, fuel bunkerage, freight transport, and municipalities through electricity and water costs. Markets for fertilizer are mainly the big crop-food producers: India, South America, US, Europe, Canada, and China.

SCOPING EXCERSISE FOR THIS SEA

Bulk removal of seabed for mining of phosphates from the ocean has not been permitted anywhere else in the world, therefore there are no international regulatory measures to follow and there is no information available on consequences expected with regard to marine life.

In order to assess and guide future management of the Namibian natural resources, the present state of the marine environment must first be known for parameters of most likely concern. Relevant aspects, which need further investigation, have been identified to give Namibia the needed facts. The pilot project will

- develop the Main Project
- describe the scientific content, which will
  - assess pre-mining state of the marine environment off the Namibian Coast
  - cover all seasons: this will involve field studies and laboratory analyses/tests
- calculate the costs of the Main Project.

Details will be presented at the consultative stakeholder meetings in Namibia, June 2014.

You are invited to participate in the Scoping Phase of the study to help flesh out the framework for the SEA and help ensure the sustainable management of the Namibian marine environment.

[11] Minerals Act: Act no. 33 of 1992 Government Gazette no.564 of 31 December 1992 (and regulations thereunder)
[12] Schneider GIC, Schreuder CP 1992: Phosphate in The Mineral Resources of Namibia. Geological Survey of Namibia

Appendix D

Invitation to Interested and Affected Parties (I&AP)

ENVIRONMENTAL ASSESSMENT: PILOT PROJECT

Investigation of cumulative impacts on the marine ecosystem from mining of phosphates off the Namibian coast

NOTICE TO ALL INTERESTED AND AFFECTED PARTIES

Notice is hereby given to all potentially Interested and/or Affected Parties (I&AP) that application for Environmental Clearance has been made to the Environmental Commissioner in terms of the Environmental Management Act 7 of 2007 and the Environmental Impact Assessment Regulations (Government Notice 30 in Government Gazette 4878 of 6 February 2012) as following:

Proponent: Ministry of Fisheries and Marine Resources

Project Title: Investigation of cumulative impacts on the marine ecosystem from mining of phosphorites off the Namibian coast

Project Location: Namibian marine waters within the EEZ

Project Description: The project will develop the scientific content of the Main Project. The procedures and studies necessary to compile the Strategic Environmental Assessment of the cumulative impacts on the marine ecosystem from seabed mining of industrial minerals, focusing on phosphorites, along the Namibian coast, will be identified.

Environmental AssessmentPractitioner : SINTEF *Fisheries and Aquaculture*

Project Team :

Roar Solbakken: Project leader, *SINTEF Fisheries and Aquaculture*
Karl Tangen: Senior scientist, *SINTEF Fisheries and Aquaculture*
Johanne Arff: Senior scientist, *SINTEF Fisheries and Aquaculture*
Jens-Otto Krakstad: Senior scientist, *Institute of Marine Research*
Bjørn Serigstad: Senior scientist, *Institute of Marine Research*

In order to comment, raise concerns, and to receive further information relating to the Project, I&APs are invited to register in writing with the Project Office giving name, affiliation (if applicable) and contact details:

Project Office: Namibia Seabed Environmental Assessment Project
Ministry of Fisheries and Marine Resources
National Marine Information and Research Centre
P.O. Box 912
Swakopmund
Namibia
Tel: 064 4101000
Fax: 064 404385
E-mail: seabed.ea@gmail.com

The background Information document is available on request or can be found at http://www.nodc-namibia.org under NAMSEAP.

Consultative meetings with stakeholders for information, discussion and input to the scoping phase of the project will be held between 2nd and 10th June 2014 in Swakopmund and Lüderitz.

Public meetings:

in Lüderitz on Tuesday 3rd June 2014 at the Nest Hotel at 5.30 pm

in Swakopmund on Thursday 5th June 2014 at the Swakopmund Hotel at 5.30 pm

MINISTRY OF FISHERIES AND MARINE RESOURCES

Namibia Seabed Environmental Assessment Project

Tel : + 064 – 4101000

Fax: : + 064 – 404385

Email: seabed.ea@gmail.com

Enquiries: Administrator Ms. B. Currie

Project Office:

National Information and Research Centre

P. O. Box 912

Swakopmund

NAMIBIA

19th May 2014

addressee

Dear *xxx*

Scoping for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

As the key stakeholder associated with the marine environment, the Ministry is invited to register for the Strategic Environmental Assessment on effects of seabed mining for industrial minerals, specifically phosphates, on Namibia's marine ecosystem.

The background information document can be accessed at

http://www.nodc-namibia.org/images/EA_Pilot_study_Seabed_Mining_BID1.pdf

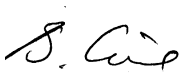
The first stakeholder consultative meetings will be held in the week 2nd – 6th June 2014, to identify and discuss the needs for the main project.

Focused meetings for *(organ of State/institution/industry)* will be held: *(listed example for institution):*

- In Lüderitz 2nd June 2014 at 1400 in the Boardroom of the Ministry of Fisheries and Marine Resources
- In Swakopmund 6th June at 0900 in the Ministry of Fisheries and Marine Resources Auditorium at the National Marine Information and Research Centre

You are invited to participate: kindly indicate intended attendance at either of these meetings.

Sincerely



_____

pp Chairperson

Sent by email after the meetings: Confirmation of the Comment Period

Dear Interested and Affected Parties:

By application or through providing a contact address when attending the consultative meetings held at the coast during the week of 02 - 06 June 2014, you are registered for the project to assess the cumulative impacts on the marine ecosystem from phosphate mining of the seabed off the Namibian coast. Comments submitted on the appropriate forms, as well as comments made during the meetings, are noted.

Registration for the project remains open until 30th June 2014 at 1700.

Any further comments you wish to add may be submitted in writing to the project office by the 30th June 2014. Thereafter no more comments will be accepted for inclusion in the draft scoping report that will be made available for comment to Interested and Affected Parties at the end of August.

Sincerely

The Administrator

Namibia Seabed Environmental Assessment Project

National Marine Information and Research Centre

P. O. Box 912

Swakopmund

Namibia

Fax: +264 64 404385

Tel: +264 64 4101000
email seabed.ea@gmail.com

ENVIRONMENTAL ASSESSMENT: PILOT PROJECT
Investigation of cumulative impacts on the marine ecosystem from mining of phosphates off the Namibian coast

NOTICE TO ALL INTERESTED AND AFFECTED PARTIES

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Environmental Assessment Practitioner: SINTEF *Fisheries and Aquaculture*

Project Team : Roar Solbakken: Project leader, SINTEF Fisheries and Aquaculture
Karl Tangen: Senior scientist, SINTEF Fisheries and Aquaculture
Johanne Arff: Senior scientist, SINTEF Fisheries and Aquaculture
Jens-Otto Krakstad: Senior scientist, Institute of Marine Research
Bjørn Serigstad: Senior scientist, Institute of Marine Research

In order to comment, raise concerns, and to receive further information relating to the Project, I&APs are invited to register in writing with the Project Office giving name, affiliation (if applicable) and contact details:

Project Office: Namibia Seabed Environmental Assessment Project
Ministry of Fisheries and Marine Resources
National Marine Information and Research Centre
P.O. Box 912
Swakopmund
Namibia
Tel: 064 4101000
Fax: 064 404385
E-mail: seabed.ea@gmail.com

The background Information document can be found at http://www.nodc-namibia.org under NAMSEAP.
Consultative meetings with stakeholders for information, discussion and input to the scoping phase of the project will be held between 2nd and 10th June 2014 in Swakopmund and Lüderitz.

Public meetings:

in Lüderitz on Tuesday 3rd June 2014 at the Nest Hotel at 5.30 pm
in Swakopmund on Thursday 5th June 2014 at the Swakopmund Hotel at 5.30 pm

Appendix E

Organs of State, Institutions and Industry Contacted Prior to the Meetings

Organs of State, Parastatal organizations

Ministry of Agriculture, Water and Forestry
Ministry of Environment and Tourism
Ministry of Fisheries and Marine Resources
Ministry of Mines and Energy
Ministry of Works and Transport

Erongo Regional Council
Kunene Regional Coucil
Karas Regional Council

Lüderitz Town Council
Municipality of Swakopmund
Municipality of Walvis Bay
Municipality of Henties Bay
Orangemund Town Coucil

Namibian Ports Authority
Namibian Standards Institute

Institutions

Gobabeb Research and Training Centre
Benguela Current Commission BCC
NACOMA
Namibia Nature Foundation
Wissenschaftliche Gesellschaft Swakopmund

INDUSTRY
The Chamber of Commerce and Industry: Coastal Branch
Confederation of Namibian Fishing Associations
Chamber of Mines of Namibia
Large Pelagic (Tuna) and Hake Longlining Association
Larger Linefish Vessels Sector
Monk & Sole Association
Rock Lobster Association
Smaller Linefish Vessels: Skiboats
LL Namibia Phosphates (Pty) Ltd
Namibian Hake Association
Red Crab Sector Group
Mariculture Industry members
Recent fishery right-holders through Fishing Associations
Midwater Trawling Association (Horse Mackerel)
Namibian Marine Phosphate (Pty) Ltd
Salt Company (Pty) Ltd
Deep Sea Trawling Association (Orange Roughy)
Members of the Namibian coastal tourism industry
Red Crab Sector Group
Walvis Bay Salt Refiners

Listed EPL-holders for industrial minerals:

Dorros Investments Number Eighty Eight (Pty) Ltd
Manmar Investments One Hundred Six (Pty) Ltd
Minemakers Tungeni JV Exploration
Baobab Equity Management (Pty) Ltd
Epangelo Mining Company (Pty) Ltd
Altius Mineral and Energy CC
Luxury Investments One Hundred (Pty)
Luxury Investments 157 (Pty) Ltd
FGK Investments Number Nineteen (Pty(Ltd
Togethe Quando Mining (Pty) Ltd
Hiber Trading & Investment CC
Kaue-Kaue Investment (Pty) Limited
Duiker Investment 128 (Pty) Ltd
Namibian Underwater Tech.Mining (Pty) Ltd
Smartis Diamond Recoveries cc.
Pegmatite Diamond and Fishing (Pty)
Duiker Investment 128 (Pty) Ltd
LL Namibia Phosphates (Pty) Ltd
Vectra Minerals CC
Vulture Minerals CC
Nambee Mining (Pty) Ltd
Pelagian Progress (Pty) Limited
Starlight Investment Holdings (Pty) Ltd
Holocene Energy (Pty) Ltd
Jantjies Mildred Nontobeko
Ando Investment CC
New Horizon Investments Group cc
Kalapuse General Dealers CC
Koujo Otniel
Gurishi Enterprises CC
Sodalite Investment CC
Okasisiti Express CC
Paveta Investments and Gen. Trading CC
Nabirm Energy Services (Pty) Ltd
South Pacific Diamond Mining Number Three (Pty) Ltd
Ndaningina Lyasimana Liithaneni
Gazania Investments 183 (Pty) Ltd
Hieroglyphics Trading Enterprises CC
Starlight Investment Holdings (Pty) Ltd

Appendix F

Register of I&AP

Surname	First name	Affiliation	Industry	institutional	private	email
Alfheim	Mr Sam	Cadilu Fishing (Pty) Ltd	x			sam.a@catofishing.com, reyero@catofishing.com
Asino	Mikka Natangwe				x	nn.natangwe65@gmail.com
Bothma	Maneljiu					meb@afd.com.na
Classen	Donavan	LL Namibia Phosphates				
De Koker	E.	CCL				elwandekoker@gmail.com
Dreyer	Mr. Charl	Cadilu Fishing (Pty) Ltd	x			cdreyer@cadilu.com
Efraim	Simon	NUNW				simonefraim95@yahoo.com
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Haininga	Fernando Julius					fernandojulius8@gmail.com 0812424830
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Hanghome	Mattheus				x	mathanghome@gmail.com
Herholdt	Siegfried				x	siggi@gts.com.na
Ileka	Erastus	NUNW				816296256
Imene	Matthew	Community			x	
Imene	Wilbard	Community			x	
Johannes	Helena	Community			x	nafau@iway.na
Kashimba	P.	Community			x	
Khito	Wonna	Shearwater	x			shearwater@iway.na
Krappmann	Oliver	Gecko Namibia	x			oliver@gecko.na
Lappas	Agamemnon	NUTAM operations				opsdep-whqimdngroup.com
Mayor WB	Secretary to	Walvis Bay Municipality		x		MSecretary@walvisbaycc.org.na
Mbako	Elliot Dhimbulukwa	Noordburg Seafood Processors CC	x			noordburg@gmail.com
Mokgatle-Aukhumes	Martina K.		x		x	naneni@iway.na
Nangula	A.	Huropo cc			x	816600632
Negumbo	Simon	Negumbo Trading				negumbo@gmail.com
Nguuitjita	Willy					812125894
Shipepe	Thomas	Mawara Trading			x	nambuli1967@yahoo.com
Shivute	Julius				x	812561737
Simon	Naftal	Naftal Trading				
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Uusiku	A.F.	FOA				
Van Niekerk	Cdr T. J.	SA Navy Hydrographic Office		x		hydrosan@iafrica.com
Witbooi	UP	NAMDEB	x			ursula.wibooi@namdeb.com
Doeseb	Heinrich	HEFDY	x			heinrichdoeseb@yahoo.com
EAPAN		EAPAN	x			info@eapan.org
!Hanabeb	Tino			Namport		tino@namport.com.na
Abette	N.	NCCI			x	811284744
Abraham	F.H.	Huropo cc			x	812611757
Adol	Jeram	Community			x	813971433
aiRE GROUP Office			x			info@aireg.na
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Amadihla	M.J.	Ark Fishing	x			matheusa@iway.na	
Amukwa	M.T.	C of FA	x			empire@namibnet.com	
Amukwe	Matti	Namibia Fishing Confederation	x			empire@namibnet.com	
Amutenya	Nangula	Walvis Bay Municipality		x		NAmutenya@walvisbaycc.org.na	
Andres	Erklni					812696945	
Angolo	Naftal	Jesmike-T.Enterprise			x	jessyymike@gmail.com	
Angula	Saima			MET DEA		saima@webmail	
Angula	Tomas	Acess					
Ashby	Auriol	EP	x		x	Ashby@aacc.com.na	
Ashili	Paulus	MFMR		x		pashili@mfmr.gov.na	
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Baard	Sypie					anssypie@gmail.com	
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Baumann	A.	Namdeb	x			alistair.baumann@namdeb.com	
Baumann	A.	NAMDEB	x			alastair.baumann@namdeb	
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Blaauw	Mr. H.M.	Nambee Mining	x			phylliciah@gmail.com, spdmining@iway.na, carme@iway.na,	
Botha	Pierre		x			pierre@thenamib.com	
Botha	Pierre	EAPAN		x		pierre@thenamib.com	
Bothma	Ben					benb@afd.com.na	
Braby	Rod	NACOMA				RBraby@nacoma.org.na	x
Brauer	M.				x	no contact given	
Brumfitt	Kaatri	NACOMA		x		KBrumfitt@nacoma.org.na	
Bruwer	Mr. H.J.	Aloe Investments trading as Desert Agricultur	x			johan@aireg.na	
Burgess	J.	LLM	x			llm@iway.na	
Burgess	Jason	LLM	x			llm@iway.na	
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Castle	Chris	Chatham Rock Phosphate Limited	x			chris@widespread.co.nz	
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Cloete	Rudi			MFMR		rcloete@mfmr.gov.na	
Coetzee	Lelanie	Walvis Bay Municipality		x		LCoetzee@walvisbaycc.org.na	
Coppin	Ronnie	Marshall Reef Fishing	x			ronnie@marshallreef.com	
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Currie	Bronwen	Tech com		x		bcurrie@mfmr.gov.na	
Currie	H.	Feike, NACOMA		x		hcurrie@feike.co.za	
D'Almeida	Graca	Tech com		x		gdalmeida@mfmr.gov.na	
Dames	P.A.	P.F. Co. Luderitz	x			PHONE	
Daniel	Karolina	Community					

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de Villiers	S.	LMC	x			Lüdmar@iway.na	
De Wee	N.	Lud Town Council		x		nico@ltc.com.na	
Dichtl	Hartmut				x	Hartmut.Dichtl@worleyparsons.com	
Dichtl	Hartmut				x	dichtl@iway.na	
Doemis	K.				x	kamil@gts.com.na	
Doeseb	H.	HEFDY group of companies	x			heinrichdoeseb@yahoo.com	
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Duncan	John	WWF, SA		x		jduncan@wwf.org.za	
EAPAN				x		info@eapan.org	
Eckstein	R.				x	reckstein@iway.na	
Edwards	Sarah				x	hyenaconflict@gmail.com	
Eimann	Tim	Namport		x		Tim@namport.com.na	
Eimbeck	B.	BIDVEST	x			birgit.eimbeck@gmail.com	
Elago	D.	SWC			x		
Ellis	Philip		x			philip@ellisandpartners.com	
Elungu	Patrick	MME		x		pelungu@mme.gov.na	
Elwen	Simon	NNF		x		simon.elwen@gmail.com	
Engelbrecht	P.	Swk Municip		x		pengelbrecht@swkmun.com.na	
Erasmus	W.	APF	x			LAFhatchery@gmail.com	
Erastus	I.	Community			x		
Erastus		Community				816922901	
Escalate Admin			x			escalate@fayo.com.na	
Fargnoli	Marcia	Earth Organization Namibia		x		marcia.a.fargnoli@gmail.com	x
Fiderieds	Brigte	!Ama Tradihona Anu					
Fleidl	T.	Five Roses Aquaculture	x			jfleidl@iway.na	
Fluksman	Samuehl	Luderitz Waterfront	x			waterfront@iway.na	
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Golaski	S.	Namibian Dolphin Project		x		nam.dolphin.project@gmail.com	
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Graef	H.				x	graef@iway.na	
Grant	G.	LL Namibia Phosphates	x			grant@sakawe.com	
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Grindley	Tess	Dolphin project			x	simon.elwen@gmail.com, nam.dolphin.project@gmail.com	
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Grobler	Kolette	MFMR		x		kolettegr@gmail.com	
Grobler	Kolette	MFMR				cgrobler@mfmr.gov.na	
Groenewald	Bahia	SANBI		x		B.Groenewald@sanbi.org.za	
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Grünewald	Ulf	Nest Hotel	x			gm@nesthotel.com	

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Hamukwaya	F	Tech com				fhamukwaya@mfmr.gov.na
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Howells	Angela				x	angelahowells@swakop.com
Huckstedt	Hans	LL Namibia Phosphates	x			hans@sakawe.com
Hückstedt	Hans	Sakawe	x			hans@sakawe.com
Ignatius Kauvee				x		ikauvee@gmail.com
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IIPINGE	A.H.	Kalapuse G.D.	x			kalapuse@iway.na
Iitembu	J.A.	MFMR		x		jaiitembu@mfmr.gov.na
Ilonga	N.N.	Community			x	nn.natangweilonga.com
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Japp	David		x			dave@capfish.co.za
Jenice						
Joel	Reinholdt	Community			x	818220838
Jonas	Wellem				x	813786461
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Josua	E.	Epangelo	x			jjosua@epangelomining.na
K.	Selma	UNAM		x		selmakosmas@gmail.com
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Kamupingene	Cecil			x	x	ckamupingene@gmail.com

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Kantika	K.			NACOMA		kleopaskantika7@gmail.com
Kapwanga	Kombadayedu	LLDiamonds, LLNP, Samicor	x			kk@sakawe.com
Kapwanga	K	LL Namibia Phosphates	x			kk@sakawe.com
Katjirua	Joyce	Namdeb	x			Joyce.Katjirua@namdeb.com
Katjirua	J	NAMDEB	x			joyce.katjirua@namdeb.com
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Appendix G

Attendance Lists for the Six Meetings

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Appendix H

Transcripts of the Meetings Minutes

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

Consultative stakeholder meeting: Lüderitz, Industry

Minutes

Date of Meeting: 2014:06:03

Venue and time: MFMR (Lüderitz) Boardroom, 0900

Chair: Ms. Graca º'Almeida

Present: see attendance register Appendix G

Proceedings:

The facilitator Mr. Philip Hooks outlined the meeting with the agenda.

Chairperson Ms. Graca D'Almeida welcomed all present.

Presentations were made and the following comments were received, noted, and as relevant to the topic of discussion, were responded to by either SINTEF or Committee members.

Participant's Issue / Comment / Question	Response
Reggie Hercules, lobster industry: The Government placed a moratorium: how is it possible for sampling to supersede the moratorium? The Minister of Fisheries took the issue to Cabinet and Cabinet put a moratorium in place, after which a certain company received a licence. Does the Ministry of Mines' decision supersede that of Cabinet?	*Committee:* The company already had a mining licence and did not receive a licence to mine or prospect. There is no violation of the moratorium.
cont.: Mining is mining: there should be a hold on everything.	*Cont.* There is no violation of the moratorium.
Sindila Mwiya, environmental consultant to LLNP: Would like clarity on procedure: the relationship between the Pilot Study and the SEA? A SEA is defined for policy, planning and programmes.	*Committee:* In the Environmental regulations a SEA does not exist, only an EIA. The Pilot Study stipulated in the contract is for scoping; not the actual main project. "Pilot" is the terminology used in the contract to describe what is to be done in the scoping. The presentations will make this clear. *Chair:* The idea of the main study is to get an Environmental Management Plan for the whole region, specifically for the marine mining of industrial minerals.
Cont: Sections 23 & 24 of the EMA provide for an SEA to provide an environmental plan. By definition an SEA will provide policy and plans for an organ of state. We need to get the definitions clear.	*Committee*: Serving on the committee are members of DEA (of MET) who manage environmental assessments: these members advise on this process in order to follow Government rules. The project has been registered with MET.
Ursula Witbbooi, NAMDEB: Requested clarity: a SEA process has been ongoing through BCC: are these phosphate issues going to fit into the BCC process?	*Chair:* The BCC project has been discussed: it is a bigger longer project on a broader scale involving 3 countries Angola, Namibia and South Africa. The timeframe for the BCC project does not allow us to wait: this project will probably feed into the BCC SEA.
Mr. Shoombe (lobster industry): We are told that Sintef has been appointed to do the research on effects of phosphate mining. That is the important thing we are interested in. Can we please go to the point and address this research of finding facts, instead of discussing definitions.	*SINTEF Roar Solbakken*: We are not against mining; we are not against fishing. We are here to present the content of the main project according to scientific content.

Dr. Jean-Paul Roux MFMR Ecosystem section: Referring to Work Packages: No. 7 is a synthesis. He identified a gap and need for an additional Work Package for conserving the ecosystem and biodiversity. Recently Namibia proclaimed their first Marine Protected Area approx. 400km long between latitutes 25º & 32ºS: this multipurpose MPA includes protection of endangered seabirds and also allows for fishing for lobster and snoek. This MPA is adjoining proposed phosphate mining and processing areas so an additional Work Package is proposed to concentrate on potential impacts that could affect the MPA.	*SINTEF:* Noted
Mr. Mukapuli: As a Lüderitz resident grown up and seen changes in the town wrt sardine and lobster fisheries. One suggestion and 2 questions: the "gap" in the fish map: should this not include lobster fishing grounds? In the phosphate distribution map is there an indication of where the mining will be done? – the size of the area	*Chair:* The map was used for illustrative purposes only: of demersal fish only. If we showed the distribution of fish in total but then it would be the whole ocean , from water depth of 10m.
Hans Hückstedt LLNP: Maps are fine. In their pre-feasibility stage the actual proposed mining area is small. The expected mined area is much less than the distribution shown in the maps; maybe 2% of mapped distribution area.	
Mr. Mukapuli: To SINTEF: intensive work to be premining, but will there be work done during mining itself? During premining is there a monitoring programme in place ?	*SINTEF*: If the mining is going to happen, then a good monitoring programme must be in place beforehand. *SINTEF:* From a food safety perspective: if coexistence of mining and fishing does happen: then it will be determined e.g. from what distance from effluents lobster can be safely harvested. It will also be determined how mining could affect fish migration (more difficult). SINTEF emphasized how important and necessary present baseline conditions are. If there were even rumours in the international seafood markets that seafood from Namibia was contaminated from phosphate mining this would be serious. That is why the solid baseline conditons are necessary: so important to know of today's situation, to monitor what could happen.
Grant Rau LLNP: Will monitoring of phosphate mining be assessed together with trawling plumes if both activities are occurring at the same time? How will you distinguish between impacts from e.g. trawling and mining?	*SINTEF Roar Solbakken*: In general, baseline measurements are necessary. Baseline will include all trawling activities and seafood activities that are already happening. If mining activities occur then these are additional to on top of whatever else is presently going on.
Reggie Hercules, lobster industry: All this is new to us. What about NAURU: where phosphate was mined: now there is no fishing industry, no nothing and millions of compensation money must be paid to the people of Naaru: a lot of wealth during mining; now nothing. We need to incorporate all such cases into consideration and into the assessment. Actually the rest of the world has refused this type of mining in their waters.	*SINTEF Bjorn* Serigstad: no-one wants it (Naaru) to happen again in other places. It is very important to do homework beforehand and be prepared. Proper baseline study is very necessary. (Mining) Operators will like to keep their reputation: I would guess it is also in the interest of phosphate mining and a very good monitoring system must be in place to stop if necessary. *Chair*: We can only learn from our own situation and our own system. Ecosystems are different so we must use our own data: that is why we want to take a precautionary approach before allowing any large scale mining, using our own data in our own environment. Other experiences

	can add to the general information. *Committee*: There have been other studies done on nodule mining for phosphates in the Chatham Rise in New Zealand. Following at least 4 years of research their assessment has been submitted to the authorities who must review it. No environmental clearance has been issued and no mining has started.
Mr Shoombe, lobster industry: Are we only interested in phosphate mining or is there something else not yet defined? For mining of phosphate, radiation needs to be analysed. What are the radiation effects?	Facilitator mentioned that this study will look at all cumulative effects. Radiation was covered in the presentations.
Reggie Hercules, lobster industry: This is not like diamond mining pumping from one specific hole (site). We are dredging the seabed - We are talking of massive vessels that need to clean up the seabed 24/7 in order to keep those vessels operational.	*SINTEF* will incorporate the mining process into the modeling studies.
Mikka LLNP: Welcomed Sintef and thanked MFMRy for the scientific approach. The element of socio-economics is not in. From the marine ecosystem there is some but not on benefits from mining. The research is only on the marine ecosystem We need to see not only the scientific aspects but also how to benefit Namibia. Need a balance – not only science, but also how Namibia will benefit on the whole. Have phosphate companies been given opportunity to present what they have done? He suggests a dialogue between scientists and mining companies. *Cont:* Request for the time frame:	*Chair:* the study specifically does not deal with the socio-economics. The outcome of the study will inform the socio-economics; they can then be done. Firstly we must get a plan, a framework. . *SINTEF:* Obviously we are interested in the information on mining: the information goes through the committee. Other committee members offer vessels to get data. SINTEF will receive all information through the authorities. It is the responsibility from mining houses and MME to provide any additional data. Data in the Main Study is very wide. There must be checking of data: that all parameters have been correctly measured, and validation of all data. For the full study and report 3 years are needed – this includes field work and write-up. SINTEF are looking for the best people available in the world and the best information available. We are not looking only at local technical input.
Grant Rau LLNP: Will the project finish 3 years from when the main project starts? Does it start today? So it could be 10 years? So that does not mean anything?	S*INTEF*: 3 years starting from the begin of the Main Study *Chair*: it is most logical that the main study will start when the funding is secured. *Committee*: The contract for the Scoping Pilot Study was signed by April: this will take 4-6 months. Once the scoping is accepted and the study is funded, it will take 3 – 4 years. There is urgency for this project; it is not likely

	to be 10 years.
Mr. Shipanga, lobster industry: Local resident from birth, and seagoing: thanked SINTEF and Steering committee. Regarding the lifespan of project: Ecosystems in different parts of the world are not the same. Investment of millions is fine but what about the local people on the ground? When the phosphate is finished, what about future generations? We must put our attention there: we must look at the broader aspect. e.g. De Beers will go, but the town of Lüderitz will stay the same. The decision must be made responsibly.	
Hans Hückstedt LLNP: announced that research by LLNP found that the phosphate reserve is for 300 years and counting. The fishing industry has only been going on since the 1940's.	
Phyllicia Hercules, Nambee Mining: For the moratorium the Pilot Study is 6 months, onwards will be the Main Study. Will the moratorium be extended? Or will there be a recommendation to the Minister, for as long as the team are busy with the studies? Will you recommend that the moratorium should be extended? It would be irresponsible not to. It would be wiser to extend the moratorium.	*Chair:* Cabinet approved the Mortorium. Recommendations will be guided by this process (of Pilot project). By August there will be a draft report. The Moratorium stands for 18 months – that leaves a few months after August. The Moratorium has an addendum for a further 3 years, so it can be extended. *Chair:* We shall be guided by the process. Cabinet will be informed (of the scoping). It is up to them to make a decision, based on all the information. After the scoping study a report will go to Cabinet .
cont: LLNP are "sampling". Would it not be in SINTEF's interest to go and start testing during sampling? To speed up the process?	*SINTEF*: Of curse all information is helpful. But to date the Main Study is not started *SINTEF* Today the main project has not yet started. The whole project must be co-ordinated. In the main project a mining company is not an active player. You cannot set a strategy with conclusions before results. Also activities must be co-ordinated (in the Main Project).
Cont: While they are sampling is it not effective to do studies?	*SINTEF*: There is not yet funding and not appropriate adequate sampling.
Cont If this Pilot Project is dragged on and after 18 months the moratorium is lifted, then this is a waste of time. So it would be irresponsible not to recommend and extension of the moratorium.	
Juan Magdalen, NOVANAM: The doors of our fishing industry are open if information is needed. To cover the study in 2 years is optimistic: it needs longer.	*SINTEF*: 2 years practical work; 1 year for write-up.
Mr. K. Kapangwa LLNP: A good approach. We were thinking the study is meant to stop development by environmental people. This started with the proposal of an industrial park at Swakopmund. Rich people did not want to see industrialization: part of this is phosphate mining. Continue with the scientific approach; it is not a beauty contest: everything is for economic development. Everything is necessary for the necessary economic development and job creation. When we fought for independence it was to uplift the people.	
Birgit Eimbeck, BIDVEST, local resident: Will the study not provide any recommendations, only present data,	*SINTEF Roar Solbakken*: We are not going to give or predict results before seeing them. They must have

mainly baseline data? From the meeting it transpires that this is to collect baseline data. Can this study in any way produce something hypothetically that can affect the future of the phosphate mining? It seems that already the mind is made up that mining will go ahead, or is there a scientific no-go scenario /possibility?	quality control. We have no conclusions whatsoever of the outcome. The responsible authorities could say "no mining" or "yes" or both. We are only open to give scientific information. We have no agenda on the issue. *Intervention from Chair*: In Cabinet's eyes all Ministries are equal. In the eyes of Government there must be a framework within which to make a decision. The intention is not to allow or to disallow. The input from SINTEF will contribute to the study that will contribute to the decision of the Government (the decision will not be from the Steering Committee). We are here to inform what needs to be done. We have no pre-empted strategy before we have facts, otherwise we would be setting ourselves up for failure – there cannot be conclusions before results One is setting up for failure if conclusions are made before the facts are there.
Jason Burgess Mariculture oyster farmer: He is cognizant of the importance of the issue and of the potential of phosphate mining. He is currently farming oysters, which are filter feeders: following the EIA held in Lüderitz at the Nest Hotel last year, concerning the experimental plant, was there a guarantee that (his) current product of raw product for raw consumption will stay safe from contamination for human consumption during the trials and experiments that are presently going on? He is importing spat and developing a hatchery in Luderitz. Any contamination can affect safe consumption of the shellfish. He accepts that dangerous industrial activities can be carried out in underdeveloped countries because those countries are prepared to take the risk. But if he will develop a hatchery in Lüderitz. he needs to know that the effluents will not harm the product. If he cannot market product (in Europe) then this is a dangerous economic activity. He works on the sea, lives on the sea, eats from the sea. He questioned whether there is testing and checking what presently is going on with the experimental work just 70m from his oyster farm. For the next 2-3 years, are we checking that the oysters will be safe? – his duty. He welcomes scientific data which takes away the emotional side.	*SINTEF*: It is difficult to understand the site selected for the phosphate experimental plant. Modelling and mapping will include such areas as spawning grounds of fish, oyster farms. Seems strange that it was decided to allow a plant before the studies were done. *SINTEF: Bjorn Serigstad:* Strange difficult to understand how the permission is given to the site before the information has been collected. We do not know how the discharge or how it spreads. It seems a backward planning of the process. *SINTEF Roar Solbakken:* comment to oyster farmer: he understands the concerns very well; and hopes his concerns will be captured in the food safety Work Package. This is potentially a very serious problem. Of course to study one should first do experimental contamination studies (not on humans!)
Hans Hückstedt LLNP: Bit off topic: they have taken samples from sea and analysed.	
Jose Carstens Fishing industry: For example, the oil spill in the Gulf of Mexico disaster, there is legal compensation by polluters. Has it been taken into account by interested parties that if they mine or during sampling, compensation might be necessary? There should be funds available for any impacts on fishing, people (consumers)? He has the recommendation that if they mine during the moratorium then funds should be available for any harm caused.	
Councillor J. Scholtz, Regional Councillor: Has listened carefully, and commends Government, to allow other activities. There are positive and negative parts to everything.	

In Lüderitz there is a lot of talk about development, job creation, So it is more than right to also accommodate, based on outcome of the studies, other sectors, pending the outcome of the study. We must also look to the future.	
Mr. Samuehl: resident in Luderitz and has been politically responsible for the area: There are certainly fears from business people in the sea that phosphate mining will diminish their operations. As an optimist: it is good to have science people to carry out the research. With full confidence in science, they must be allowed to do what they must do. The hope is for a win-win situation for the town which would boost this town's development. The bottom line is to take note of all scientific input given to ensure their final report takes everything into consideration.	
Grant Rau LLNP: He has 8 points: 1) BID: BID does not address socio-economic aspects. It is internationally acknowledged for the need for socio -economic data in an SEA. There is therefore discrepancy in the BID document. There is disparity in information provided in BID between that provided for fisheries and phosphate mining. Criticism as to lack of socio-economic inclusion in SEA. *Erez Mishal LLNP*: Are you saying you are conducting a study excluding a part: this is not doing a proper study.	*SINTEF*: this has been answered already by the Chair and it will be addressed in Main Study. *Committee*: decided to take out socio-economics from phosphate mining because this industry has not yet happened; there are no concrete figures from socio-economics. Fishing industry: already proven therefore figures are in from available statistics. To exclude world commodity prices of phosphate was a decision by the consultants. *Committee:* In predicting a new industry there are no actual figures. The task this Pilot Study was contracted for, did not include socio-economics. This study is not looking at the economics: this is looking at the consequences on the ecosystem bearing in mind that the living ecosystem provides the basis for the fishing industry. *Chair:* if you want to evaluate the intrinsic value of the marine ecosystem it can be done but we must be a realistic: it is huge and will not fit into the timeframe. The socio-economics of a living marine system is not just the fish taken from that system. We are here to be guided but we must be realistic. This aspect has been already been much-debated.
Sindile Mwiya: It is ill-advised to use the term SEA: not the right terminology as it will include everything. The right terminology has not been used. He supports the work packages 100%. But just call it a baseline study: he challenges to call it a SEA.	*Chair:* In this process we take note of comments: the message is we don't know what we do. We do know what we are doing. We have experts from MET on the committee who are advising.
Reggie Hercules lobster industry: This same research happened before diamond mining. As a result "real" investors like NAMDEB or De Beers came supplying sustainable employment, but we also had fly-by-nights. We must look into the background of the investors. However we have already successful abalone and oysters: for oysters and abalone growing faster in our seas: why don't we rather use our seas this way to create wealth profitably by using the natural system?	
Grant Rau LLNP: Re BID and maps presented:	

We assume that this study will take into consideration the current activities. Baseline studies: must take into consideration all other activities and industries. Will SINTEF investigate phosphate grades? It must be determined what area will be mined? At grades of 4.5% phosphate there is no possible way for that sediment to be mined. Will SINTEF be looking at a % of the deposits which can viably be mined? The grade-values are needed. The areas are known: for cumulative impact you must know what area can be mined. The studies are already there. The information of deposits must be included in the modeling: the area. There is a "rush" – no one even knows when they ask for EPLs. To do a cumulative impact SINTEF must know the size of the area to be affected. Grain-size is irrelevant. *Erez Mishal LLNP:* Third party companies' information is reputable, giving information about our deposits and grades.	*Committee*: the information was provided from MME *Chair*: if the ocean cannot be mined why all those EPLs? This is a long-term project, and one decision is needed, one framework, that is why the study is needed. We do not want to address each company as it comes along in the future. *SINTEF*: Deposits as they are today. Please include information for modeling. Grain-size is needed (from those areas). *SINTEF*: The information is important and a lot is not available: it is fine to provide us with information, and from other companies, to be provided for modeling. *Chair*: What is the best way of getting this information to SINTEF: we need to create a link *SINTEF:* There is need for a plan to develop the activity at sea and information about discharges to the sea. How much volume, how much discharge. Without this we cannot do anything. *Committee*: Steering committee creates a vehicle for the link. Data is collected through Ministries?
Mr. K. Kapwanga LLNP: the Chamber of Mines should be the liaison link via the chairperson, not through the committee	
Sindile Mwiya: according to the Minerals Act there is provision for exploration information to be exclusive property of the company, not MME. Companies are not responsible to MME with data.	*Chair*: not comfortable. These data are needed a.s.a.p. Are we saying companies make contact to Administrator & SINTEF? Contact person from LLNP and NMP?
Jeremy Midgley environmental consultant NMP: Clarity is needed. The scoping has not been with primary parties for first-hand information. It is of primary importance that SINTEF meet with mining companies to gather firsthand data. Data is from all sources and stakeholders.	*Chair:* Only two mining companies but how many other fishing companies and many other industries? *Committee*: So SINTEF includes all fishing companies too?
Mr. Shipanga, lobster industry: In Lüderitz there are 2 companies with a mining licence. But everyone should be treated the same. It is advisable not to have some groups/companies preferred to others (for information sourcing). Where is the community?	*SINTEF*: Comment on information supply (for the project): All information supply belongs to the Main Project Work Package 1: these data are not handled in the Pilot Project. When the Main Project is decided then the data will be collected. Only when the Main Project is decided will these data be sourced.
Erez Mishal, LLNP: When doing scoping it is very different whether small areas are considered or the whole coast, therefore preliminary information will be	

useful and helpful. The whole approach will be different .	
Sindile Mwiya: On procedure: if this is a Scoping Report only, why is a SEMP required (point 6 BID)? Why is a SEMP in a deliverable in the Scoping Study?	*Committee*: point taken: we shall get advice from MET
Grant Rau LLNP: Modeling is using some real data: practically this is simulating otherwise it is another desk-top study. *Hans Hückstedt LLNP* : an exchange of mining technology is needed with SINTEF	*SINTEF:* input numbers are needed, including planned amount of discharges, chemicals used, when other companies come in (join) to mine. Details of the discharge permit must be known, and the company will need to assess and do the monitoring. There is a big responsibility on companies to come up with what they will discharge. They should be monitored by other companies. The planned technology must be known .
Grant Rau LLNP: From BID: deposits around the world. That mining is not permitted in other parts of world is not true; it is being proposed in other parts of the world e.g. Mexico and New Zealand examples given. BID: comments on wide continental shelf, organic-rich sediments LLNP has many cores >2000 also investigated so we know. BID: biological system supports industries; does that infer phosphate mining cannot. Inference should not be there The proponent and BID queried by LLNP	*Committee*: Aware of activities in other parts of the world. There is no seabed mining of phosphates yet. *Committee*: Off Namibia the most organic rich sediments off any upwelling area, lots of German sediment data being collected. Living marine ecosystem is the basis of the industries. Will be looking at the distribution of mining sites relative to distribution. *Committee:* The BID is prepared by the proponent of the activity i.e. the living marine ecosystem & services; not phosphate mining. Therefore as proponent the major amount of information is about the living marine ecosystem: this is usual in a BID. *Chair*: MFMR's mandate is to look after the marine ecosystem.
Mr. Shoombee, lobster industry: From which countries are the main investors in phosphate mining? And where can I get the info for records please?	
Eli Nefussy LLNP: same investors as the fishing companies	
Joyce Namdeb, as individual: If we are talking of this project we are talking of the studies commissioned by MFMR; we are not talking about a phosphate mining project: this is a MFMR project. Look at the aim on the slides: they related and clarified the project. MFMR is the proponent. The phosphate mining people are I&APs. So if you look at the name of the project it has nothing about phospate mining industry. MFMR is the proponent, who funds this project, therefore the investors in this project are MFMR.	Facilitator thanked for clarification.
Mr. Shipanga rock lobster industry : Queried role of investors	*Chair:* The steering committee will not go into socio-economics, for fairness' sake.
Grant Rau LLNP: (8)?	
Hans Hückstedt LLNP: requested the presentations.	SINTEF: These will be available on website
Meeting adjourned	

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

Consultative stakeholder meeting: Lüderitz, Institutions

Minutes

Date of Meeting: 2014:06:02

Venue and time: Ministry of Fisheries and Marine Resources Boardroom, Lüderitz, 1730

Chair: Ms. Graca D'Almeida

Present: see attendance register (Appendix G)

Proceedings:

The facilitator Mr. Philip Hooks outlined the meeting with the agenda.

Chairperson Ms. Graca D'Almeida welcomed all present.

Presentations were made and the following comments were received, noted, and as relevant to the topic of discussion, were responded to by either SINTEF or Committee members.

Participant Issue / Comment / Question	Response
Jean-Paul Roux, MFMR : The EIAs that are related to marine stuff are being misconducted by splitting the land part of the project and the marine part. The two cannot go without each other. I see the title of this project is the cumulative effects: my question is does this involve both the shore processing and the land processing and the consequences, and if not the strong concern is that it should, because phosphate mining in the end needs shore processing and this produces large amounts of land disturbance and marine disturbance due to nasty effluents. Processing of these minerals produces phosphogypsum in large quantities which we don't want. That needs to be taken into account.	*Chair:* You cannot separate one process from the other because it is like one process. Although there is a technicality problem: maybe it must be addressed by committee. Ministry of Fisheries MFMR mandate ends at the high water mark and on land it is Ministry of Environment and Tourism MET. There is common understanding of the effects on the marine environment, but the way the system works unfortunately is that if there is an EIA that is for land it is handled by MET, with your (MFMR's) inputs – you are just a stakeholder without the final say. However in fact even the Environmental Commissioner said he cannot give clearance for one without the other, and vice versa.
Cont: Just from the marine point of view the processing from phosphate mining will affect the marine environment, even if the processing is done on land it will produce in excess of 400,000 tonnes of effluent, even for a small plant, which is going to be dumped into inshore waters. In the case of Lüderitz it is near enough to lobster, the line fish fishery, aquaculture, and is in the middle of a Marine Protected Area. So, just from the marine area point of view, it has to be taken into account.	*Chair*: For environmental clearances with new Environmental Act: all 3 ministries must sign off clearances; before it was not like that. You are correct. For the land part it is not sure if MFMR has to sign off. If so it is a much stronger process. It is a very valid point which must be taken up.
Cecil Kamupingene LTC: My impression to understand the discussion: what is the difference of diamond mining to phosphate mining, and secondly with this project of (Ministry of) Fisheries, why is it not from mining, because from my point of view the investment is from mining, and this is not different from diamond mining. Very important point: from Fisheries (MFMR) why did they not do the same for diamond mining? Where is collaboration with Ministry of Mines and Energy? It is	*Chair:* I specifically quoted the Environmental Act regulations of 2012. Before those regulations, the process was that MME gives the licence on condition that the company gets the environmental clearance. There is no guarantee that you will get environmental clearance when the mining licence is issued. Now the regulations dictate that all 3 Ministers must sign off the clearance following the environmental assessment. We now have a committee that has all the Ministries (MFMR, MET, MME, MWT). Unfortunately the (mining) licences were given but they did not have

difficult to understand how this phosphate issue came to be different.	environmental clearances. A clearance is when every Ministry stakeholder is happy and satisfied with your environmental assessment. First question: Diamond mining has been going on for some time. Diamonds are mainly in the south. They are alluvial compared to phosphates. I have shown you a map of phosphates. If you look at the map of the phosphates and look at the map of exploratory licences replicate the distribution. Phosphates require removal of bulk to a certain sediment depth. You will remove not only phosphate but also organisms which have a function there. We cannot just remove something and not have consequences. There are also trace elements in the removed mud: what effects will this have? If you have mines all over can you still have a vibrant fishery? These are the questions that have to be answered.
Jean-Paul Roux MFMR: Diamond mining: until now from diamond mining the area impact is very small and they mine a small area at a time, though there are plans to expand so impact may expand. But this (phosphate mining) is large-scale bulk removal right from the start. Worldwide there are major issues in terms of applying the concept of ecosystem approach to fisheries, and there is worldwide concern about the effect that bottom trawls have on the ecology of the sea, by just touching the bottom. The Norwegians are very aware of this. Here we would not have to worry about it – we would be totally removing the bottom(!)	
Erich Maletsky MFMR: How long has the Mariane project been going on, and also with regard to the benthic mapping, what percentage has been actually covered of the area you are working in? *Cont:* To follow up: do you get any extra information from the mining industry that you can add into the Mariane project? Or is it just based on the research capacity that you have in Norway?	*SINTEF*: The Mariane project is a very expensive project that began 5-6 years ago. It has concentrated on the most important fishing areas. It costs a lot of money and is very ambitious but also very important for Norway. It will be used to see if it is possible to develop the mining industry along with the oil industry and the fishing industry. The fisheries want to see; also the export value for aquaculture products has become very important for Norway; 20years back it was only small. The Mariane project is very important and could also be important for other countries. Maybe it is not necessary to start monitoring all the parameters but aim to start with a few activities and you can add on. *SINTEF*: Quality control of the data is very important. So to search the internet for data is not accepted. We need to know how the data were collected. All the steps and quality control are important, keeping to international standards. The way research data are collected is very important to control.
HW the Mayor Susan Ndjaleka : We really appreciate you being here. We want you to know that as a town, in Lüderitz neither fishing nor diamond mining sectors have been doing well for the past 5 years. Having the study now: we want you to know, in order to uplift the economic activities of the town, we are forced to attract other investment, industrial activities - be it tourism and even this phosphate as well in a way, is welcome because of the high unemployment rate in the town and for the survival of job security - permanent jobs. So please, what other activities within the fishery sector are there that industries can start to give back those glorious days and to have the resources for our people. It is a burning issue. Lüderitz is something	*SINTEF*: I very much agree about the question of creating more value in the fishing industry. There are several routes but they are knowledge-based so need investments and research. Investments: to utilize the whole fish and get more value from the fish. In Norway it is the trend to use the whole fish: the head, the gut; and to extract enzymes and fatty acids, flavours; to extract bioflavoids and so on and so on, to get more value from the fish. But at the base there must be development technology; for handling and care of the fish, not only when landed but on the ship also, to ensure that all parts have quality human use, high-value use. This requires technology

extraordinary. It is not Walvis Bay; it is not Swakopmund. This is another town. We need Government support in order to revive the town's economic uplifting. This exercise of yours should not just be advice on law-making, but also looking how the town as a hub that is very important for the Ministry, will survive and sustain the fishing. As of now we cannot convince the community otherwise because the fishing industry is not doing well.	development. You have fish just out here, fresh, and there are possibilities. We would be more that glad to come to co-operate with you and have this knowledge exchange. But of course technology needs development for your own species The principle and technologies are there *SINTEF*: There is some similar experience in Norway from fish stocks. When herring disappeared for more than 10 years: it was really bad; the cod was disappearing because cod ate herring and herring were not there. So they had very strict regulations and slowly we were able to slowly rebuild the fish stock. This came after the oil industry.
Valerie, LTC: Question: can you give us an indication of how long this main project of investigations and regulations will take? What is the time frame we are looking at? The reason I am asking: the second presenter has mentioned that you will be looking at the pre-mining description. Are we now going to tell potential investors that come to our office to hang on, let's wait for this process to be finished, so that we can have the necessary regulations in place? *Cont*: So where does that leave us as Local Authorities then, as in the current situation with potential investors when it comes to advising our investors?	*SINTEF:* This needs at least 2 years because years are not the same of processes in the ocean; then after gathering data to work it up another year. *Input from facilitator:* Would you not like to wait to make the right decision?
Nasser Tjipura, Head of Infrstructure LTC: We just heard that mining phosphate has never taken place from the sea. We know there are interested parties who want to mine. Does SINTEF know the mining methodology the company has, to incorporate into studies of models of the prospective company coming in, to deliver to you how they are going to do their mining so that you can put into the oceanographic studies? Also we know the company have a prototype plant which is going to be a replica of their whole type of industry. It is very important because speakers have mentioned the effluents to the sea – if they will be damaging or not. I think it is very, very important at this stage to involve the 2 parties. It is also mentioned Ministry of Mines are part of this but none the less we are not seeing anyone from Ministry of Mines here. I think we should have also someone from Ministry of Mines who can be on the side. If you can look at the long-term positive of the investment it might be a whole lot bigger than what we are doing now in terms of looking on the impact it will have on the sea. The sea is broad. We have to look into the final benefit of what we are doing. Are they going to look? Are SINTEF going to meet them?	*SINTEF*: You mean the methods of extraction? *SINTEF*: Is there a plan for development and operation, for phosphate mining extraction side, and explaining processing with what kinds of chemicals to be used: how much and expected discharge – there must be some plans there? It would be interesting. Also considered must be some sort of discharge permit? *Facilitator*: Industry most likely at the industry meeting tomorrow.
Kolette Grobler MFMR: at scoping meeting for the testing plant there were some sediment analyses in that report which I presume is open to the public. They have already done some analyses of sediment that they have collected from the mining sites. I don't know if that will help.	
Nasser Tjipura LTC : You have shown that (in Norway) oil and fishing can co-exist. It is also our vision that phosphate mining and fishing should co-exist.	*SINTEF:* I think it is more expensive than the mining company envisions. If they are planning for a long-term investment, to mine for long term 20 years or more, then they need to do their homework before they start. I am afraid that otherwise the company is not very popular after some years.

	SINTEF: Before we can say here whether it is good to have co-existence or not we need data which we do not have – that is what the Main Project is all about. *Committee:* MME were invited to this meeting so we are very sorry they are not here. The mining of phosphate is vastly different from putting down oil rigs. So when talking of getting baseline data one must think of effects: stripping the seabed as compared to putting down units. We can see the success in Norway but we are talking of a totally different mining activity. Unfortunately we cannot just use that experience. And that is exactly why for a new activity we must get the information. *SINTEF:* That is why in Norway they are thinking of closing some areas of mineral deposits to mining, and that decision from the Government has to be based on facts: are we going to do it or not. I think there is more or less the same situation you are having here in Namibia: problems of sedimentation, chemicals, bottom systems, fish. Extensive modelling (DREAM model) will be used in very large project over 4-5 years (in Norway) to first model the scenario.
Erich Maletsky MFMR: What has been echoed before: is that first the current state of the Benguela Current ecosystem must be known. Only after the regulations are in place could the mining activity begin. To give context on what we are talking about: Information on the raw phosphate commodity price is presently US$108/tonne, so imagine to be a financially viable venture, how much phosphate you need to extract. So it is a very vastly consumptive approach for this phosphate mining venture. And many of the benthic species & fishes actually lie on the sediment there, so if we strip the sediment away we remove them with their life cycle.	
Jean-Paul Roux MFMR : more a remark than a question re aspects of mining vs fishing: one part is answering the planning problems and the Mayoress' concerns about the town. We have in Lüderitz a very special place. We are between 2 national parks with an MPA right in the middle. This town was built from fishing and mining: lobster and diamonds: both luxury items, lots of money for the product. Now we are looking at a completely different industry: a big impact for a lot less money per tonne. But one aspect of economy of this town which is totally underdeveloped is tourism, and this is another choice. You can do tourism and fishing – it can go ahead, but tourism and large-scale industry – no, likely a problem. In terms of biodiversity we are in an incredible place. We are on land and on the shore, in the northern parts of a biome that is ranked 35th in the world in terms of biodiversity and we are in a corner which is special as the driest part. This biome stops at Diaz Point. And there is no development, no investment in the conservation of this area. So this is a sector of the economy that is totally underdeveloped: there is no knowledge of it, though there is marine tourism; there is tourism based on linefish, and the lobster festival. These are areas that need to be developed. The advantage of those and fishing is that they are potentially sustainable. Mining, no matter how you look at it, is not sustainable – you extract: once it is	

finished it is finished and you are left with the damage. Diamond companies now have to rehabilitate on land, but rehabilitation of habitats in the water is impossible. And if the habitat is modified to such an extent that it is harming biodiversity or fishery resources, then we are the losers for the long-term. Even if in the short-term we become rich from phosphate mining. This is something to keep in mind.	
Cecil Kamupingene LTC: Presenters spoke of integrated management. What does that mean? There is risk in any project and risk must be mitigated. In that line, for sediment, and projects of any nature: first things first: find out what these (mining) people want to do, how will they work on the ground, thirdly how will they reduce the risk in the process? A developing country is more relying on primary and secondary activities, not necessarily tertially. Tourism does not make up Lüderitz – we know it has potential but it will take time; Lüderitz is not Swakopmund. For investment we must assess each project and not be subjective but be objective: how are they going to do this extraction, what is going on on the ground, what will be the outcome. With mining and fishing why not additionally processing from phosphate mining: what does that mean in terms of infrastructure? to integrate this process. How are they going to assess?	*Chair*: In terms of these proceedings, I am independent. In this process we are trying not to be exclusve. Over and again: the Government needs to first evaluate the risk. We do not know the risk. We do not have the baseline data. We can blame ourselves as a Government. We have to evaluate the risk. Here we hear the experience of Norway. We have just 2 research vessels. Norway has many. They (Norway) can show us their spawning areas. For the government to go in and make an uninformed decision would be a terrible mistake. That would be like basing your house on a river that in 5 years might be flooded. Government wants time to make an informed decision; it is not a position on mining or fishing. Yes, we are consulting companies. At the moment we have 2 companies with (mining) licences, tomorrow we might have 10. Where do we make the baseline of how many? Where do you draw the line (as a Government). We are not pre-empting what the study is going to reveal. Hypothetically, you could have started something and then the information comes along that that is actually a very high-risk area – so move from there. We are in a tight spot: yes we do realize the serious needs of Lüderitz to develop this town, but then again you do not want in 100 years to have a sad story. It is unfortuntely just something we have to study.
Kolette Grobler MFMR: Regarding testing samples for fish and heavy metals: Are you aware of the project being done by Deon Louw? He is now taking samples to France to use data for analysis. *Cont*: Questions regarding the technical needs of collecting oceanographic data, and additional monitoring lines, near the phosphate mining, on a monthly basis? The buoys? It is quite a different situation here compared to Swakopmund. Discussion on where buoys would be positioned.	*SINTEF:* No we do not know: very interesting and very valuable. Thank you *SINTEF:* That is something we would very much like to co-operate on, use your expertise and knowledge. *Committee*: The buoys were mainly under the German scientists' supervision. *SINTEF*: We would get information from the model to guide us re deployment of buoys.
Cecil Kamupingene LTC: Other question: the engagement of players for the investigations mentioned in terms of investigations: Mining and fishing: as much as we are aware of the potential harm from mining, we must not be subjective.	*Facilitator:* due process is being followed *SINTEF*: Asking about the way they would extract information to be in model: Yes.
Nasser Tjipura LTC: Fishing trawling is not allowed at a certain distance, depth from the shore?	*Chair:* Shallower than 200m water depth there is no trawling allowed. At Lüderitz the 200m depth on the continental shelf is not the same as at other places along the coast.
Nasser Tjipura LTC: To try to get to the area where the phosphate deposits are, with the possibility to mine, the geologists can see where the deposit will be viable. Geologists should be involved.	*Committee:* We have asked MME whether there is independent survey of the marine geology: they (MME) do not carry out independent surveys. In fisheries for fish stocks independent surveys are carried out all the time. We have only the information from literature. The detailed information comes only from mining companies at their specific sites, not from along the whole coast. *SINTEF:* If you are going to involve geological surveying then it is necessary to carry out surveys, but

	we are not going to involve phosphate quality assessments *Committee* : It would be great to have this information along the whole coast. *Chair:* MME does not have their own vessel. MME are involved even though there is no-one (from MME) here. The study now has its ToR but when it comes to the economics of the deposits – that is something that must be developed by the mining companies
Jean Paul Roux MFMR: To clarify the less than 200m depth trawling not allowed: That does not mean that mining within that area will not interfere with commercial fishing because fishing is not happening. You must understand the reason that fishing is not allowed: it is to protect the fishery. Because on this shelf area is where for example the juvenile hake occur (smaller than commercial size). So if you mess up this area you interfere with the juvenile hake and you kill the fishery outside.	
Erich Maletsky MFMR: How long has the MARIANE project been going on, and also with regard to the benthic mapping, what percentage has been actually covered of the area you are working in. To follow up: do you get any extra information from the mining industry that you can add into the Mariane project? Or is it just based on the research capacity that you have in Norway?	*SINTEF*: The MARIANE project is a very expensive project that began 5-6 years ago. It has concentrated on the most important fishing areas. It costs a lot of money and is very ambitious but also very important for Norway. It will be used to see if it is possible to develop the mining industry along with the oil industry and the fishing industry. The fisheries want to see; also the export value for aquaculture products has become very important for Norway; 20years back it was only small. The Mariane project is very important and could also be important for other countries. Maybe it is not necessary to start monitoring all the parameters but aim to start with a few activities and you can add on *SINTEF*: Quality control of the data is very important. So to search the internet for data is not accepted. We need to know how the data were collected. All the steps and quality control are important, keeping to international standards. The way research data are collected is very important to control.
	Chair: announcement regarding coming meetings: Tomorrow we have 2 more meetings: industry and public. There are no decisions yet. We shall incorporate all comments.
Paulus Ashili MFMR: Last year we had an SEA on marine from the BCC. What happened to that?	*Chair* : That SEA is still in infancy stages. It is a very costly project. *Committee*: It is a huge project
Meeting adjourned: 5:30pm	

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

Consultative stakeholder meeting: Lüderitz, Public

Minutes

Date of Meeting: 2014:06:03

Venue and time: Nest Hotel, Lüderitz, 1730

Chair: Ms. Graca D'Almeida

Present: see attendance register (Appendiix H)

Proceedings:

The facilitator Mr. Philip Hooks outlined the meeting with the agenda.

Chairperson Ms. Graca D'Almeida welcomed all present.

Presentations were made and the following comments were received, noted, and as relevant to the topic of discussion, were responded to by either SINTEF or Committee members.

Participant: Issue / Comment / Question	Response
Mr. Valombola: Mining and fishing: he requests the project not to be influenced by Swakopmund.	
Mr. Siloka: From the map: spawning within 200m zone: what effects will phosphate mining have on fisheries and will there be any radioactivity effects on fisheries?	*Chair:* We know that after spawning, young fish occur shallower than 200m. We need maps of eggs and larvae. If there is exact overlap of early fish stages with mining, you would expect impacts, and that is why the studies are necessary. *SINTEF*: Referred to geological processes: in order to address the radioactivity problems. Radioactivity will be studied. *SINTEF:* Regarding maps: there are lots of good data in Namibia e.g. Dr. Roux has very good work on young hake which should be published as soon as possible.
Mr. Siloka: What effect will the sea currents have on the effects from mining?	*Chair*: To find out, these are exactly what the studies are for.
Mr. Makaula: Thank you for the information. Why Lüderitz for the mining? From the distribution maps the phosphate deposits are very little at Lüderitz. Based on the maps of deposits, they appear to be more towards Walvis Bay & Swakopmund.	*Committee:* The mined deposits loaded onto ships will have to be brought to shore, unloaded at ports, and processing will need infrastructure. So the only places to choose from are Lüderitz and Walvis Bay. It seems the mining company has chosen Lüderitz. That was the mining company's decision.
Mr. Makaula: Based on phosphate mining experiences in other countries, should the people of Lüderitz see this as positive or negative? Or will our kids have	*Chair*: There is no experience to draw from because marine mining for phosphates has not been done before anywhere in the world. We do not have

problems?	examples. *Committee*: We are proposing these studies because of the concerns. There are concerns regarding the processing which could produce large amounts of effluent returned to the sea: we will look at the risks. Some of our biggest concerns are regarding the waste products. *SINTEF:* these are the questions to be addressed in the project.
Mr. Mukapuli: Is there no new (scientific) information? If not, who is going to do it?	*Committee:* The information on the sediments along our coast is limited: this type of work has not been the work of the Ministry of Fisheries whose work has focused on the state of the fish stocks. There has been a lot of work on sediments carried out by German researchers and already we are promised all these data, to feed into the studies being proposed. Most surely there will be data lacking for some areas that could be mined. Once we know the gaps, this can be addressed by the SINTEF team, to get information on things such as sediment type, animals that live on the sediment, bacteria, heavy metals.
Mr Valombola: No-one has experience on phosphate. If new, why not compare with other mining - diamonds, gas, oil, many others etc. – combine with these. Why is there motivation from MFMR for phosphate? Trawling: why is this not investigated in the report?	Noted
Mr Shipanga: Namibian waters are one of the most productive areas in the world. Pre-mining studies: oceanographic measurements are good. At the end of the day when the moratorium is over, everything is in the hands of SINTEF to be analysed scientifically. There are a lot of investors: fine, but we should watch the fly-by-nights. We want clarity: after 50 years, what will be the situation? It is serious. For upcoming generations? We need to discuss wisely.	Noted
Mr. Musiko: We need clarification; we need to hear about phosphate. I know a diamond, and uranium. Please explain phosphate. What is the value of phosphate? We are expected to know.	*Committee:* Phosphate that is targeted for mining off Nambia is a mineral resource. It is found as tiny little grains in the surface sediment. It is mixed in with all the other parts of the sediment – mud, sand, shell. To mine the it the sediment must be collected: the plan is to lift up the surface sediment to varying depths (thickness); this bulk has to be transported to shore and onshore the small granules must be separated out from the rest and perhaps cleaned. It looks like little grains of sand. After refining on shore must be either sold as raw phosphate rock or its main use is to make fertilizer which is sold mainly to the big crop-producing countries in the world. To make fertilizer involves a lot processes, including acid-processes. The present value of phosphate is N$ US 108 per tonne; it is not a very high-value commodity, it can be processed into fertilizer which is higher-priced.
Mr. Samuehl: We want to understand about the feedback procedure: once affected communities/stakeholders have given input. Will affected parties have opportunity to interrogate the report, comment, add?	*Committee:* These meetings are right at the beginning of the planning process, so that planning does not go ahead without everyone knowing what is being planned. The SINTEF team will prepare a draft pilot report which will be put out for comment before the final report. Any input regarding the planning will be incorporated for consideration in the draft report. It will be a large so it will go onto a website for anyone who

	has registered. That will give you at least a month before the final These meetings are an effort to share as much as possible with the public.
Mr. Cecil Kamupingene LTC: During the process of research are you going to engage the (mining) companies involved? What technology is being used for mining, what innovations in terms of extracting ? And integration of mining and fishing. Will there be consultation with mining companies?	*SINTEF*: no mining company or fishing company will be a partner in the project. - SINTEF will not evaluate the technology used: industries are in the forefront for this. - SINTEF will only assess the environmental impact in state-of-the art evaluation of pre-mining (work package 1). Of course we need information. - Information from mining companies will not have priority over information from other industries. - Information from mining companies will go to the interministerial steering committee. - The object of the studies will be to assess the risk on the environment.
Mr. Thomas Shipepe (son of Lüderitz): The funding is not yet sorted out. If not yet sorted out, looking at the timeframe: - 2 years of research, then compile the main report - how long will the funding process take? And how will it impact the process of the studies? - the study to be done: will it include recommendations on whether phosphate mining is viable or not, whether it should go ahead or not?	*SINTEF:* Financing: SINTEF's mission is to try to get co-funding. The main funding is expected to come from the Government. There is a strong message that the funding must not come from either the mining or the fishing industry. SINTEF is working on the topic of funding and there is a lot of interest. *SINTEF*: The project will bring out the facts: if the Main Project is carried out with example the threshold values e.g. for survival of fish larvae, will be determined. The facts will be provided. The decision will be a Namibian decision.
Mr. Thomas Shipepe: Phosphate Mining companies that have done their own studies and research: will they come up with their own information to counter? Will the effects of diamond mining on the sea environment also be part of the studies?	*Chair:* This study is not for impacts of other mining (diamonds). It is not sure that they are looking at the same components: work done by mining companies is focused differently. Is this request for further peer-review? *SINTEF:* Some baseline contribution may come from companies.
Mr. Shoombe lobster industry: From the World Nuclear Association: Uranium from phosphate: "the hidden truth about commercial phosphate fertilizer". If the phosphate is being unloaded in Lüderitz, with the particles in our area, will mining companies take workers for medical checkups? If phosphate mining is to continue it will continue (list of many countries). The investors involved know of the dangers associated with phosphate mining. The results that will come will be detrimental.	*SINTEF*: This is the reason for the Seafood Safety Work Package. Land-phosphate results might be detrimental; from marine phosphate mines we shall have to investigate. Yes, there will be focus on this issue to investigate.
Mr. Simon: Need clarity on phosphates and uranium: this is confusing.	
Mr. Kapwanga: Basically there is no uranium in phosphates in our sea. Uranium is not a bad product. We know how to handle uranium. If there was uranium we would be richer or would be mining both uranium and phosphate. The statement is a lie: if you have the research give it to the committee.	
Mr. Mukapuli: A suggestion: it is not clear from the	*Chair:* A comment: From an objective point of view:

miners' point of view: there must be a (public) meeting with the mining industry: they must tell us (the public): they must tell us their scope of work, their methodology, their investments, their area, they must tell us how it will affect us / other industries involved. Maybe that will give us some clear indication, whether to support or not.	we are here to share information and get your input. What we don't want to see is fisheries-interest people against mining-interest people. We are here for constructive input. This is not to try to challenge one another. From the scientific study, Cabinet will make a decision. This is not a battleground. This is your chance to give input. Fisheries want to give the opportunity to everyone for their input. The decision will be based on the input of science.
Mr. Siloka: In a very positive light: looking at the deposits on the map: we need to find facts: there were confusing articles as to why to transport to Lüderitz. Somewhere a decision was already taken, to use Lüderitz to transport the phosphate to. Should the people of Lüderitz not have a concern on it if they can? Thank you. Maybe when we have the chance, and access to the experiments, and information on deposits, maybe there will then be opportunity for feedback?	*Chair*: That is unfortunately information we are not privy to; we do not have the knowledge so we cannot give you answers. This project is talking about the marine component. There is another mining project which falls under the Ministry of Environment. But what is of interest are the effluents going into the ocean
Mr. Valombola: Those who do not know what phosphate is, the phosphates are in Lüderitz at the pilot plant, behind the fish shop. As I said at the beginning, let us not have the influence of Swakopmund. Let us stand as Lüderitz community. Let us see if it will benefit Lüderitz or if not of benefit to Lüderitz. I have also to blame the Chairperson and team. They are supposed to approach the phosphate company so that when they come here they join the effort so that when there is any question they make things clear to the public. The phosphate company will also come to make awareness to the public.	*Chair*: this process is guided by regulations. We have already had 2 meetings. This is not just about phosphate – there are other users of the ocean. The regulations are standard: we are following regulations and processes
Phyllicia Hercules: I sense some confusion here, especially after Mr. Valombola's comment: the pilot project that the scientists are talking about is one that have undertaken, not the one the phosphate company is presently busy with. LLNP are busy sampling and are they processing at their processing plant. My concerns now are about those sediments that are being processed. What is being done about the tailings: monitoring of the tailings? Is there any group that is monitoring them or the impact that they are having right now - anyone monitoring them?	*Committee*: We have seen no results yet. *Speaking from MFMR*: MFMR has seen no results.
Cont: For years the fishing industry and with dredging for diamonds, the fishing industry maintains that diamond mining has had an impact on their fishing. Is dredging for phosphate not one and the same thing? My concern is that research is being biased to other industries because it is only looking at one mining	*Committee:* Diamond-mining we inherited, and dredging for diamonds began before the EMA and regulations. Phosphate mining is a new activity: if we were to lump everything together it would take too long to come to a decision. We acknowledge that diamond mining is similar but it is happening already

industry. If the study is to be done it will be expensive. Why cannot the study cover all industries e.g. what about oil exploration? And new diamond mining licences are being issued annually, so why not include these? *Mr. Thomas Shipepe*: This is biased, because one cannot only look at one type of mining, one industry, excluding the rest. A survey of the area should be included in the scoping report to look at everything. Diamond mining licences are also issued all the time.	and will be looked into in the baseline. Phosphate mining is a new activity; the activities are not the same. *Chair:* Bear in mind: the Moratorium was deliberated in Cabinet and these things were debated: this study for impacts from phosphate mining is a Cabinet directive that specifies what is expected. Yes, ideally one would like to look at every industry (and future activities). Studies are very, very expensive. Phosphate is a new industry. We must prioritize what must be addressed. Although some licences have been issued (for phosphate mining) no environmental clearances have been issued. *SINTEF*: The baseline study results will include the other ongoing mining activities and cater for new industries. The studies can also be used for upcoming activities.
(name not clear): There is always change, and issues. The issues always come when the information is not clear. The information is not clear: is a risk already picked up? Please keep to statement that other new commodities could come up, and information could be used for future mining. The study is being used for a specific product.	*SINTEF*: This is the reason that the Government has contracted SINTEF: the answers are not yet there or we would not be here. The effects are not yet known. *Chair*: we have had similar questions at other meetings. Bear in mind that Namibia is signatory to many conventions and especially fishery conventions. For situations where one does not know these include the "Precautionary approach". This states that in situations where we do not know the consequences, the activity is not allowed to go ahead. Not having the information does not give us the right to go ahead and make an uninformed decision.
Mr. Namukomba: Chairman Chamber of Commerce Lüderitz: Commended the team for creating the platform and thanked the community for the good turnout. We are normally scared about things we do not know about. Changes bring fears to people. It is time for as a community, society and country to be objective. Probably concerns tonight, not opposition; we must look to the positive. Last year we opposed a name change; we are in a similar situation. Be calm and apply our minds. As a fishing town we are faced with lots of challenges, with the high cost of business. We need to diversify the economy and not rely on the fishing industry with so many challenges. The NCC's mission is to promote business and economic development in Lderitz, and be aware of possible development to promote economic development. At a time that fishing Industry is struggling, and neither fishing nor diamond mining are doing well: 1. Objective of study should not be to stop or delay mining of marine phosphate or industries associated with it. 2. Main objective should be how to find ways how to mine it without negatively affecting the other existing industries –fishing, tourism, diamond mining etc. We need to find ways how to co-exist with other industries. 3. Look at socio-economic issues (to be taken note of, given to chairperson).	*Chair*: there is nothing fishy or suspicious about leaving out the economic aspects. Why are we not including the socio-economic study – do you want a very hasty one (study)? Remember MFMR is the proponent of the project. Apart from the fish, you need to know the value of the whole ecosystem. We can do that - but it is a long and very complicated study. There have been several attempts but it is an intricate process: it is not something to be tackled easily, lightly or quickly to integrate into this study. We have looked at evaluating the ecosystem and we realize it needs to be done but to do it now would postpone this study.

The NCC strongly objects to the omission of the socio-economic aspect – it is seen as a bias against the phosphate mining industry.	
Mr. Shipanga, lobster industry: I have taken note of the chairpersons' input from the Committee and Chamber of Commerce. This is not a place. There are 2 EPL holders; to take into consideration. Let us work together: some companies are prospecting: hand-in-hand. From our town we want to know what is happening. From the prospecting, safety and security are also a concern: what company, who are they? Take note of the people when Government takes decisions. We want jobs so we want to talk.	
Sindile Mwiya: Diamonds are not included in this study. But the SEA is on bulk seabed mining – from the Cabinet decision (waving a paper in the air). He maintains that from point no. 3 of the Cabinet Decision the SEA must be on bulk mining: quotes point no 3 as being a SEA on "bulk seabed mining": a specific Directive. Questions why is that not implemented so that other sectors can be looked at?	*Chair:* The SEA is specifically on phosphate mining, from the Cabinet Decision. It is clear it is on phosphates and not on impacts from diamonds. Can you read the whole document if that is the case?
Cecil Kamupingene LTC: I am more on economics. I have a question How do you do a study on the ecosystem then leave out the socio-economic aspects? Then there is subjectivity. Why do you mention benefits of fisheries? There is subjectivity.	*Chair:* Again you are reminded that the proponent of the project is the Ministry of Fisheries. The Ministry cannot operate outside its mandate.
Jeremy Midgley, environmental consultant for NMP: Queried the time allowance for comments that have not been given at the meeting: there is a problem wrt regulations: there must be a set period of time for written comments following the consultative meetings. There is confusion: this morning we were told one week. Referring to regulations in which this project registered. There is a major mess of the process. There is a lot of process controversy. You do not want the process to affect the quality and scientific integrity of the project.	*Committee*: For SEA there is not actually a required public consultation: we are giving one to inform people. We acknowledge fully that there is not specific legislation and it is also our problem that SEA is not accounted for the regulations. Committee informed that public consultation is not absolutely necessary at this stage. We told earlier meetings 1 week, but 2 weeks are fine for comments (to be submitted after the meetings).
(Name not clear): To suggest that before any conclusions that the people involved in this project come back to community and make presentation to the community, then answer any questions. Request that the results of the baseline study requested to be communicated back to community in the same way.	*Committee* after the draft report is out there will be time for comment. *SINTEF*: The project owner decides how matter will be distributed i.e. Cabinet or MFMR or committee will distribute; it is not for SINTEF to decide.
Sindile Mwiya : To give clarification: the SEA is provided for in the Law: sections 23 & 24 of the Environmental Management Act EMA. An environmental plan is done for Policy, planning and	

programmes. An SEA is not done on an activity. If it is for an activity you must do an EIA. So what we expect from your SEA is a plan for policy, planning and programmes. The deliverables must be on policy, planning and programmes. The EMA provides for regional projects. The consultative process is very clear in the EMA: to be for a minimum of 2 weeks (for comments) so it cannot be done in 1 week.	
Meeting adjourned.	

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

Consultative stakeholder meeting: Swakopmund, Industry

Minutes

Date of Meeting: 2014:06:05

Venue and time: MFMR (NatMIRC) Boardroom, 0900

Chair: Mr. Rudi Cloete

Present: see attendance register Appendix G

Proceedings:

The facilitator Mr. Philip Hooks welcomed all and outlined the meeting with the agenda.

Chairperson Mr. Rudi Cloete welcomed all present and introduced the project.

Presentations were made and the following comments were noted, and as relevant to the topic of discussion, were responded to by either SINTEF or Committee members.

Participant's Issue / Comment / Question	Response
Roar Solbakken SINTEF: At the start he made the announcement that 1. We are not here to prevent fishing, or destroy fishing, or prevent mining or destroy mining. We are here to present the components of the main project, for gaining information for the decision makers. The Main Project will gain data. 2. The content of the Main Project: for this the best researchers available from all over the world will be used to build up the project team.	
Mattheus Amadihla, Ark Fishing: Thank you for invitation. I am disappointed in representation by high-ranking officials in the Ministry and captains of industry, as this is their livelihood.	*Chris Bartholomae, MFMR Head of NatMIRC:* Deputy Directors from MFMR are present. This is one of many meetings in this week: this is specifically for the industry.
Cont: SINTEF in presentation did not mention pilot projects carried out in other countries – why not?	*Bjorn Serigstad SINTEF*: SINTEF used the Norwegian experience as an example. SINTEF has worked in 66 different countries. For this type of phosphate marine mining there is no experience to compare to, from around the world.
Elifas Hawala, MD of Epangelo Mining Company (state-owned): A valuable exercise. Wrt ToR for this study. I do not understand why phosphate mining (both mining/dredging from the sea and processing either at sea or on land) is differentiated from other marine mining - why differentiate from diamond, gold marine mining? Why are the investigations only on phosphate mining?	*Roar Solbakken SINTEF*: SINTEF are answerable in the research to the owner of the project *Chair*: the brief to the committee covers only phosphate mining *Committee:* Marine phosphate mining requires removal of the seabed. It is a new type of activity. We inherited the diamond mining. If we were to start on the diamond mining as well it would take longer. The mining methods are different and the processing on land is different. There is no experience anywhere else in the world of actual phosphate mining.
Cont. What is really the difference to diamond mining? What is the scientific integrity of excluding diamond mining: e.g. if you are going to kill monkfish by diamond mining or by phosphate mining? Are the effects not the same?	*Bjorn Serigstad SINTEF*: The baselines will cover all other impacts from mining that are presently going on in the sea. We have to start somewhere: the baselines will show the situation before any phosphate mining starts.
David Russell, Namibian Confederation of Fishing Associations: A comprehensive programme. Request for a Hazard Analysis Critical Control Point HACCP of impacts with regard to the ecosystem to	*Roar Solbakken SINTEF*: agreed. The critical levels will be described in detail. *Facilitator*: will focus be for any particular WPs? E.g.

include fatal flaws : can the studies be focused to determine absolutely critical levels of impact on the ecosystem that could stop phosphate mining going ahead? I would like to see a lot of work focused on the critical aspects, as a result of this study.	food safety?
Cont: Will the Work Package on food safety define a fatal flaw, if heavy metal concentrations entering the food chain resulted in making products unacceptable to markets? This is critical. Likewise critical levels with regard to breeding of fish? as sensitive areas.	*Roar Solbakken SINTEF*: Of course these will be included to determine critical levels. Toxicological studies will be included: concentration levels may not be exceeded in top predator (e.g. human)
Mr. Veston Malango, Chamber of Mines Thanks to organizers. It is not clear on the Pilot Project: 1. Timelines: when are you delivering? 2. Financing: negotiations: I thought that is more a responsibility of the government 3. Stakeholders: Mining companies have submitted comments to the steering committee: if need should be taken one to one.	*Roar Solbakken SINTEF*: re (1): referring to the contract: this was signd 5th March 2014. After 6 months (extra is the Norwegian holiday period) the draft report will be available many weeks before the final report so that (input from stakeholders) can be processed. Input must address the scientific approach. Re (2): SINTEF regards funding as the main responsibility of Cabinet; however SINTEF are attempting to assist with co-funding. *SINTEF Bjorn Serigstad*: comment through the FAO and the Nansen Programme this may be possible: to sponsor some of the research projects. *Roar Solbakken SINTEF*: Following the stakeholder meeting in December last year, it was agreed to add to the planning for the main study (the Pilot Project), to look into possibilities for co-funding. In other SINTEF projects this is also done as SINTEF has experience, and sees it as a service to the client.
Etuna Josua, Epangelo Mining: Can the presentations be shared? Will they be on the website?	*SINTEF*: Once a web -link is established the presentations will be uploaded.
Mike Woodborne, NMP: 5 questions on the Work Packages: 1. For a strategic assessment the socio-economic aspects should be included. If strategic decisions are to be taken then the socio-economic aspect is needed in another module Work Package 11 2. The Benguela is a transboundary system: this should be considered when assessing the baseline. Where are the boundaries? 3. Comments about doing an impact assessment: to do impact assessment a module is left out that looks at techniques to be used: extraction and refinement. Is there not a module missing? It is necessary to look at the type of techniques to be used. Or in which module is the extraction process (methods), and land-processing? 4. Will the methods to be used be related to grades and areas to be mined? Is there scope for the scientific team to look at grades - stepping into an activity-based assessment. There is need to have clear understanding, and compare diamond and phosphate mining net effects: fill the knowledge gaps. A module is needed that allows you to fill the knowledge gaps. SINTEF should collect information on how mining is to be done. 5. Toxicity and release of substances (Work Packages 4 & 8): Plumes: thresholds: there is opportunity to do detailed studies on fishing trawling currently, as a point of reference on what the system currently is tolerating. He recommends detailed studies on trawl plumes as point of reference. He suggests some measurements and models on trawls to give contextual baselines. Whatever approach is	*Committee:* This study was requested by the Ministry to purely focus on the ecosystem effects. An SEA study can be focused on any aspect that you like. It does expressly not address socio-economics (in BID). The socio-economic aspect has been identified as important and probably will be done in time, but not in this study; it is not included in the contract. *SINTEF*: 1. *Bjorn Serigstad*: the socio-economic aspect is expressly omitted from this science-based study, although these are looked at indirectly in the baselines 2. *Bjorn Serigstad*: Yes, this study includes transboundary fish stocks, but this study cannot do everything and must start in the area (of the Benguela) where mining is proposed to take place in Namibia. *Chairperson* : the boundaries of the study are set for Namibia's EEZ. 3. *Johanne Arff:* will include the mining activities in the modeling: the model will take into consideration the methods to be used. 4. Methods will relate to the resource. *Bjorn Serigstad:* it will also be important to do lab studies for processing aspect, to carry out exposure/response tests on effluent on the marine species concerned (Work Packages 5 & 6). 5. *Roar Solbakken:* This is also relevant to food safety: Mining on that scale will not start first and then look: the risks must be known beforehand. *Bjorn Serigstad:* It is very important to have

being proposed for mining be done for fishing trawling.	information on trawling and frequency (for example there are trawl-free zones in Norway; areas where the eggs are on the bottom, so this is important)
Usko Shivute, Seafood Processors: He thanked the team. He is not a scientist. He is concerned about phosphate mining and its impact on the fishing industry: of the balance between the two, and the sustainability of the marine life. *Mr. Malango Chamber of Mines:* When MME grants an EPL in a sensitive area then more stringent conditions are attached to mitigate the adverse environmental effects e.g. for uranium mining. *Elifas Hawala, Epangelo (EPL holder)*: There is a limit set on the marine environment: to stay away from certain depths and areas, and certain methods not allowed. So there are regulations. There is a mechanism to allow the mining to stop. *Cont:* There is only one company Debmarine that monitors and reports. There is also the Inspectorate of Mines; there is lack of capacity. That is also why we are asking the question about the difference for phosphate. And for that there is no effluent at sea because they are taking it back to land.	*Roar Solbakken SINTEF:* He takes note. Referring to previous speaker about trawling and diamonds: we cannot turn back time: the baseline cannot be pre-diamond mining, and the baseline cannot be pre-fishing. Of course both these activities are important to the environment. The questions will be if they are exceeding the limit for food safety according to international agreements that allow for harmonized food safety levels. From baseline we have already the impact from the diamond mining industry and the fishing industry – these will be included in the values, as the present environmental state at the moment. To calculate backwards before diamond mining and before fishing industry there need to be a lot of studies. *Bjorn Serigstad SINTEF:* One concern is that if the mining industry gets their licence and starts and there is an impact on certain fish stocks or species: is it possible to stop their activity? In Norway for example there is inspection of reporting to verify monitoring results. Are there inspectors to check and verify? It is necessary to have regulation. Regulation is the basis for co-existence: there must be rules and regulation. I have seen in most African countries that there is a licence and there are conditions but it is not possible to stop the activity. It is important to regulate. *Committee:* So the leading question is, to someone from (Ministry of) Mines and Energy: are there conditions on the marine mining licences that allow for stoppage if regulatory levels are exceeded and are these levels spelled out? Do we have anybody from the Ministry of Mines and Energy? Or from a regulatory authority? *SINTEF:* Is there quality control of the monitoring measurements that are being taken to assess the activity? *Committee:* In this instance where fears are being voiced about how to regulate and how to control overstepping levels: this is one of the reasons we are taking the Precautionary approach in trying to understand what the effects would be before they happen. We are going into an unknown activity: we do not know what the effluents or the pollution might be.
Chris Bartholomae MFMR: Will the outputs, especially model outputs, be generally available for other uses?	*Johanne Arff SINTEF*: Yes
Mike Woodborne NMP: Re the Lack of knowledge on the existing operational and permitting and compliance requirements in the mining industry as well as in the diamond industry. There is already industry operating, and a dredging industry operating for Namport: none of	*Facilitator:* You would like to see an analysis of the current means or methods that are used for monitoring

these industries happen without an impact assessment and an environmental management plan is needed. The documents stipulate the conditions. So he suggests that if there is a gap in knowledge that it should be covered by what is happening there. The capabilities of the existing government and regulators are mandated and have acted in the past. This seems to lead specifically to the question of current methods used for monitoring and regulating (based on current lack of capacity) into a Work Package.	and regulation? *Facilitator*: How realistic will it be for regulatory control to actually take place? Is there request to be included in the work package, how regulation would ensue based on the present infrastructure and capacity? In a new or existing Work Package? *Bjorn Serigstad SINTEF:* It is important that a company has a system for monitoring and reporting. The authority has to trust the company and there must be expert check that monitoring is being done properly. That is the only way to do the monitoring because the Government cannot officially do all the monitoring.
Matti Amukwe, Chairperson, Confederation of Fishing Industries: Thanked the committee. We need understanding to find out what will the impacts be from mining phosphate. We all know this has never been done anywhere in the world. That should be the focus of this study. The problems with trawling the diamond mining should be in another study. The focus of this study should be on phosphate mining impacts.	
Grant Rau LLNP: In the agenda: what is to be covered the pilot project? If the Government doesn't come up with the funding then the Main Project might never happen. Is it possible to get, from the team in front, a list of work packages for the Pilot Study? for these meetings' agenda? We don't know what will come out of this Pilot Study document. *Cont:* The Working Packages are for the Main Study. What is going to be in the Pilot Study? The scoping report will outline the ToR for the Work Packages. What is the scope of the meetings?	*Roar Solbakken SINTEF*: The intention of the meetings is to have input and suggestions for the Main Project.
Jeremy Midgley, environmental consultant representing NMP: The Work Packages: the first work package: let's assume that one of the tasks of this component in terms of the budget: there may be no work already done in Namibia so it might be very expensive so you don't know until you start the work package, or there might be extensive work done, so less. The problem is to know how much it will cost in the beginning but you are only doing that assessment on the Main Project: a chicken-and-egg situation. So for the client you will only find out cost in the Main Project: a problem. Requested response from Mr. Solbakken. *Anja Kreiner MFMR:* He has a point: you don't know the outcome of Work Package 1, so you don't know what the other work packages entail. But although not mentioned: they are busy with sourcing of meta-data already in the scoping phase.	*Roar Solbakken SINTEF:* You are completely correct and agreed. Work Package 1 is very much basic to the rest. We regard this as a bit difficult but the idea is to tell the proponent, the project owner, what does this mean in money, for the study to be conducted. I know this is not easy but we are coming out with not a thumb-suck figure, but there are going to be some background calculations and calculations for telling not exactly the price, but the level – talking about altogether ten million euros, or 20, 30 or 5 and so-on, and we shall give that level. But there are uncertainties so this is challenging: I agree, but we shall come up with something that the project owner has to face. It is much more than a guess. We have to know what we are speaking about. We have a lot of experience in SINTEF. When we do research for different clients we are very well trained to calculate the costs but it is challenging. We are going to manage our goal of providing a good budget: giving the study and the budget and hopefully a budget for each Work Package.
Matthew Hambuda, *Large Pelagic Association:* One question: What is the current status of Australia on phosphate mining? I think there was a time they were engaging in phosphate mining. *Mike Woodborne NMP*: As just said they (in New Zealand) have their mining permit and are waiting. There are other areas around the world that are considering phosphate mining: South Africa, Mexico, a few others. In Australia there are no phosphate mining licences issued; there are no potential commercially viable marine deposits off Australia.	*SINTEF:* The mining companies are the best to give you information *Committee*: I don't know about Australia but in New Zealand they have a mining licence, but they still have to get approval for environmental clearance from their Environmental Protection Agency. Their application was accepted by the EPA very recently in the last few days, but now they still have to get their environmental clearance. They are not mining yet.

Dave Russell, Confederation of Fishing Associations: Concern is about the food safety aspect, about the effluents.	*SINTEF:* This is an important aspect and will be covered in the Work Package.
Bronwen Currie MFMR: In capacity of MFMR official request to SINTEF regarding an industry that is not known in Namibia. We know that the effluent permits are controlled by the Department of Water Affairs, and the permits are not very comprehensive and do not address effluents specific to this industry. Asked SINTEF in one of their Work Packages to make available the pollution risks from processing of phosphate.	*SINTEF:* It will be included in the work package on modeling.
Martha Uumati, personal capacity, BCC : Listening, but the part missing is to hear from the phosphate people at least a presentation because there is lack of information so we are not able to give input. It is hard to give input to the work packages if we are not informed. There is not even a presentation from the phosphate side. So it would be appreciated because I have no idea of what they are doing, and it will be the same for the public. *Cont.* That is something that should be taking place right now. We have heard from the fishing industry but not input from the phosphate industry. *Cont:* What we would like to hear is about the processing, what happens with the waste products. *Cont.* We are talking about phosphate mining related to the marine ecosystem. So for the public and all stakeholders to understand, we need to have information to be well informed and saying that it is our responsibility to get the information- it is very hard. *Cont:* That is all we are asking for.	*Committee:* This is an SEA, not an EIA. As such we are presenting the marine ecosystem. Do we need a whole presentation on the marine ecosystem and all the services it delivers as well as a whole presentation on phosphate mining? For these meetings at the time people were invited as interested and affected parties I&AP we expect them to have informed themselves otherwise the meetings would take all day. *Facilitator*: In Lüderitz not everyone knew or understood but there was a request that the way mining would be done would be provided to the scientists with the link between the mining houses and the steering committee to provide the scientists with the necessary information. *Committee:* There was very little from the fishing industry that you received now (at this meeting). *Committee*: It would be extremely difficult to tackle all the different areas that we are talking about: to show demersal trawling, demersal processing, pelagic trawling, pelagic processing, mining activity, mining processing. That is not for this morning's meeting. *SINTEF:* She has a good point in what she is proposing because there is not known what this phosphate mining represents so to have some guidance would help. There is a lot known about fishing but for the processing of phosphate so I would appreciate a brief presentation: 15 minutes presentation: this would be very helpful.
Jeremy Midgley, environmental consultant representing NMP: A 15 minute presentation is a good idea but obviously there are a lot of other marine stakeholders that actually haven't had the opportunity to look at that material and be informed so I think we are looking liking at a retro-thing of the steering committee.	
Dave Russell Confederation of Fishing Associations: On that effluent issue: I am assuming that there is a difference in LLNP possible effluent and NMP effluents, and I think they are at different stages with LLNP now at a pilot plant stage; and whether the results from that could now be worked into the Main Project to involve	*SINTEF*: We can used different processes to get results; different processes will not give the same results if the different mines do not take the same approach.

the scientists directly with LLNP. My concern is that there will be an extrapolation of the results: there is a pilot project which is small and then you will take those small numbers to make big numbers. Will the experiment go on long enough to link into the Main Project and with NMP are the implications likely to be different?	
Elifas Hawala, Epangelo Mining: Confused because at the beginning I thought we talked of an SEA which is much broader actually than an environmental impact assessment. But then you are talking about effluent from processing. Before you talk about processing you must have assumptions and we need to know those assumptions on effluent at sea or from land. So that is where confusing: you are jumping from an SEA to an EIA: I am one of the companies with a licence : we have 5 and do not know what assumptions will be made. *Cont*: That is what I am saying: we do not all want fertilizers. To develop assumptions you need a lot of information from us. It is better to be scientific and not make assumptions. *Cont*: Re the SEA: the part about the effluents: do you do that in the SEA stage? Form land or from sea? I think it is beyond an SEA.	*SINTEF*: It is important to have the correct input for the model otherwise we will not get the correct results. It is very important to have correct input on the processes. *Committee*: in a general sense we are mining for phosphates: basic steps of collecting bulk material, separating and refining, and perhaps processing into a final product: not specific companies, just the processes *SINTEF:* Of course the background information from mining companies is important. These documents (*referring to NMP EIA BID)* are public: the information is there and that is good politics for industrial development But we need to know much more, if new principles haven't come up in recent years. We want the background information. But all the figures of measurement carried out, which we discussed in Lüderitz also, from measurements carried out in a good way by the industry – fishing or mining: they are interesting, but we won't use them uncritically without quality assurance. We don't want only assumptions, but we have to do some assumptions and use background information. Then we have to do measurements and experiments; also modeling to get out information and not assumptions. *SINTEF:* There are so many comments on SEA, EIA, and I don't think many people understand what is inside these different studies although I have been working with them. Why nice names with nothing of important information inside them? Often it is just a desktop study inside an EIA – something from here and there to get a nice report and actually no real information inside.
Grant Rau LLNP: To come back to effluents: the effluents from the beneficiation plant, looking at it as a general process instead of a specific process. There are different ways of processing to get phosphoric acid from phosphorite. The different ways have different effluents. If you look at the general way of phosphoric acid production you get radioactive phosphogypsum which is very detrimental to the environment and certainly if they look at that effluent no project will go ahead for beneficiation in Namibia. But that is a generalization. But companies such as ourselves are not using that general beneficiation method we are using a different beneficiation method, which is why we spent 20 million dollars to bring up a very small pilot plant in Lüderitz – busy with that now. From that we will get actual effluent that will be recorded and we will go through the environmental process which can then be used to feed into a model. You must look at that effluent. If you went to Morocco or Florida and looked at that effluent this project could possibly never go ahead. You cannot generalize; you have to look at individual effluent.	
Jeremy Midgley, environmental consultant representing NMP: The question about an EIA/SEA: although not regulations specific in the Environmental Act they talk about an environmental plan which is akin	*Committee:* The steps are actually in the BID. The timeframe is not written in but we will stick to the EIA regulations for timeframes.

to an SEA. You can do various EAs. We are not really informed from the BID document or this process here what level or what component of an EIA is going to be done. What SEA exactly are you doing? You have mentioned cumulative impacts and inherent in cumulative impacts of a strategic nature is a socio-economic assessment. Also yesterday we heard that public scoping is not necessarily part of this strategic assessment: this was rather a shock because when you read the literature it inherently says public scoping. So this is about process re EIA. What are those process steps that this process is actually engaging in. It would be valuable for the steering committee to put those process steps together to take us through from the Pilot Study to the SEA. From a process point of view how long will we have to submit comments to the steering committee for the pilot study; how long will we have for comments to the draft document that is going to be produced by SINTEF. We don't know if the EIA processes are simply being taken over into the SEA process.	
Mike Woodborne NMP: To come back to the final question on the work package side relating to work package 8 re the scope of some of the recommendations put forward: recommendations on levels and thresholds etc. in terms of toxicology and suspended sediment etc.: will these recommendations apply only to phosphate mining or are these recommendations going to apply to all operators in the marine space? *Cont:* To clarify my earlier point about making measurements of tolerances and thresholds of current activities underway: I appreciate it is impossible to establish baseline for activities already underway and we have to accept that a large part of the ocean bed is already disturbed environment. Suggestion: to measure and establish exactly now, the parameters inside a plume on the seabed: to have a measure of the turbidity, suspended solids, chemistry etc. inside a plume to gauge at a later stage on a contextual basis, any impact new activities that are going to come in. Regarding process: would appreciate timelines attached. Secondly is the process being followed under the guidance and advice of the MET? There is not a set of meetings in Windhoek which is the seat of Government: the reason for this? In closing when will we see the breakdown of the work packages? Without seeing this we cannot give specific comments.	*SINTEF:* Thresholds limits are valid to any activities – this is how it usually works: to example fish or mussels or oysters. *SINTEF*: According to internationally acceptable levels. *Committee:* This was a committee decision because main stakeholders are represented at the coast *SINTEF*: will discuss with steering committee to come up with a date. *Committee*: Of course then there will be time to comment on the draft report.
Jeremy Midgley, environmental consultant representing NMP: Some more process-related stuff: the Cabinet made a declaration some time ago on the moratorium: the terms of the Directive have not yet been cleared yet on the Directive. Can those terms be posted on the website for transparency? *Cont:* The appointment of the steering committee: the ToR of the steering committee: can that be posted on the website? SINTEF as well – their terms of work scope as well to be posted on the website. If Administrator could advise when. And the appointment of the Environmental Practitioner on there as well; and SINTEF scope of work as well, as well as the application document for the environmental clearance	*Committee:* Nobody has access to the actual Cabinet Decision or a copy, but anyone can go to the Ministries and read it - to the Permanent Secretary of the line Ministries. We do not have copies.

certificate that was submitted if you could post that on the website as well. *Cont*. As soon as possible. These will provide clarity for some of the questions and perhaps we will be able to fine-tune comments. I believe if they are provided up front it provides clarity and transparency. If it comes later it is just going to thwart the process later	*Committee:* All these usually come in the scoping report as attachments. Present meetings go on for 2 weeks. Let us know exactly what you want as soon as possible.
Etuna Josua, Epangelo Mining: I just want to make a suggestion: the Moratorium: we can request it individually from the Ministries. I think it will be easier if the committee will just get a copy and put it on the website rather than 50 companies requesting the same document, or is it meant to be a secret? C*ont:* Just making the request will suffice, for feedback.	*Committee*: It is not secret: it is just not available in a "copy" form. *Committee*: We can make a request from the committee to the Permanent Secretary that the request came up but we cannot give an answer on that. Up to present we can go to the PS' office to see it, but not to get copies *Committee:* I think that goes for any Cabinet Decisions, not this one specifically.
*Jeremy Midgley, environmental consultant representing NM*P: From the steering committee will you confirm that the Ministry of Works Transport and Communication is actually a formal party in the steering committee?	*Committee*: Yes that Ministry received their invitations at the same time as other Ministries and we followed up with the Director and we have the nominations. They have not attended to date in the meetings but we have their nominations so we hope they will attend the committee meetings. They were invited right from the beginning.
Grant Rau LLNP: All my questions relate to the presentations. The way I see it the scoping study is going to take a while, the funding will take a while, the actual studies will take a longer while. It relates to use of existing data. Dr. Arff referred to existing transects on the shelf. I am not sure how long the monitoring has been ongoing but maybe the panel could answer. What depth do they currently go to? Also mentioned that they might need to extend them. Question is as to whether the existing data from these transects can be used to feed into the mathematical models immediately. The fishing industry is very anxious to know whether there will be an impact from phosphate mining, and on the ecosystem and on the industry. This study will go on for 3 or 4 years. Is there no way that existing data that can be fed into these models now to give an interim result or is it assumed that because the information is coming from fishing industry that it is incorrect? Second question refers to the diagram: the red block: I see it looks as if it extends to mid-Atlantic Ridge but he phosphate deposits only extend to about 80km offshore. Understand currents are mainly N and S in the Benguela ecosystem, and where mining would take place. I don't see how the plumes could possibly ever reach that far. In the phosphate industry most of the mined material will actually stay on board the vessel as compared to the diamond industry. I can tell you the plumes will not reach out to the rim of that red block: there is no possible way. Last question on toxicology re fishing industry concern. With this study potentially taking several years why is it not possible to take up to 100 tonnes of phosphate material immediately and test its toxicology and with preliminary results alleviate the fears of the fishing industry	*Committee*: (Data not from the fishing industry).Those MFMR data of course will be fed into the models. But not sure if the data are adequate. We have no data on currents and that is very important for the models so it is difficult now to say if there can be interim results because the modelers have to see if the data are sufficient and also if in the correct area. The monitoring is going on for physical-chemical since 1995 with biological starting 2000 but it is not the same for all transect lines, and not in the same temporal resolution. Of course all data will be made available for the modelers. *SINTEF:* For resolution for the model: we have to have some area for this model. You don't actually know how far these plumes are extending. In order to know that we actually have enough data for the modeling you need to model such an area, and include small scale processes. *SINTEF:* We have to have the data because what you saw was the large oceanographic model which will serve a smaller model *SINTEF*: it is possible to do what you are proposing but it takes money and a contract with an accredited laboratory. With the pilot plant in Lüderitz there is possibility to study the process and to test toxicity of the effluent if there is an effluent. *SINTEF:* A comment: on principle: we also have to see this commercially in the Main Project. If tests funded by the fisheries industry or mining industry within in the main project then we end up with the Main Project funded in part by different industries. I am not saying we are not going to do it, just a comment.
Meeting adjourned	

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining Interministerial Technical Steering Committee

Consultative stakeholder meeting: Swakopmund: Public

Minutes

Date of Meeting: 2014:06:05
Venue and time: Swakopmund Hotel, 1730
Chair: Mr. Rudi Cloete

Present: see attendance register (Appendix G)
Proceedings:
The facilitator Mr. Philip Hooks outlined the purpose of the meeting and presented the agenda.
Chairperson Mr.Rudi Cloete welcomed all present and introduced the topic.

Following the presentations the following comments were received, noted, and if relevant to the topic of discussion, responded to by either SINTEF or Committee members.

Participant's Issue / Comment / Question	Response
Siggi Herholdt (public): PC Will the final report be available for comments?	*SINTEF:* This will be for the project owner. *COMMITTEE:* Draft report will be available on SINTEF website and available for comment before final version
Anton von Wietersheim, National Assembly: Very impressed and thanks, especially for the Norwegian example. Question touches on remark made about not giving out licences before research is done: we have just received public reports that the company LLNP announces they will continue their mining anyway, despite the moratorium. This raises the question of what is the worth of the research if the mining is going on anyway? More particularly they have been active – "sample mining" – they touch on Work Package 2 - do you have any contact with that existing operation for info from the operation? 2) Work Package 5: they LLNP are already moving material from sea onto land and storing residues in some storage facilities. Queried about safety? What is being done about the residue? Do you have access to doing toxic studies on that specific operation? 3) How will the suggestions for monitoring and management eventually influence operations already ongoing – how will that be co-ordinated?	*SINTEF:* Regarding Work Package 5: We cannot do an EIA for any single mining company: not given that job by MFMR and not our intention. *Chair:* That plant is to see if they can actually get phosphate from the plant. I visited it personally: it will run for about 10 days. It is not a mining operation. They want to know f they can get the phosphate from the samples. *Committee*: The company has no go-ahead to mine. The actual mining activity has not started yet: there is absolutely no environmental clearance for mining to go ahead. The moratorium stands as is. The experimental plant is about to run for about 10 days. We, the Ministry of Fisheries have not received any environmental reports: we await those. A lot of people are confused.
Frank Löhnert independent public: To Bjorn Serigstad: with regard to biodiversity, fishery stocks research etc. which was done in Norway and will presumably be done here: in which work package does this description fit into for here? - It seems to be missing. Why the pre-environmental studies?	*SINTEF:* WP 3: programme of surveillance and control of food safety; and WP 5 experimental studies: similar to experiments in Norway and in ocean modeling. All tasks in WP 3 will address these issues. *Committee* WP 3 baseline studies *SINTEF:* WP 1 is also important in describing the baseline situation: there is a lot of data available already existing: we saw in Lüderitz that scientists have very useful data about hake along the coast. There is a lot of information.
Christo Retief, *Republikein newspaper:* Queried the timeframe of the process. You said SINTEF was contacted in 2012. We are now talking another 2 years. This is not grandstand journalism. Secondly we have heard samples from the seabed have been seen in Lüderitz – is that not mining? – removal of stuff, storage of that stuff in Lüderitz for the purposes of determining the viability of phosphate mining: is that regarded as mining or regarded as not mining? – removing stuff from	*Committee*: The contract with SINTEF was signed in March 2014: that is when the project started. The sampling of sediment is part of the prospecting: it does not qualify as full-scale mining. Sampling does not qualify as full-scale mining.

the seabed?	
Erwin Leuschner, Journalist for Allgemeine Zeitung : The moratorium was put in place last year for 18 months. You stay that the study will run for 2 years, so the moratorium will come to end before the study is done. Please give an indication of what will be done after the study, and what does a study like this cost, actually?	*Committee*: the moratorium was set for 18 months with an addendum for a longer period pending the scoping/Pilot Study. The Pilot study report will presumably be taken to Cabinet and a decision will be made whether or not to go ahead with the main study, which will take a further 2 to 3 years.
H. Hoffmann, environmentalist in Swakopmund : Oceanographic parameters are to be measured, but how is the actual mining process going to be assessed. Because mining has not started yet how do we know what is going to come out of the sea? Be it in terms of pollution etc.	*SINTEF*: We need to do sampling: sediment sampling to know about contaminants, grain size. Information will feed into the model and we shall use the model to get an idea of the changes. It is a mathematical model, not actual mining. *SINTEF*: It is necessary to know from the mining company what volumes will be extracted, what volumes will be discharged and also the operational development at sea and on land. The industry will have to come up with volumes.
Siggi Herholdt, private: One of the expected outcomes of this study will be to suggest to Namibia how to manage co-existence and you mentioned you might need information from the mining companies on extraction. There are quite a lot of prospecting licences already along the whole Namibian coast for phosphate mining and a large portion along the Namibian coast contains phosphate deposit so in the end there will be interest to mine the whole Namibian coast. What I was missing in the Work Packages was where would such a limit lie? Because (in Norway) you have put aside areas that should not be mined but we have a more complex situation because of effects of effects, so to me that aspect was missing in the Work Packages. We are not looking at one mining operation that will happen: we are looking at many potential mining activities because there are already many prospecting licences existing owned by companies so where do you draw the line? about the whole coast wanting to be mined? On the modeling side you would have to model the potential impact of many mines: where would you put the limit and put aside areas? You did it in Norway but I do not see it in the work packages. No that is not what I asked. SINTEF said you need an indication from the mining companies of how much (volume). But you have different scenarios: maybe just a few mines along the coast or if it is so viable that there will be such pressure to mine the deposit. So we have different scenarios. I want to bring forward this point.	*SINTEF*: It is possible to do some toxicological studies and it is possible to do the modeling to indicate critical stress situations. From these indications it might be possible to start at a few sites along the coast and those sites should be chosen where the modeling and toxicology tests have provided information about the sensitivity and where the conflict will be as small as possible. Once the extraction has started we will learn whether there is an effect or not and it may be possible to go into a more difficult area if it is proved that it does not have an effect on the fishery. It is an approach. *Committee:* To interrogate: are you asking if there is an option of a no-go option? *Committee:* A very valid question and it is to be addressed but the final decision will lie with the politicians. This study can only give recommendation of the sensitive areas, but the decision is with the politicians to take this into consideration. *SINTEF:* We have not presented the full Work Packages because they are in development. What we have shown is the backbone. To go through every task would take 2-3 hours. This is an impact study on the environment not for only one spot but we are covering the whole coast.
Christo Retief, Republikein newspaper: So I would like to come back and add to what Mr. Solbakken just said: wouldn't it be wise or this team to also include in a Work Package, to go down to Lüderitz and include in a Work Package what they are doing at the moment, because it is a prospecting process: to look at their results, to look at their processes, and to include that as a Work Package for this study?	*SINTEF:* It is always of importance to know what is happening there, but earlier today we had with the industry: that if we are going to take special cases with the mining industry long before it is decided about the Main Study: that is not our mission here. But to know what is happening there is important. But we are not able to go in there and do analyses. That will be included in the Main Project funded by the Government and co-funded by others. Otherwise it will be questionable if some partners are involved in this before the Main Study has started.
Anton von Wietersheim, National Assembly: It was clearly stated that it is a sample-mining operation. Are there strict criteria on what a sample-mining operation is? And that it is not just a loophole for a bulk mining operation. Are these criteria laid down and what are	*Committee:* To my knowledge there is no specification as to what is exploration and what is mining but I know from the LLNP plant that they are using a grab sampler which has limited capacity and they do inform us every time they go

they? You will give peace of mind to the residents of Lüderitz because that is where most of my information comes from. If that is clearly stated because it reminds me of the situation with the whales: where for 10 to 20 years now whales are caught for research - which is just a loophole for certain nations to keep on whaling. That is why this question is important for us.	out to sample. The method is limited. *Environmental commissioner:* There are conditions when it comes to exploration: first it is short-term; you cannot do it beyond 2 years otherwise it will be considered mining. In this particular example the quantity of the sample is limited. I was there. Also the conditions attached that there should be officials from the Ministry of Fisheries to do inspections in terms of the quantity. Also the specific samples taken go into storage for the laboratory, not to be stored for fertilizer. There is not any possibility of mining: that I can assure you. The clearance they have obtained is clearly stated for experimentation and sampling, nothing more.
K. Remus: 2 Questions: I come from the industry and how come there are no restrictions on how to take samples? If you give a goal to somebody to take samples for research etc. how come there are no stipulations, otherwise they will just do what they want? This is what I learned because I came from the industry. This is what concerns me here in Namibia. Second regarding speakers 2 & 3 regarding the modeling. You said you want to model the whole thing: have you considered modeling the fish farms and the pollution of the fish farms into your model because you speak of a lot of potential of the sea and money talks of course. If you build monocultures into the sea then there is also pollution. Have you considered this in your model: the fish farms? – Question refers to Norway. My question refers to using the sea to harvest and increase the harvest capacity, then more pollution. In Norway is there a model the monoculture. *Cont* As a researcher you would consider a lot of factors.	*SINTEF:* Regarding modeling: we have a lot of fish farms in Norway with models of the pollution and strict regulations so they have to follow the regulations. This is something that can be done. *SINTEF:* There are permits to regulate discharge and monitor effluents: can be found on the internet. One aspect is not to have a farm on one site for a long time: you must circulate sites and we are looking at the sediments of the fish farms so if conditions are not as they should be you have to move to another location: to not spread disease there are strict distances between farms and monitoring and very strict regulation of pollution. To comment on this Pilot Project: for any industry the same regulations apply to production and to monitoring. So there must be a full set of monitoring also for the exploratory operations. *Environmental Commissioner*: There is limited area: their sampling is not spread all over. There is a specific site where they are doing their collection and this is very limited I think it is a few square km.
Heidi Potgieter: A question more for the Commissioner: Does the public have access to the environmental clearance conditions because I think that would help in a lot of situations to clarify these questions?	*Environmental Commissioner:* Yes as provided for in the law, if you give us a formal request we can look into it.
Sam Mafwila: It looks to me a very good initiative. In our ocean where we have multiple users: I see this study focusing only on phosphate mining but as far as I am concerned we have many existing, and we need to know where we are coming from. My questions is: are you under strict instructions to focus only on the phosphate; if not how are you going to incorporate the existing activities that take place? And also one kind of mining is going on. *Cont*: The models being proposed: as far as I am concerned all models are wrong; that is why they are called models – anyone may challenge me on that. But how do we get reality out of the models? - the actual emissions. But how do we get reality out of this one? Actual field conditions?	*SINTEF*: I don't know how long the diamond mining has existed: it is very hard to go back in time to before the diamond industry started, so today we are looking at baseline studies of the baseline of now of diamond mining and fishing as well. We cannot go back in time. We cannot go back before diamond mining started or pre-fishing and we must be realistic. We know it is a baseline study of the state now. *Committee*: We will take all the other users into consideration before phosphate mining starts. *SINTEF*: That is why we need a monitoring programme, to achieve real data from what is happening in the ocean. We need these to tune the models. The best of course would have been to cover the whole Namibian shelf with monitoring programmes but that would be time-consuming and very expensive. So that is why we need models to get an idea of the processes. And of course we need to validate the models, not just

	tune them. For that purpose we might use satellite images to just get an idea of the surface scales over even small areas. We need to validate and need to tune the model otherwise we cannot trust it.
(Name not clear)*Member of civil service:* My question, or suggestion: I understand why you have all sorts of and organisms but why have you left out the macroalgae which can also be used? You have mentioned all others. *Cont.* Another small thing: I heard from the presenter how aquaculture is accounting for most of the fisheries in Norway. Interesting but in Namibia it can't happen. So we have the fishing and mining. In Norway they rely more on the fjords. That aquaculture will take over: that we should not wait for. Lastly to get the cost for the project: it has already been asked for. The cost of the SEA.	*SINTEF: I* am sorry it was not in the presentation but it will be taken care of. We will have surveys of the benthos of various sorts but even if not mentioned here it will be presented in the work packages as separate tasks. I am sorry for that confusion. *SINTEF:* When I presented what the Pilot Project is really about, one of the tasks is to calculate the costs of the separate work packages. But first we must have concretely all the Work Packages with all the analyses. So it is not possible to say now: I will not give a thumb-suck amount because this has to be calculated based on real substance in the Work Packages so I cannot give you a figure.
H. Hoffmann: One more question: about the fishing industry and the harvesting of fishes etc. probably based on what the factories take out and the ships and so on: what about other things that consume the fish: penguins, seals, seabirds: are they being taken into account?	*SINTEF:* We will talk of seabirds and sea mammals; but regarding regulations in Namibia we are not going into those. Of course seabirds and sea mammals are also good indicator species.
Sam Mafwila: For the studies what kinds of experiments are you going to propose? And what depths? *Cont.*: We have a really successful fishing industry so we should test some of these species of the fishing industry.	*SINTEF:* It is important to test the sediments that are extracted to make suspensions of what they are taking up and what they are releasing in the sea. So maybe we need to do some tests on specific elements but the most important is to set up a test facility where we can mix in the sediments or the effluent water in the same way as the industry as discharging. One concern is also consumption of oxygen from the discharge because there are a lot of nutrients in the sediments and when dispersed in the water column may consume oxygen: interesting to look at. These sorts of studies can help to give advice to release the leftover discharge at the surface or deposit it at the bottom, or going through the whole water column: this is to be considered. *SINTEF*: When we test the water with suspended material we need to use the organisms that are living at the site where the phosphate is extracted and that may include fish eggs, fish larvae, zooplankton and the organisms of concern in the area to be affected. This is very important. If you just go to the literature to find out, as is used in almost all environmental assessments, you have about 50 pages with a very nice cover and glossy figures, and maybe only 2 or 3 pages with facts. The rest is copied from around the world.
Horst Graef, citizen: Not a scientist or biologist. We clearly have 2 different Ministries here with different interests. If we don't get them to gel, and sit together around the table, one is going to work against the other one. So if you want to have a long-term success I think it is very important that these 2 Ministries get together. Furthermore I am a bit worried about the situation now because we had the crash in 2008, where the banks got rescued, with the argument used "too big to fail". Now these people have invested quite a lot of capital already heavily in the mining industry and I am pretty sure that sooner or later someone will say we must rescue them because they have invested so much capital plus the fact that others say we have also got licences so we want to go ahead. Coupled to this is the fact that you have	*Committee:* On the technical steering committee we have 3 MME members, and Ministry of Transport members. They are not here tonight but we have a meeting next week. We are talking to them. *Committee*: If we are talking about big investments then you should look at the fishing industry.

pointed out by 2050 there is going to be a huge pressure on production. What are we looking for – for phosphates. So there is an incentive to mine phosphates because there are a lot of profits to be gained from mining phosphates. And this in the end, will drive it – believe me.	
David Russell Confederation of Fishing Associations: In terms of the risk assessment: through these Work Packages will a picture be painted to give direction: for example if a company has quite a large acquisition area but there may be areas within that it is discovered that there is a very good stock breeding area. To allow that if there is to be development to be allowed in the most low-risk areas so damage will be limited. Will the research capture that? So that if you start out and mistakes are found that the damage will be limited.	*SINTEF:* After the Main Study it will be possible to give out recommendation on what would be the best place to start phosphate mining for minor impact on other resources but at the moment it is very difficult to decide what is the best site to start.
Horst Graef: Are there any plans on the planet where they have started mining phosphate in the sea yet? So there is no experience so we are doing the first experiment?	
Martha Uumati: I was wondering about the shareholders in this phosphate mining business. You are saying it has not been done anywhere else in the world. But who are the shareholders in this phosphate mining? We want to know. We know for sure it is not 100% Namibians. If they are from wherever they come from, do they not have phosphate where they come from, and why are come to Namibia and test everything in Namibia and leave the phosphate there? I think that is one of the questions we should address: who are the shareholders? Because they can ask who are the shareholders in the fishing industry and we can answer.	*SINTEF:* The mining industries are represented in Norway, so it should be possible to include them. *Committee*: This is socio-economics *Facilitator* : We are getting off the point; we are dealing with scientific Work packages not socio-economics and shareholding.
Erwin Leuschner, Allgemeine Zeitung: What is the time-frame of the Pilot Study and the Main Project after all the WPs have been concluded? *Cont:* And the main study?	*SINTEF:* The pilot Study was contracted in March this year: the time was 6-months and it does not include the coming Norwegian summer holiday so we hope to finish the Pilot Study before 7 months has passed. That is the timeframe. That will depend on when the Main Study will start. That the Cabinet will decide.
Mike Woodborne NMP: Do we have an indication of the cost of the Main Study and what is the cost of the Pilot Study and will there be a decision from the Pilot Study to spend the money on the upcoming Main Study?	*Facilitator:* The cost: of what the scientists were contracted: Is it possible to answer the question? *SINTEF:* Yes of course it is possible. The Namibian Government through by the Ministry of Fisheries and Marine Resources brought up approximately 170000 Euros. And there are other internal costs that the Namibian interministerial steering committee has, for meetings, organizing meetings, advising; so there is no fixed figure on the cost of this project.
Rod Braby in private capacity: As far as I understand there have been other studies done e.g. New Zealand. I am not sure how advanced they are. I would like to ask whether what you are packaging compares to what they might have been doing?	*Committee:* yes the study that is being done, the Chatham Rise study, has been handed in to the Environmental Authorities in New Zealand. It is on their website. The studies are pretty similar. This has been 4 years of intensive research just for one single activity. And I believe that study will be open for everybody on the web. It was handed in about 2 weeks ago and is under scrutiny at the moment. It is a huge amount of benthic, oceanographic studies. I am not sure on the toxicology: their mining method is different they are mining nodules not granules in the mud so I am not sure on those sort of studies but I know the oceanography and benthic studies are very intensive for that single EIA. That is the most advanced study as far as phosphate mining goes. I can get that site onto the Namibian project website if people are interested. Similar sorts of studies.

Heidi Potgieter: In a similar way can the environmental clearance conditions for other sampling sites be made available seeing as the public can have access to them? Via this project? *K. Remus*: But participating here at this meeting, is it not already reason enough to ask to try to get access to this document? – because of interest to know what is going on, what is regulated, what conditions? *Martha Uumati:* What would be a valid interest request then? Give us an example	*Committee:* Earlier the Environmental Commissioner indicated that you can request if you motivate the reasons you want it; then it can be made available to you. So therefore if you are interested in this do as the Commissioner said. The environmental clearances are with the Ministry of Environment and Tourism not with the committee therefore you can go directly straight to the Commissioner's office. I am talking about the clearance. For the licence and conditions of the licence and for sampling you go to the Ministry of Mines and Energy because they have that mandate. *Committee*: I guess the question is can all these be available through this project? *Environmental Commissioner*: Just to clarify: the reports or the studies: they are available to public. Correspondence like environmental clearance certificate is issued to an individual, it is not public. This is true of any sort of individual letter addressed to you or to me. I cannot for some reason just make it available. But there is provision in the Act: if you provide a valid reason why you would like that information, it can be made available to you. If you provide a valid reason, and if the Commissioner is convinced that you need access to such a clearance certificate, it can be issued. *Environmental Commissioner*: It is true, the interest. And me too I am here driving 3 hours from Windhoek to be here this evening. Also it does not mean that we should not follow the procedures that are there, unfortunately. If we receive a request, we will obviously have to look into the request to make the information available to the person. When you write a corresponding letter to make justification why you are requesting For certain X information, I would not know what is valid to you. But if your correspondence contains information that you need to get access to such information then we shall see to it: It is not so difficult: just make a request, one page, to ask. It is not the first time we are receiving this sort of letter. As a citizen of Namibia we are entitled to information, if you launch your letter as per the Act. If you are not satisfied with the response from our office then the Law makes provisions to take it further to the Minister, and if you are not satisfied with the Minister's response you can go to the court. So it is not true that you cannot get access to the information.
SINTEF: I would like to add to my opening comment and make one more comment before we leave, to what you have said and why. We know that a lot of these mined minerals in the sediment have components - industrial components in a sense that are destroying the fatty acids, destroying the membranes and can change the gene expression, and the gene expression has been tested in rats: they suddenly stop to burn fatty acids and the rats get obese within a few weeks – that is an example. I am not saying this is going to happen but this is the reason for this (study) because this is very serious and all this can lead to cardiovascular diseases, to metabolic disturbances, to cancer of course, and so on. There are many reasons to be a bit afraid of what toxins and substances are accumulating in the food web, accumulating finally in the fish which is going for human	*Committee:* In connection with this, in connection with the modeling studies, in connection with all the studies that are being made: how are you going to present?- the suggestion of tolerance levels that will be unacceptable? In other words it cannot happen if too high? You will actually define a threshold level that would prevent the activity from happening? *SINTEF:* Guidelines, international guidelines, references that will show if unacceptable, above thresholds. Also if there is effluent from a processing plant, and the process effluent at sea: the discharge permit of the different contaminants should be monitored daily and reported by the company itself on a daily basis and it should be

consumption. This is the reason why this is very important: there is no reason to take chances and risk health. To do this will be determinate and will end speculation: we might find there are no dangerous impacts, and that's nice if that is so, so this is the reason for this.	possible to self-control and if the self-control is functioning, it should be possible to stop the activity if you are exceeding what is acceptable. But we see many places there are licences but there is no way to stop it if things are operating very differently to what is expected. So it is needed to have this kind of discharge permit and to have some kind of reaction if levels are exceeded. You have 2 possibilities: to stop or to have purification of the effluents.
Selma from UNAM: I have not had a chance to read properly how oil is mined but from your understanding of how it is done, how does it compare with phosphate mining, is it more dangerous? Is the one better than the other, one compared to the other? So we know that with good regulation of oil, equipment, noise, it can work.	*SINTEF*: If we go some years back, it was foreign companies that came to Norway starting the oil exploration in the sea, mostly American companies, and they did not care much about the environment but they cared about production volume: that was what they were focusing on. And we were very stubborn, we were coming up with request that they must do some monitoring and look what they were doing. And they thought we were stupid because this was not important, but if you look at the monitoring when it started it was significantly polluted around the oil installation, and not much money was spent on environmental care. But we developed a body called the SFD – something like an EPA – which had the authority to go in and audit and regulate the industry: coming up with standards and doing the monitoring. We did the screening of the chemicals used in oil production and developed standards for operations. When we excluded some chemicals and used more user-friendly chemicals the environment improved and it is much better today than 40 years ago. So it is important to be able to use stricter regulations. If we see there is an effect, we go back and narrow what you are allowed to discharge and have monitoring. It has to be knowledge-based: the more knowledge you have the better you can regulate the industry. With transparency and good communication between the different users of the sea: that is the most important. And communication and good transparency; when the different bodies want to hide things and don't tell about licences, areas, on both sides government and company, there is little chance to succeed if there is no openness. If people request information, withholding information is very bad starting point and from industry if they do not want to stand up and tell about themselves that is a bad starting point. Both sides have to improve considerably if you should succeed in a co-existence.
Meeting adjourned	

Scoping Pilot Study for the environmental assessment of impacts on the marine ecosystem from marine phosphate mining

Consultative stakeholder meeting: Swakopmund, Institutions

Minutes

Date of Meeting: 2014:06:06

Venue and time: MFMR (NatMIRC) Boardroom, 0900

Chair: Mr. Rudi Cloete

Present: see attendance register (Appendix G)

Proceedings:

The facilitator Mr. Philip Hooks outlined the meeting with the agenda.

Chairperson Mr. Rudi Cloete welcomed all present.

Presentations were made and the following comments were received, noted, and as relevant to the topic of discussion, were responded to by either SINTEF or Committee members.

Participant Issue / Comment / Question	**Response**
Chris Bartholomae MFMR: I would like to know: work packages that are busy setting up now for the main study to be done. Some of them might be complicated and costly. If the money sourced is not enough is there a plan B to be flexible to be able to do less but enough to have a result that might fit in the time frame or will it be very difficult to make it flexible in that sense? I was not thinking of only Work Package 1, rather the levels in each package.	*SINTEF:* The work packages are built up in a logical way. So if limited we will not get enough information. Packages can be made smaller and flexible, but should not to be limited e.g. to only 1 because we already have Work Package 1. If you as project holder want the package smaller it can be done but must be discussed.
Bronwen Currie MFMR: As an example could the multibeam scanner be fitted onto the RV Mirabilis? Is it on the Nansen?	*SINTEF:* That would be too costly because it is fitted to the hull of the ship Yes.
Rudi Cloete MFMR: Regarding the work packages: A caution to bear in mind when designing the Work Packages that we are a 3rd world country: so we cannot go for the most high-tech technologies, regarding the the practicalities for equipment, getting equipment here; we also have very rough seas. Keep in mind when designing the Work Packages. So we have to be very robust.	Noted
Beau Tjizoo MFMR: I am not sure I understand SINTEF's mandate: the scope of this project. When we say it will take 3 years? So the main study will take 3 years? SINTEF's role is basically the planning programme?	*SINTEF:* The work packages are for the Main Study. It depends on the decisions from the Cabinet. SINTEF's role is presently the planning for the main project. If there is going to be a monitoring programme it will be 3 years.
Bronwen Currie MFMR: Informed the NatMIRC scientists that in Lüderitz there was a request from the scientists to include another work package on the Marine Protected Area because they do have a lot of good data and this will go forward as a suggestion.	*SINTEF*: We think that this is a good suggestion. *SINTEF:* We did not present or include everything in the presentation. In the pre-environmental study there are many tasks that will be in the report e.g. seabirds

	and mammals, the littoral zone, are also important.
Anja van der Plas MFMR: With regard to modelling: in the SINMOD model: a water column model: did not see output e.g. for oxygen, nutrients. Oxygen is usually modelled as a tracer rather than an active property. In the DREAM model is this a sediment model? with water column/sediment interaction and fluxes? I am not sure whether you have the fluxes in What is the temporal resolution of the current measurements? - From one of their studies as part of BENEFIT roject: springtides are important, tidal bores, especially at the shelf break currents. Only with a lowered ADCP were these picked up.	*SINTEF:* will look into these. I am not sure I can answer this because I am not working with these models. *SINTEF:* Yes the buoy will be at a point source; the temporal resolution can be decided. *SINTEF*: It would be ADCP. I am very glad of this input and would like more input on the topic
Richard Goraeb MFMR: Are there any plans to study the large sulphur bacteria?	*SINTEF:* That is very important. Bacteria and microorganisms are some of the most important organisms in the sea and should be included.
Chris Bartholomae MFMR: From the circular requesting data Information on transects, you will see what we have. Will this be done in Work Package 1?	*SINTEF:* We need some information in order to decide the transects so it is very nice to have some information.You can just respond on email.
David Uushona, Walvis Bay Municipality: From a layman's perspective: I understand this study is looking at the cost-benefit of living resources and non-living mineral resources, looking at both. The team seem to be mainly on living resources. Would it not be good to also have more on the non-living phosphate resources? Otherwise it would be seen as concentrating on the living resources? There is a cost-benefit from exploiting the living resources and non-living mineral commodity. Yes it answers. After the study the phosphate people might want this. It is to lessen the argument between the two. How can we somehow answer to this?	*SINTEF:* We shall also have oceanographers working on the non-living, and chemists and people who will be working on the physical conditions – it will be taken care of. But we not go into the more technical processes of the mining and the processing of the phosphate. *SINTEF*: We are tasked to look at the marine ecosystem we are not doing in-depth studies on the technologies of mining . That must be done by the mineral people themselves. We are going to focus on the marine ecosystem. *Committee:* the socio-economic analysis is specifically left out of this; this is a study on the impacts on the living ecosystem. We have been asked a lot on this already and acknowledged that the socio-economics are desirable. But not to be done in this study that is only to look impacts on the living ecosystem. It is very difficult to make predictions before something is happening, that things will go along as before, socio-economically. This study is being proposed and financed by the Ministry of Fisheries; it is acknowledged that a socio-economic study would be valuable. *Chris Bartholomae MFMR:* The ecosystem is the one that can be harmed; a non-living resource lie minerals in the ocean – not much can harm or happen to them. So the thing is to see basically whether this mining would have an influence on the environment, how big etc. and then afterwards to advise – be careful of this/that, or never do it there, or whatever. But not to prevent it – that is not the idea. Not to be for or against, but to see what would be the most sensible to do when we have the results.
Oliver Numwa, MFMR: The oceanographic monitoring platforms: are those only in planned mining areas?	*SINTEF*: Platforms are very expensive so we could not have many. We suggest just one for a start, and move to another place for the second year. They are also expensive to run: transfer of data, maintenance: costly. *Facilitator*: there are many areas: a company will not be picked.

Oliver Numwa, MFMR: From the Norwegian experience: referring to the Norwegian studies and maps; and using Namibian maps: we see the resources overlap. Realizing this, do you think this sort of thing will be possible?	*SINTEF*: From the Norwegian perspective, some areas could be used for both activities, some not, even though fishing carries on along the whole coast. One should look into sensitive areas before deciding. It would have been better in Namibia to have had data and information before licences were given out. Licences were given out before the sensitive areas were identified.
Rudi Cloete MFMR: A suggestion: Mining and processing will have totally different impacts and therefore need totally different Work Packages. Should there be a specific work package for the land processing?	*SINTEF*: In Work Packages there are a lot of different tasks. SINTEF has plans to investigate impacts from land-processing onto shore environment, e.g. impacts to oyster production. It might not be the phosphate itself that has an impact, it is the effluents produced from processing. The influences might also be very close to shore, near to land. *SINTEF*: Effluent impacts are included in all the Work Packages.
Anja van der Plas MFMR: Clarity requested on the Dream model: is it to be used on the seabottom dredging is that on seabottom, or for pumping inot hopper, and discharge, or both? It is important to include the impacts at the bottom and at the surface of the water column. Regarding the hopper: the pumping and the effluents must include overflow from the hopper, not just over the bottom. Fluids from sediments need to be looked at.	*SINTEF*: We will look at the methods to be used. *SINTEF*: the models will show surface and bottom discharges, but we need information on discharges. *SINTEF:* Drill cuttings from deep-sea drilling are a similar problem. There are different ways to deal with them. Sometimes all to land, sometimes to the seabottom. There are different ways to deal with methods: improvements which cost money, however such improvements required from the mining companies cost the mining company more. We need to know the discharge. The model can include these mitigation measures to show that they are effective. *SINTEF*: The model will clearly show how mitigation can help.
Chris Bartholomae MFMR: Work Package 8: Is this if mining activity takes place? And Work Package 10: Monitoring: is this if activity takes place? *Cont*. This intention of the work packages should be made clear.	*SINTEF*: It is very important to have a discharge permit which has threshold values. To set threshold values is difficult but it will be necessary, to set critical levels with monitoring and independent auditing by another company, with control in place. If the limits are exceeded over the threshold values then the activity must stop or pay daily fines. Therefore these issues need to be addressed in the licence before any activity. The company itself should set up control.
Beau Tjizoo MFMR: SINTEF will you carry out the monitoring programme? Who is going to do the monitoring to collect data over the next 2 years?	*SINTEF*: We SINTEF would like to collaborate with Namibians and use students. *SINTEF*: We do not know yet; cautioned we are not there yet, so we cannot say yet. The work packages are set up in a logical way. We also do not know who will be contracted to do the work.
Bronwen Currie MFMR: Are you asking who will do the work – will NatMIRC do the work? *Anja Kreiner MFMR:* Someone needs to be appointed first. *Beau Tjizoo MFMR*: The moratorium of one and a half years: in that time we should have some idea of whether or not phosphate mining should go ahead.	*SINTEF*: That is not up to us.
Chris Bartholomae MFMR: The ToR for the main project will be advertised and consultants appointed.	*Committee*: The Pilot Project is what SINTEF are contracted for.
Simon Elwen Namibia Nature Foundation NNF: The	*SINTEF*: This is serious and need to be done. Food

relationship between radioactive materials and phosphate: in connection with food safety: it is very difficult to measure but serious in human food. There is a serious need for this to be done.	safety and toxicological studies. When these are measured in the sediments it will not be the same in edible parts (food). We are looking at the food chain. *SINTEF*: Food safety and toxicological studies: this is difficult to determine. When something is measured in sediments it is not the same. We shall focus on the edible parts of food – the movement through the food chain.
Anja van der Plas MFMR referred to colleague Deon's collections: In the last oceanographic survey Deon Louw a colleague collected sediments and water and fish for radionuclides and trace elements. But it will take 2 years to analyse.	
Simon Elwen NNF: We have just had back some analyses of heavy metals in dolphins: they are not exceptionally high though in cadmium which I believe is pretty natural. From what I am seeing there has been a strong focus on the offshore environment and as recently raised it is in the coastal environment where these top predators, including birds etc., are going to be affected by what is produced from inshore processing. Yes the results are from other projects. The data are out there.	*SINTEF*: Can you regard your data (on dolphins) as kind of baseline baseline data?
Cont : What we have picked up over the past 5 years is a rapid and fairly large increase in large whales feeding in Namibian waters. Fisheries studies have been lacking on whales (ex-whaling) but S.A. west coast is important: appears related to *Calanus* abundance e.g. in St. Helena Bay and recently e.g. 6 fin whales sighted off Lüderitz – they eat a lot of copepods. So whales are becoming increasingly more important in the ecosystem; also eating at the same level as anchovies and sardines. This needs to be highlighted. A baseline on cetaceans is needed. Heaviside dolphins feed on mullet: this provides a notable example for food chain (bioaccumulation) inshore.	
Oliver Numwa MFMR: Asked about the duration for planning, and end phase – 3 years?	*SINTEF*: The Pilot Study will create the Main Study. The Pilot study will be completed 6 months after contract signing, so the report from the pilot study will be finished in September. The proposal for the Main Study is to include data collection over all seasons: we suggest for 2 years, plus one year to process all data (the timelines will depend on the project owner).
Chris Bartholomae MFMR: Is there any positive feedback re funding? *Cont:* When the pilot project is finished, funding processes take time. Is it realistic to wait for funding?	*SINTEF*: Not yet any confirmed funding but SINTEF is in dialogue for funding from various sources and other parties are interested. The project owner must do the main funding, SINTEF are trying to help to get co-funding; we cannot be responsible for total funding. *Committee:* Questions from all meetings are for timelines, and funding will affect these.
Chris Bartholomae MFMR: To the committee: were there any discussions about the availability of money for this project? It will be several millions.	*Committee:* No but everyone is aware of this: it is not as though we have forgotten about it and SINTEF are meeting with the Minister on Monday and the Chairperson Graca has said this must be high on the agenda.
Oliver Numwa MFMR: Seeing that this project is very important, with the direct interest given by the Namibian community at large, I want to know whether SINTEF have been given the mandate by the	*SINTEF*: No, we are not interfering with the local decision. This is for Namibia. We decided we will not go into Namibian politics or development.

Government to also give recommendation by saying that even though there are licences issued for mining, they should hold on because it will take time for us to come up with a scientific conclusion, to say whether this mining should go ahead or not. So I just want to know if this planning phase will also allow also recommendations? I think you have partially answered my question. But looking at the pressure also from the mining people: they are pressurizing the Government and that is why the Minister came up with the Moratorium, so within this background SINTEF was consulted. And now I can understand because you are explaining to us that you were just consulted to give a project proposal that could be done since there will be funding attached.	*Committee*: But in your scoping Pilot Project you will surely give reasons as to why you have designed the packages: the need? Will it be clear to the owner of the project why you are proposing this type of work? You cannot make a decision for them but will you say why it is desirable to carry on with the Main Project? *SINTEF:* For the work we are proposing in the Main Project of course we will try to define why this should be done, because we are not doing this for fun. This will provide information about the Main Project to have value for making decisions.
Beau Tjizoo MFMR: Now at the end of SINTEF there will be a plan, of what can be done. What will be the position of Government: what are we going to tell them? What we are told is what can be done to understand the environment, but I do not see an answer to the question of whether phosphate should be allowed or should not be allowed. I do not see that in whatever is here. *Cont*. But that won't be soon. It won't be in the next 2 years. And in the next 2 years the industry will want to know if they can use their licences or not. They do not want to wait until that project is finished. *Cont.* But they have their licence(s). *Cont*. But was there not the understanding that with the moratorium there will be time to do the investigations? or do we not understand? that after this moratorium there should be some more known about whether they should allow or not allow it?	*Committee*: It's shown the way it should be done: what the Main Project should give will say these are the potential impacts, these are the sensitive areas for no-go areas. So from the outcome of the Main Project the politicians should be able to make a decision. *Committee:* But it is not up to what the industry wants, it is up to what the Government decides. *Committee:* They have no environmental clearance so if no environmental clearance is given until the Main Project is finished, their licence does not help them. They need an environmental clearance. *Committee:* It will be impossible to get an answer by the end of the 18 months. I don't think anyone expected that. The mining companies were planning to start in 2012 when they got their licences but they did not get environmental clearances. *Committee*: There is apparently an addendum to the moratorium for another 3 years.
Chris Bartholomae MFMR: As I understand it, I would make a recommendation for Monday with the Minister: to make it very clear that there should be some kind of a timeline even if it is a rough timeline to say when this will be done, that this is in the proposal. If the Ministry cannot fund it from its pocket immediately – because I see funding e.g. from the World Bank takes something like 2 years to get the funding - that sort of timeline of 2 or so years to have the study must be clear. If you don't do that it will be very difficult to explain to him in 2 months time or when he asks you about this study. So I think those things should be clear, at that meeting, otherwise it will be difficult to explain that there will be no answers after 18 months.	
Meeting adjourned	

Appendix I

Written Comments and Concerns from the Meetings

Summary of Comments and Concerns Received in Writing During/After the Consultative Meetings in Swakopmund and Lüderitz in June 2014.

Jessica Kemper (Registered I&AP)
Biologist specializing in the conservation biology of African Penguin and other seabirds breeding along Namibia's coast.
When evaluating the baseline data and making recommendations in terms of phosphate (a) seabed mining and (b) effluent discharge, I would like to urge you to consider the following bird-related aspects: (See full submissions below)

1. The Namibian Islands' Marine Protected Area
2. Wetlands, IBAs, Ramsar sites
3. Birds associated with the Namibian coast and marine environment

David Russell (Registered I&AP)
On behalf of the Confederation of Namibian Fishing Associations
As part of the main study: (See full submissions below)

1. Studies should be undertaken to ensure that process effluent discharge, dredged silt drift and mining sound impacts etc. do not negatively impact on critical ecosystem areas such as fish breeding grounds or juvenile development.
2. An analysis of current means of monitoring and regulation based on current infrastructure and capacity in Namibia would be needed, as well as recommendations on what is required, so that any weak links can be rectified.
3. Internationally accepted threshold tolerance limits need to be clearly defined, and linked to mining license requirements, to ensure effective management.
4. The mining companies responsible for the proposed marine phosphate mining projects, should be required to supply all the information they currently have on potential impacts, so that data gathering for the main study is made easier.
5. Request the environmental monitoring equipment moored at sea, include sound recording equipment.

Jeremy Midgley (Registered I&AP)
Appointed environmental consultant to Namibian Marine Phosphate
20 points have been submitted: (See full submissions below)

1. Designation of the Environmental Assessment Practitioner (EAP) not clearly determined.
2. Knowledge and experience of the designated EAP is questionable.
3. The failure to provide requested documentation raises questions about the transparency of the process and the integrity of the parties involved in managing the SEA process.
4. The appointment and role of the SEA Administrator is called into question with regards to the appropriateness of participation, transparency of participation and optimization of functional roles that can be attended to, so as to ensure for a balanced assessment.
5. The role of public consultation in the SEA process is not clearly understood by members of the Technical Steering Committee and the SEA Administrator. Designation of a knowledgeable EAP would have been more favourable for the proponent.
6. Lack of representation from the mining and fishing industries on the Technical Steering Committee negates the transparency and partnership principles that are inherent and integral in the undertaking of an SEA.
7. Extent of viable mining operations is limited to a small area and could not be sustained over an area equivalent to current fishing operations as feared by that sector of industry.
8. It would be important for the scoping report to contain information regarding the mining rates and methods as these are among the key factors in determining the nature, duration and extent of the potential and actual impacts associated with respective mining methods.
9. Failure to include a work package on the socio economic aspects undermines the value of the final strategic assessment.
10. Comparison of proposed with existing bulk mining shows that phosphate mining will be less extensive.
11. By definition in order to conduct an SEA with focus on the cumulative effects of phosphate dredging, the scope of the study must also include all other marine activities.
12. Since this main project will have a direct effect on present and future generations as well as implications for the ecosystem it is an essential requirement that the draft scoping (pilot) report is workshopped sectorially with the mining companies. This workshop should be attended by by SINTEF / IMR, with representatives from all sectors represented by the Steering Committee. Similar workshops should be conducted with all other marine industry sectors.
13. A six month period has been lost from the declaration of the moratorium to the appointment of the EAP for the environmental assessment.
14. The stated gaps in knowledge regarding the ecosystem in reference to fisheries means that the impact of fisheries should be investigated too.
15. The request to have SINTEF undertake the pilot study in relation to the correct tender process of government initiatives being employed is questioned. It is suggested that opportunities be given to other scientific institutions for work package tasks.

16. A concern is raised that not all the positions on the Technical Steering Committee have been filled. Consequently, could the terms of reference for the scoping (pilot) phase, the appointment of the EAP and the SEA process and planned outcomes be signed off without the presence of the missing representatives?
17. It hoped that a balanced scoping assessment is undertaken through the interaction of the industry scientists and not just those associated with NatMIRC. Additionally, the Chamber of Mines is suggested as the liaison body between the industry and SINTEF.
18. It is standard environmental assessment practice to respond individually to ALL issues raised and a Comments and Response Report be produced. The responses need to be integrated by the EAP with inputs from members of the Steering Committee, SINTEF/IMR and proponent.
19. There was a Bias in the content of the BID and presentations by SINTEF/ IMR/ Proponent.
20. With reference to the presentations given at the public and industrial consultation meetings, nine of the work packages were represented by their titles only, which did not allow the I&APs to make any meaningful contribution or comment.

V. Malango (Registered I&AP)
Chief Executive Officer – Chamber of Mines

Six points were raised: (See full submissions below)

1. Query regarding the appointment of the EAP
2. The pilot study will not provide the applicable authorities with a risk assessment of the potential impacts of phosphate mining.
3. A work package on the socio economic aspects must be included as it an integral part of an SEA.
4. The BID and presentations at the meetings were biased.
5. Mining and fishing industry should be represented on the Technical Steering Committee
6. Due to envisaged high costs of the main project and potential far reaching effects of the outcomes it would be wise to hold workshops to discuss the scoping report with all affected stakeholders.

Crispin Clay (Registered I&AP)
Chairman Lüderitzbucht Foundation

The points raised by the chairman of the Lüderitzbucht revealed a confusion between the pilot project of one of the phosphate mining companies as opposed to the SEA pilot study or SEA scoping report to be undertaken by SINTEF. See the full account below. However, the points raised by the Foundation are relevant in that they raise questions which the main SEA hopes to answer at least in part. Some of the points relevant to the scoping report focus are:

1. Will the mining of phosphates in Namibian waters violate the principles and regulations of recognised Acts and Conventions currently upheld by the Namibian Government?
2. Will the impacts of past, current and proposed activities be included in the main study?
3. Can the credentials of the SINTEF team be provided in the Draft Scoping Report?
4. The responses to the chairman are included below immediately after the Foundation's comments and concerns.

K. Kapwanga (Registered I&AP) & H. Hückstedt (Registered I&AP)
Director and Project Manager of LL Namibia Phosphates

LL Namibia Phosphates provided an official list of comments and queries to Sintef on the background information document. These points were read out at the first industry meeting in Lüderitz. The main issue or question isprovided as follows: (See full submissions below)

1. An SEA should include a socio economic study component.
2. It is believed that all activities within the marine ecosystem need to be assessed and not just phosphate mining impacts in order for it to be a cumulative assessment.
3. There is no way of accurately determining cumulative impact without having an estimate of the potential area to be mined.
4. How is SINTEF planning to investigate the impact of marine phosphate mining on the Benguela ecosystem when no mining will have taken place and no mining will occur in the near future due to the Moratorium in place against this activity?
5. References in the BID are inaccurate with regard to the current status of phosphate mining worldwide. Relevant information collected by the vessel Dr Fridtjof Nansen regarding bottom trawling over the years will be important to include. Will SINTEF evaluate the extent of existing disruption to the seabed by trawling which will then form the baseline for any further disruption by the phosphate mining industry within concession holder's specific licences?
6. Will SINTEF be looking at defining the relative position of sediments containing potentially high gas, nutrient and heavy metals, relative to existing phosphate licence areas, based on the numerous studies that have already been conducted?
7. Will SINTEF in their study take into account the carbon footprint and excessive import costs of importing fertilisers and also the loss of foreign exchange, tax revenue, Lüderitz service industries and other related environmental, social and economic impacts should Namibian phosphate mining not proceed?
8. Will the role of these MPA's and their intended purpose be taken into account when Sintef examine the utilization of Namibia's marine resources by all stakeholders and industries?
9. The average size of the phosphate pellets is 0.1 to 1mm not "less than 0.3mm" as stated in the BID.

10. LLNP trust that SINTEF's work in this upcoming study will be of a standard that is in line with their reputable, international standing.

Grant Rau(Registered I&AP)
Chief Geologist forLL Namibia Phosphates
The following points were extracted from the full account provided: (See full submissions below)

1. SINTEF should not be allowed to write their own scope to extract maximum work at the cost of the Namibian Government.
2. How will SINTEF determine what the most significant impacts of phosphate mining will be on the environment without having tested the phosphate sediments to ascertain what they contain? What if the phosphate sediments are tested and are completely inert, then what do Sintef intend to examine? Surely the material that is at the crux of the Moratorium should be tested up front as at least the very starting point and basis for where most time and effort should be concentrated during any follow-up studies?
3. To run swath bathymetry over the flat, featureless continental shelf area is not productive.
4. Without having an indication of the "scale of impact" how can SINTEF even determine the Terms of Reference (Work Package Content)?
5. How can environmental thresholds and monitoring obligations be set for the phosphate industry alone? SINTEF study should be aimed at protecting the ecosystem and thus all users exceeding set international environmental thresholds should be subject to the same standards and monitoring requirements or else legal action will be impossible to implement.
6. How are the industries or stakeholders or IAP's meant to give feedback when the detail of the work packages were so vague?
7. Does SINTEF believe that their 2 years of "new" data will outweigh decades of existing information or that the ecosystem would have changed dramatically over the last 10 – 20 years?
8. Does it make sense to spend 100's of millions of dollars on collecting data over a 2 year period to feed a model which gives a result that is far less scientifically constrained and significant than "real-time" information that is free and currently available?
9. A statement made by a member of the SINTEF team regarding the transparency of the whole process from both sides was taken as an offence by the phosphate mining representatives present. The full description of this offence should be taken from the source document below

Swakopmund Matters (Registered I&AP)
In reference to the SEA for assessing the cumulative impacts of phosphate mining on the Namibian marine ecosystem and in particularly the document sent regarding the crucial decision by New Zealand's Environmental Protection Agency regarding marine mining the following statement is provided by the I&AP:
'The significance of this decision and the reasoning behind it should not escape the minds of those in Namibia who have an equally important task in protecting and preserving Namibia's marine environment and its resources.'

Heidi Potgieter (Registered I&AP)
Feike Resource Management Advisors
It is time our government took their international and national legal obligations, to conserve and protect the environment, seriously. Constitutional, environmental democracy requires that the mining companies and other domineering, financial interests take account of the real well being of the majority of Namibian citizens. More and meaningful transparency is crucial.

Cdr T.J. Van Niekerk(Registered I&AP)
Superintendent Maritime Safety Information -SA Navy Hydrographic Office
This office must be informed of all survey operations in order for us to send the relevant navigational warnings to warn other mariners of potential dangers.

Paolo Esposito (Registered I&AP)
Special Counsel to International Mining & Dredging Operations
We kindly request you to keep us informed as to the development of the EAP. Our operations manager Mr Lappas already requested registration as IAP for the Pilot Study, having our Namibian subsidiaries interests in EPLs for heavy minerals (including phosphates).
We are unable to submit any comment at present (being our survey data being still under evaluation and the feasibility of the mining operations therefore not been fully assessed). We request to inform us of any development in the aforementioned matter, which will directly affect our phosphate operations and forthcoming business strategy.

Mr Woodbourne (Registered I&AP)
Chief Operations Officer – Namibian Marine Phoshates
Points raised summarised as follows: (See full submissions below)

1. A socio economic work package should be included.
2. Timeline for EIA process requested
3. Boundaries of study requested and why
4. Sea bottom impacts due to trawling by fishing industry in the vicinity of proposed phosphate mining should also be considered.
5. Will the toxicity thresholds that are envisaged for regulation of activities extend to current activities that disturb the ocean floor (diamond mining and bottom trawling)

Baobab Equity Management (Pty) Ltd. (Registered I&AP)
Jerome Kisting, Managing Director
Points raised (full submission below)

1. Technical Steering committee should include industry representatives and BCC. Their tasks should include:a) Baseline data inventory: collect, validate and review, b) decide on acceptable baseline wrt data, c)interrogate the hake industry and benefits therefrom, d)do feasibility analysis of fishing and mining
2. BCC attract independent international facilitator/reviewer.
3. Determine if the different sectors can co-exist

NCCI Lüderitz branch
Chairman Manu Namukomba
Points raised: (see ful submission below)

1. The study should not delay mining but find a way for mining to coexist with the other industries of fishing, tourism, diamond mining.

Mr G. Murta Mariculture Industry
Clarification on the pilot study: affecting aquaculture industry (positive/negative).

1. Output of the pilot study and study: a "master plan" with information of what needs to be studied, especially levels of contaminants can be critical in the water column to threatening the aquaculture industry?

The models: information to be obtained concerning the impacts in aquaculture farms in Namibia: Walvisbay and Luderitz

Strategic Environmental Assessment of the cumulative impacts on the marine ecosystem from bulk seabed mining of industrial minerals, specifically phosphates, off the Namibian coast

Additional input: J. Kemper

I am a biologist specializing in the conservation biology of African Penguin and other seabirds breeding along Namibia's coast. I have lived in Lüderitz for the last 15 years and am familiar with much of the local coastal (both terrestrial and marine) ecology and its dynamics. I have therefore registered with this project as an I&AP.

After attending the very informative public meeting at Lüderitz on 3 June 2014 I was heartened to hear that the SEA will not only focus on collecting and collating (baseline) data related to bulk seabed mining as such, but also data linked to effluents returned to the sea. Depending on the scale at which marine phosphates are likely to be processed, and the level of processing and benefication (e.g. phosphate rock versus phosphoric acid), the amount of effluent stored in coastal slurry ponds or released into the sea could have major impacts on the local ecology, as well as the local fishing industry (particularly the rock lobster and mariculture industries). In terms of birds for example, increased turbidity stemming from effluent discharge could change local prey distribution and availability and could impair feeding success of bird species relying on vision (such as penguins, gannets and cormorants). Sediment discharge could smother kelp beds and rocky shores, thus damaging feeding habitat of a number of shorebirds, while the discharge of chemicals or harmful organisms could directly kill organisms throughout the food chain.

When evaluating your baseline data and making recommendations in terms of phosphate (a) seabed mining and (b) effluent discharge, I would like to urge you to consider the following bird-related aspects:

1. The Namibian Islands' Marine Protected Area

The Namibian Islands' Marine Protected Area (NIMPA) specifically aims to (a) improve the status of species of conservation significance, (b) preserve ecosystem health and function and (c) improve fisheries management. One of the key objectives of NIMPA is to protect a number of threatened seabirds and their breeding and crucial foraging habitats.

The NIMPA encompasses all of Namibia's natural seabird breeding islands; details about these islands are found in Currie et al. 2009. Of the ten species of seabird species that regularly breed on these islands, eight are endemic to southern Africa and seven are threatened locally and/or globally (see table below):

Species	**Breeding endemic to**	**Global threat status (IUCN)**	**Local threat status (NRDB)***	**Additional remarks**
African Penguin	Namibia, SA	Endangered	Endangered	Namibian waters are important for juvenile penguins from SA too (see Sherley et al 2013a)
Cape Gannet	Namibia, SA	Endangered	Critically Endangered	Breeds on six islands globally of which three are in Namibia; Namibian population has declined by >80% in the last three generations
Bank Cormorant	Namibia, SA	Endangered	Endangered	Namibia supports 86% of the global population; Mercury Island alone hosts 72% of the

				global population
Cape Cormorant	Southern Angola, Namibia, SA	Endangered	Endangered	Global status was changed from Near Threatened to Endangered in 2013
Crowned Cormorant	Namibia, SA	Near Threatened	Near Threatened	
White-breasted Cormorant	N/A	Least Concern	Least Concern	
Swift Tern	Nominate race endemic to southern Africa	Least Concern	Least Concern	
Hartlaub's Gull	Namibia, SA	Near Threatened	Least Concern	
Kelp Gull	N/A	Least Concern	Least Concern	
African Black Oystercatcher	Namibia, SA	Near Threatened	Near Threatened	Pomona, Possession, Halifax, Penguin and Seal islands in Namibia support a significant part of the global breeding population

*Namibian Red Data Book for birds (in prep.)

2. Wetlands, IBAs, Ramsar sites

There are five prominent coastal wetlands in Namibia, namely the Kunene River mouth, Walvis Bay Lagoon (a global key stop-over locality for migrating shorebirds), Sandwich Harbour, Lüderitz Second Lagoon, and the Orange River mouth. These wetlands, characterized by networks of detritus-rich mudflats, sometimes interspersed with patches of vegetation and vegetated channels, are protected from deep wave action and serve as nutrient traps, forming a rich substrate for plant growth and supplying food for a diverse suite of shore birds. (Noli-Peard and Williams 1991). Because these wetlands are widely spaced and relatively small in extent, they offer crucial foraging and roosting habitat to a large number of birds, including resident species and a range of shorebirds migrating along the western coast of Africa (also known as the East Atlantic Flyway) and may support tens of thousands of birds (Whitelaw et al. 1978, Williams 1993, Wearne and Underhill 2005).

The array of the Walvis Bay wetlands, consisting of the Walvis Bay lagoon, mudflats, shoreline and salt works, is rated as the most important coastal wetland in southern Africa and one of the three top coastal wetlands in Africa for palaearctic birds (Wearne and Underhill 2005). These wetlands regularly support a minimum of 20 000 birds at any time, but may support up to 250 000 birds. They support up to 70% of the global population of Chestnut-banded Plovers, 40% of the African sub-species of Black-necked Grebe and 80% of the southern African population of Lesser Flamingo (Robertson et al. 2012, http://www.nnf.org.na/CETN/ramsar.htm).

Sandwich Harbour, about 55 km south of Walvis Bay, is the second-most important wetland in terms of wader and shorebird numbers in southern Africa (Wearne and Underhill 2005). It is a natural lagoon with two main wetlands; these have changed naturally in size and shape with time (Robertson et al. 2012). The long-term average number of birds found at Sandwich Harbour in summer is 145 000 (Simmons 2002).

The salt marsh wetland at Lüderitz Second Lagoon is the only notable wetland between Sandwich Harbour and the Orange River mouth wetlands. Although comparatively small in

extent, this wetland provides crucial roosting and foraging habitat for a range of resident and migratory birds. The head of the Lagoon, and the associated wetland, is one of the most important avian biodiversity hotspots in the Lüderitz region. Most birds forage and roost in the Lagoon itself, along the mudflat and sandy beach, the salt marsh vegetation and in the channels running through the wetland. In addition, there is a series of small, vegetated bayhead wetlands between Lüderitz and Guano Bay, roughly 10 km west of Lüderitz.

The intertidal zone of Namibia's coastline provides foraging habitat to large numbers of shorebirds, including a number of migratory species, as well as two species of gulls. Foraging habitat for shorebirds along Namibia's coast includes both rocky and sandy substrates; stranded kelp and associated isopod, insect and polychaete communities may support high densities of shorebirds.

On a global scale, the southern African region contains extremely high levels of biodiversity, including a complex and diverse array of ecosystems ranging from arid deserts to lush forests. This unique patchwork of ecosystems results in a rich and varied avifauna. An inventory of sites that are deemed critically important for birds at a global scale endeavours to supply decision-makers with information on the priority areas for conserving birds and their habitats. These sites, termed Important Bird Areas (IBAs), are therefore defined as places of international significance for the conservation of birds at a global, continental or southern African (regional) level. Altogether 21 IBAs have been identified for Namibia, of which two sites are regional IBAs and 19 sites are global IBAs. Walvis Bay Lagoon, Sandwich Harbour, Mercury, Ichaboe, the Lüderitz Bay (Penguin, Seal, Halifax) and Possession islands, the Namib-Naukluft National Park and the Tsau//Khaeb (Sperrgebiet) National Park (including the Namibian side of the Orange River mouth) are all global IBAs (Barnes 1998).

Worldwide, more than 2 000 Ramsar Sites have been registered by 160 countries, or "Contracting Parties" to date. Namibia has been a Contracting Party to the Ramsar Convention since December 1995, and currently has five wetlands or wetland systems registered as Ramsar Sites, including Walvis Bay Lagoon, Sandwich Harbour and the Orange River mouth. Initial tentative steps have been taken to nominate the seabird breeding islands for Ramsar Site status.

A draft text for the tentative listing of the Namibian portion of the Benguela Current Marine Ecosystem as a World Heritage Site has been communicated by the Namibia National Committee for World Heritage to MFMR during 2013.

3. Birds associated with the Namibian coast and marine environment

There is a relatively high diversity of birds using Namibia's coast and marine environment to breed, forage and/or roost. Williams (1993) estimated that between 1.4 and 1.6 million birds belonging to 73 species regularly occur along or off the Namibian coast.

A total of 175 species of birds are known or are likely to breed, forage and/or roost along Namibia's coastline, from the shore to oceanic waters. Of these, 34 species are considered vagrants and rare visitors. Of the remaining 141 bird species, 115 species are associated with Namibia's wetlands, islands and shore, while 26 species are exclusively associated with the marine environment. The majority (98) of species listed are resident to the area, although seasonal migrants are common, particularly among wetland and offshore species (Hockey et al. 2005, Sinclair et al. 2011).

A suite of bird species that "may not be killed, disturbed or maimed" are listed in Section 18(1)(b) of the regulations pertaining to the Marine Resources Act of 2000.

4. Some references

These references might be useful for you – I have some of these as pdfs and can email those on request.

Agreement on the Conservation of Albatrosses and Petrels (2009). ACAP Species assessments. Downloaded from http://www.acap.aq/acap-species on 12 June 2012.

Barnes KN (ed.) (1998). The Important Bird Areas of southern Africa. BirdLife South Africa, Johannesburg.

Bartlett PA, Roux J-P, Jones R and Kemper J (2003). A new mainland breeding locality for African Penguins, Bank and Crowned Cormorants on the Namib desert coast. Ostrich 74: 222-225.

BirdLife International Seabird Tracking Database: this shows summary maps of tracked albatrosses and petrels and give a good idea which species frequent Namibia's coast. http://www.seabirdtracking.org/dataset.php

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Dundee BL (2006). The diet and foraging ecology of chick-rearing gannets on the Namibian islands in relation to environmental features: a study using telemetry. MSc thesis, University of Cape Town, South Africa.

Hockey PAR (1982). Waders (Charadrii) and other coastal birds in the Lüderitz region of South West Africa. Madoqua 13(1): 27-33.

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Ludynia K, Roux J-P, Jones R, Kemper J and Underhill LG (2010a). Surviving off junk: low-energy prey dominates the diet of African penguins *Spheniscus demersus* at Mercury Island, Namibia, between 1996 and 2009. African Journal of Marine Science 32(3): 563-572.

Ludynia K, Jones R, Kemper J, Garthe S and Underhill LG (2010b). Foraging behaviour of bank cormorants in Namibia: implications for conservation. Endangered Species Research 12: 31-40.

Ludynia K, Kemper J and Roux J-P (2012). The Namibian Islands' Marine Protected Area: Using seabird tracking data to define boundaries and assess their adequacy. Biological Conservation 156: 136-145.

Ludynia K 2012. Continuation of the study: Foraging strategies of endangered seabird species in the Namibian Benguela ecosystem and their implications for population trends. Internal MFMR report.

Noli-Peard KR and Williams AJ (1991). Wetlands of the Namib coast. Madoqua 17(2): 147-153.

Robertson T, Jarvis A, Mendelsohn J and Swart R (2012). Namibia's Coast – Ocean riches and desert treasures. Ministry of Environment and Tourism, Directorate of Environmental Affairs, Namibia.

Sherley RB, Ludynia K, Lamont T, Roux J-P, Crawford RJM, Underhill LG (2013a). The initial journey of an Endangered penguin: implications for seabird conservation. Endangered Species Research 21: 89-95. *[This paper gives the initial results of tracking studies of juvenile penguins from South Africa; we have since then started to gather data from Namibia, which show similar results but still needs to be published; see the very useful map on the 14 September 2013 entry on the "Penguin Watch" website on* http://penguins.adu.org.za/news_list_all.php *]*

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Simmons R, Baker N, Braby R, Dodman T, Nasirwa O, Tyler, S, Versfeld W, Wearne K and Wheeler M (2007). The Chestnut-banded Plover is an overlooked globally near Threatened Species. Bird Conservation International 17: 273-283.

Simmons RE, Brown CJ and Kemper J (in prep.) Birds to watch – red, rare and endemic species. Namibia Nature Foundation, Windhoek, Namibia. *[although the book is not published yet, I have all species texts; please let me know if you would like to see any of them]*

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30 June 2014

The Administrator
Namibia Seabed Environmental Assessment Project
National Marine Information and Research Centre
P. O. Box 912
Swakopmund
Namibia
Email seabed.ea@gmail.com

Dear Sir / Madam

Re: Submission to consultative meetings of 5 June in Swakopmund to assess the cumulative impacts on the marine ecosystem from phosphate mining of the seabed off the Namibian coast.

The Namibian fishing industry is by legal requirement not allowed to trawl for fish inside the 200 metre depth restriction so as to allow fish breeding stocks to be given a proper chance to breed in the shallows, as well as to protect juveniles. It is noted that phosphate deposits in some cases have been found shallower than 200 metres. The fishing industry is concerned that the phosphate mining sector should not be allowed to mine in waters shallower than 200 metres for the same reasons. And also, knowing that the early stages of fish are very sensitive, where mining is close to the 200 metre depth restriction, studies should be undertaken to ensure that silt drift and sound impacts etc. do not negatively impact on critical ecosystem areas such as fish breeding grounds or juvenile development.

This also applies to effluents from the land based side to marine phosphate mining re-entering the sea, again potentially impacting sensitive breeding grounds, as well as aquaculture operations.

Ongoing monitoring of environmental impacts is a critical issue, particularly if a decision is taken to go ahead with marine phosphate mining. A representative from the Ministry of Mines and Energy at the morning industry meeting in Swakopmund, stated that currently there isn't the capacity to effectively monitor effluents. He stated that if negative environmental impacts overstep critical levels, there is a mechanism in place to stop mining. However, at this stage monitoring capacity is not good enough.

It was noted that Norway's experience in the oil and gas industry was that initially American companies were mostly doing the mining and there was poor environmental monitoring by these companies. Then Norway started taking control and relevant monitoring and regulations were put in place. Namibia can learn from Norway's experience. Consequently, as part of the main study, an analysis of current means of monitoring and regulation based on current infrastructure and capacity in Namibia would be needed, as well as recommendations on what is required, so that any weak links can be rectified. Internationally accepted threshold tolerance limits need to be clearly defined, and linked to mining license requirements, to ensure effective management.

To facilitate an effective study, the mining companies responsible for the proposed marine phosphate mining projects, should be required to supply all the information they currently have on potential impacts, so that data gathering for the main study is made easier. A culture of transparency and good communication needs to be fostered. If the mining companies are willing to do this, it will help create transparency and trust. If they don't, trust will remain a real issue.

Separately, on the issue of sound impacts, Namibia's Large Pelagic Fishing Association has asked that where there is environmental monitoring equipment moored at sea, that this includes sound recording equipment. The concern is that seismic airgun blasts from oil and gas exploration vessels, are scaring away the fish. In Namibia's southern waters, around Namibia's southern border, and in fishing grounds off Luderitz, migratory tuna has been particularly affected. Further north, the pelagic species pilchard and snoek have also shown evidence that they are negatively impacted by seismic sound.

Thank you for noting these additional points.

Yours sincerely

David Russell
On behalf of the Confederation of Namibian Fishing Associations

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Chairman, Confederation of Namibian Fishing Associations
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Cc: Matthew Hambuda
Chairman, Namibian Large Pelagic and Hake Longlining Association

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

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Organization: **Namibian Marine Phosphate)Pty) LTD**	Fax: **+264 64 200290**
Designation: **Consultant (J Midgley & Associates – HES Risk Management)**	E-Mail: **mwjmidg@mweb.co.za**
Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Duties of the Proponent: Appointment of EAP

The Environmental Impact Assessment Regulations: Environmental Management Act 2007, requires, under Section 3 – Duties of the Proponent: the proponent must:

a) Designate an environmental assessment practitioner (hereinafter referred to as the EAP) to manage the assessment process.

It is evident from meetings held to date that this has not been undertaken by the proponent - MFMR. It was made clear by SINTEF that they are <u>only</u> undertaking scientific investigations.
An EAP has not been appointed. (the Steering Committee is not an EAP)
An EAP is a named individual and not a committee.
This is a critical process failure in the SEA scoping (pilot) phase undertaking.

THANK YOU FOR YOUR PARTICIPATION

All relevant documentation will be placed on the web-site:
http://www.nodc-namibia.org, under NAMSEAP
Please be sure to visit the web-site to stay informed as the project progresses.

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

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Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Duties of Proponent: Qualifications of EAP

The Environmental Impact Assessment Regulations: Environmental Management Act 2007, requires, under Section 4 – General requirements of the EAP:

The EAP designated in terms of regulation 3 must -

a) Have knowledge of and experience in conducting assessments, including knowledge of the ACT, these regulations and guidelines that have relevance to the proposed activity

During the sectorial and public consultation phases at both Luderitz and Swakopmund, there was demonstratable lack of understanding of these requirements from the representatives of the proponent.
There were some grossly inaccurate statements regarding knowledge of the Acts and Regulations. These could not be verified due to the absence of many members of the Steering Committee, e.g. no representative of MET was present except at the last meeting held in Swakopmund on the 5th June.
In the absence of an appointed EAP (the Steering Committee is not an EAP) with the appropriate qualifications, the knowledge of, and experience to, conduct ('environmental') assessments is questioned.
The appointed EAP needs to demonstrate compliance with section 4a, this has not happened thus far.

THANK YOU FOR YOUR PARTICIPATION

All relevant documentation will be placed on the web-site:
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Please be sure to visit the web-site to stay informed as the project progresses.

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

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Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Request for supporting documentation.

At the sectorial meeting in Swakopmund 5th June, the following information was requested to be posted on the web site:

1- the terms of reference of the Norwegian Consultants –
2- the terms of reference of the appointments of the members of the Steering Committee
3- the terms of reference of the appointment of the Administrator to the Steering Committee
4- the registration document of the SEA process (application for an Environmental Clearance certificate)
5- the terms of reference for the moratorium drawn up by the Cabinet.
6- That those items be posted as soon as possible after the meeting of the 5the of June so as to provide opportunity for assessment, and that optimization of comments from I&APs can be provided.

The MFMR member of the Steering Committee agreed to the request with the exception of item 5 which requires the approval of the Permanent Secretary MFMR before it can be placed on the web site. The other items the Steering Committee member advised would be posted.

The failure to provide Items 1 – 4 & 6 raises questions about the transparency of the process and the integrity of the parties involved in managing the SEA process.

THANK YOU FOR YOUR PARTICIPATION

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Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

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Designation: **Consultant (J Midgley & Associates – HES Risk Management)**	E-Mail: **mwjmidg@mweb.co.za**
Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Role of Administrator.
Namibian Marine Phosphate was advised in a separate meeting by Ms. G D'Almeida (Director Resource Management MFMR) that the Administrator's function was to execute the tasks as required by the members of the Steering Committee, that the Administrator is not a member of the Steering Committee. This advice by Ms G D'Almeida established satisfactory context to NMP regarding the appointment of Ms B Currie as the Administrator. This is because Ms B Currie is known to be a serious and committed objector to the mining of marine phosphates, hence her appointment was not seen to be appropriate unless it was in a strictly neutral capacity.

During the various stakeholders and public meetings in Luderitz and Swakopmund, there were some deferrals by the attending Steering Committee and panel members to Ms B Currie, that would / may possibly constitute a breach of this terms of appointment as the SEA Administrator. (The ToRs of appointment have been requested, agreed to be provided, but as of today [25 June 2014] has not been provided. Whilst no specific issue is referred to in this commentary, the general matter is brought to attention of the Steering Committee and in particular the Chair, so that the appropriateness of participation, transparency of participation and optimization of functional roles can be attended to, so as to ensure for a balanced assessment.

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My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Open period for comments - the scoping phase.
The open period for submission of comments was not detailed in the BID document. Further, there was significant surprise that the Administrator advised at the Luderitz public meeting that the open period for comments was limited to the duration of the meeting. This is a violation of the intent of the basic principles of stakeholder engagement, as well as regulatory requirements of the Act. In discussion at same meeting it was confirmed that 12 days would be allowed. Subsequent to this the Administrator by email to all registered I&APs advised that the period now has been extended to 30 June 2014, some 17 working days since the final public meeting of the 5th June.

In the same conversation at the Luderitz meeting the Administrator informed the IA&Ps that the MET Steering Committee member advised the Steering Committee that public consultation is not required in the SEA process. If this comment is correct, this is a shocking statement and the fact that it was repeated at the public meeting demonstrates a serious lack understanding of the Act, regulations, and the intent of environmental assessments. SEAs have many components, of which consultation and engagement with I&APs is fundamental. Despite the lack of promulgated regulations governing SEA, the process should follow the spirit and intent of the EIA process pathway in respect of openness, transparency and public consultation.

The appointment of an EAP would have prevented such and positioned the proponent in a more favorable light.

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Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

The absence of representation from the mining and the fishing industries on the Steering Committee, removes constructive participation of the directly 'assessed' parties from the SEA management process and thus negates the transparency and partnership principles that are inherent and integral in the undertaking of an SEA.

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My interest in this project:
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COMMENTS:

Context and area of possible operation.
The Namibian EEZ covers some 560 152 km^2 with an estimated area of ~ 70 000 km^2 in which bottom trawling maybe undertaken. The actual area trawled is estimated to be between 30 000 and 40 000 km^2 annually. Marine phosphates of greater than 1% P_2O_5 content cover approximately 70 000km^2 (depth range 25m to 550m). Deposits containing between 5% and 15 % P_2O_5 cover approximately 17 000 km^2 (depth range 50 to 350m) and those containing greater than 15% P_2O_5 cover approximately 1 500 km^2 (depth range 180 to 300m).

The area containing greater than 15% P_2O_5 is considered the minimum for an economically viable marine phosphate deposit. The rates of dredging proposed by the two current licence holders is up to 7 km^2 annually. The identified economic resource if all is extracted at this rate would last for 214 years. The opportunity for other mining companies to establish viable economic deposits, is minimal, as the majority of the greater than 15% P_2O_5 resource is held by the two licensed mining companies. Hence the fears that phosphate mining will take place over the entire fishing grounds (~ 70 000 km^2) is not realistic.

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COMMENTS:

Extraction methods & rate.

It was evident from the recent scoping meetings that there seems to be (at this stage – essentially, the stage of gathering the basic information and determining the gaps) little interest in SINTEF/IMR engaging directly with the mining companies and understanding the mining methods and rates. Mining rates and methods are among the key factors in determining the nature, duration and extent of the potential and actual impacts associated with respective mining methods. Such information is critical in assessing the risk and thereby contributing to the scoping report providing an output of risk determination.

In the SEA, the assessment of the ecosystem with the area of assessment being identified as he EEZ, it is necessary that all activities that have a direct impact on the seabed are assessed with equal assessment and evaluatory tools.

Present 'extracting' methods (including the proposed phosphate mining) of significance that impact the seafloor directly:

- Bottom trawling – over an area of between (est) 35 000km^2 40 000km^2 (annually) from within an area (est) of 70 000km^2
- Drilling and crawler technology diamond mining – over an area of 12km^2 (2013 Namdeb area as reported in the press)
- Proposed phosphate crawler technology and conventional dredging – over an area of 7 km^2 and 9.5million m^3 (annual)

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COMMENTS:

Socio-economic assessments are an integral (fundamental) component in an SEA (Strategic Environmental Assessment), or a CEA (Cumulative Environmental Assessment). Failure to assess such, removes one of the primary evaluation components from the SEA and makes the validity of the assessment questionable. When the Cabinet in their directive declared an SEA be undertaken, and the proponent (MFMR) took up the responsibility to undertake the requirements of the directive, MFMR automatically took on responsibility and the mandate to execute the task in FULL. Whilst there is latitude in determining the exact content of an SEA, that latitude is NOT extended to the socio-economic component.

The suggestion that the socio-economic component be addressed after completion of the pilot and main phases is not acceptable. An SEA address both the environmental and economic opportunities and constrains provided by the area under investigation.

The contents of a specific socio-economic work package needs to be included in the scoping assessment (pilot project). Subsequently a full socio-economic work package must be addressed in the main phase. This is an essential requirement and failure to do so would seriously undermine the value of the final strategic assessment.

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COMMENTS:

Bulk mining:

In the media Namdeb is reported to have mined an area of 12 km^2 in 2013. This translates to the removal of 14.4million m^3 of material from the sea floor. [12 000 000 x 0.6 m (estimated sediment depth) x 2 (specific gravity)].

Namibian Marine Phosphate (NMP) proposes to extract 5.5 million m^3 annually (less than half the volume currently mined for diamonds) from an area of up to 3 km^2 annually (less than a quarter of the area currently mined for diamonds). The mining rates and volumes proposed by NMP are fixed in the EIA for a 20 year licence period (changes in rate and volume would require a re-assessment of the EIA). The area and rate extraction in the marine diamond mining industry are not controlled in the same way: within recent years the area of extraction has increased from 7 km^2 to present 12 km^2.

LL Phosphates, reportedly intends to mine an area of up to 4 km^2 and extract 2.3 million m^3 of seabed material annually.

The combined rates and volumes mined of both proposed phosphate projects is less than that currently undertaken by marine diamond mining. Hence the intended phosphate mining is merely a portion of the "bulk" mining industry operating in Namibia.

Other "bulk mining" activities include capital dredging in the Port of Walvis Bay for new developments, and maintenance dredging in both the ports of Walvis Bay and Luderitz.

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COMMENTS:

Cumulative effects:
The Environmental regulations define:

"Cumulative effect", in relation to an activity, means the effect of an activity that in itself may not be significant but may become significant when added to the existing and potential effects eventuating from similar or diverse activities or undertakings in the area.

By definition in order to conduct an SEA with focus on the cumulative effects of phosphate dredging, the scope of the study must also include all other marine activities, viz:

- Oil and Gas exploration
- Fishing
- Shipping – in particular oil tankers and cruise liners

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COMMENTS:
Given the scope and cost of the proposed research for the SEA, it is critical that the research program is focused on providing the information that Government requires to make a decision with respect to marine phosphate mining. Based on the information presented by the SINTEF/IMR team it is likely that the main project will cost in excess of N$ 300 million. Since this main project will have a direct effect on present and future generations as well as implications for the ecosystem it is an essential requirement that the draft scoping (pilot) report is workshopped sectorially with the mining companies. This workshop should be attended by by SINTEF / IMR, with representatives from all sectors represented by the Steering Committee. Similar workshops should be conduced with all other marine industry sectors.

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COMMENTS:

Stakeholders were invited (by letter) by MFMR to a "Stakeholder Consultative meeting for a scoping study for an Environmental Assessment of Phosphate mining along the Namibia coast", held in Swakopmund on 11th December 2013.

During the meeting (discussion item on the agenda), the programme facilitator requested delegates to provide terms of reference for the scoping study.

- The ToRs as established at the meeting and subsequent inputs have not been circulated to I&APs for comment.
- The minutes of the meeting have as yet not been circulated.
- There was no systematic gathering of comments and responses from the meeting, which is a formal part of any environmental assessment process.

During the meeting, SINTEF and IMR were introduced as the parties commissioned to undertake the assessment. It has been recently advised (at the I&AP scoping meetings –Luderitz & Swakopmund) that the contract with SINTEF / IMR was only signed in March 2014. The newspaper announcement (quoting the Minister of Fisheries and Marine Resources) of the notification of the moratorium was made on 19th September 2013. Precious time of the Cabinet-declared 18-month moratorium period has been lost (reference the introduction and subsequent appointment of the assessment consultants). This is of obvious concern with respect to the reduction from the moratorium period of 18 months, to an effective 12 month timeframe.

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COMMENTS:

It has been stated by MFMR that it needs to be certain (established on scientific evidence) that the proposed phosphate mining will not negatively effect, the ecosystem, the spawning grounds and the and consequently the fishing industry. Approval, therefore, to mine phosphate cannot be issued until this is known.

However, in the opening address by Ms G D'Almeida (MFMR) at the recent I&AP meetings, it was clearly stated that a basic understanding of the early life stages and distribution of fish eggs of commercially important fishes and the ecosystem is still lacking. And that before embarking on any (mining) a thorough investigation is required. It is essential to understand the impact of this (mining) on the ecosystem.

It is evident from the above statement that there are large and significant gaps in the knowledge of marine fisheries of the region, and that if the fishing industry were a 'new' industry it too would be subjected to a moratorium. By implication it is further evident that the impacts of the fishing industry on the ecosystem are largely unaccounted for and that little no assessment of the significance of these impacts has been undertaken. There was apparently some attempt in the hake industry for certification to the Marine Stewardship Council (MSC) Standard. However, this seems to have been started, stalled and presently is not on the agenda. The MSC addresses a range of elements, with the 'ecosystem' being one of them. It may well be perceived that the assessment of cumulative impacts in the SEA under the guise of investigating the environmental effects of the proposed phosphate mining are allows the authorities to 'get their own house in order' at some other party's cost.

How are the impacts of bottom trawling assessed in Namibia? Bottom trawling occurs from within an area of ~ 70,000km^2, with between and estimated 35 000 and 40 000 km^2 being directly impacted annually. Recently the European Union narrowly avoided having to ban bottom trawling.

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My interest in this project: **Appointed environmental consultant to Namibian Marine Phosphate**	

COMMENTS:

ToRs

Has the entire Steering Committee signed off on:

(1) the ToRs of the Scoping phase (pilot study);
(2) the appointment of SINTEF / IMR; and
(3) the overall SEA process and the planned outcomes.

The question is raised in respect of the absence of representation of many Steering Committee members during the I&AP consultation meetings. Despite being reported (at the 11 December Swakopmund Workshop) that the MWTC, Department of Maritime Affairs is a member of the Steering Committee, I&APs were informed at the 02 – 05 June consultation meetings that the actual MWTC: DMA member(s) of the Steering Committee had yet to be appointed.

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COMMENTS:

Tender Process.
Given that the SEA is an initiative of the Government, it assumed that the work scope would have to be put out to tender, was this done or was an exemption established? If an exemption was provided, please provide a copy of this document in the scoping report.

Irrespective it would have been prudent of the Steering Committee to put the request for these services out to tender. The outcomes of the scoping phase (pilot phase) should amongst other deliverables be geared to providing other scientific institutions the opportunity to bid on the main phase of the project (tender for the main phase). The assessment of the received proposals should be evaluated by the Steering Committee in full consultation with industry (fishing and mining).

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COMMENTS:

I&AP interaction with SINTEF/IMR

It was evident from discussion during the I&AP consultation period (02 to 06 June), that the Steering Committee appears to be acting as a 'firewall' between SINTEF/IMR and I&APs, particularly Key Stakeholders, i.e. the mining industry. There was the suggestion from the members attending of the Steering Committee that a 'liaison' person be used. There are presently only two companies who have been issued mining licences, the liaison opportunity exists via the Chamber of Mines (COM). The COM has previously offered to be part of the Steering Committee whereby it can perform such functions as these discussed herein. It was also reported that there was a lack of data (information) from MME. These 'data' can be provided by COM and/or directly by the mining companies.

The firewall is perhaps further substantiated in so far as at the Swakopmund stakeholder meeting it was advised that the Steering Committee and SINTEF/IMR were to have a meeting with "the scientists". Here it assumed that this means the NatMIRC scientists. There are a number of scientists who are working on the Namibian Marine Phosphate, and the LL Phosphate project who could also be directly consulted in the same manner. Will a similar meeting with the industry scientists be arranged during the during the scoping phase ? This would ensure that a balanced scoping assessment is undertaken.

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Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Scoping report: Issues and responses thereto.
There was a remark passed at one of the scoping meetings, that only some of the issues raised by the I&APs and responses by the proponent's EAP will be reported on. It is standard environmental assessment practice to respond individually to ALL issues raised and a Comments and Response Report be produced. The responses need to be integrated by the EAP with inputs from members of the Steering Committee, SINTEF/IMR and proponent.

THANK YOU FOR YOUR PARTICIPATION

All relevant documentation will be placed on the web-site:
http://www.nodc-namibia.org, under NAMSEAP
Please be sure to visit the web-site to stay informed as the project progresses.

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

19

Title, Initial & Surname: **Mr. J.L Midgley**	Telephone: **+27 832649484** **+264 64 278150**
Organization: **Namibian Marine Phosphate (Pty) LTD**	Fax: **+264 64 200290**
Designation: **Consultant (J Midgley & Associates – HES Risk Management)**	E-Mail: **mwjmidg@mweb.co.za**
Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	

My interest in this project:
Appointed environmental consultant to Namibian Marine Phosphate

COMMENTS:

Bias in the content of the BID and presentations by SINTEF/ IMR/ Proponent

The balance of the content of the BID was strongly in favour of the benefits of the fishing industry e.g. figures for the value and the number employed by the industry were given, whereas no data on the potential value of marine phosphate mining was presented. It is clear that the compiler of the BID made little or no attempt to obtain the latter information.

In the list of work packages for the main study only that dealing with Food Safety contained a potential list of contents. In the presentation on this topic much was made of the potential threat of released heavy metals and other discharges resulting from mining to fishing and food security. No attempt was made to balance this with a discussion of the benefits to Namibia of mining the marine phosphate.

The Norwegian example of coexistence between the offshore oil and gas industry and the fisheries presented by IMR are not directly comparable with either marine diamond mining or the proposed phosphate mining. (Offshore oil and gas operations are in the main, very different from bulk dredging /mining operations). There are European examples of large scale dredging of sand / aggregates and marls (a calcium-magnesium deposit which is processed and used as a fertilizer) co-existing with fisheries that would have served as a far more relevant example.

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Postal Address/City: **C/o – Private Bag 5018 Walvis Bay Namibia**	
My interest in this project: **Appointed environmental consultant to Namibian Marine Phosphate**	

COMMENTS:

Content of work packages for main project

Of the 10 work packages presented by SINTEF for comment by the I&APs only one (Food Safety) listed the proposed contents of that study. All the other work packages were only represented by their titles which did not allow the I&APs to make any meaningful contribution or comment. Surely the SINTEF/IMR scientists could have provided more detail. It should also be noted that the list of work packages did not include a socio-economic study which is an essential component of an SEA.

THANK YOU FOR YOUR PARTICIPATION

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http://www.nodc-namibia.org, under NAMSEAP
Please be sure to visit the web-site to stay informed as the project progresses.

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

Title, Initial & Surname: **Mr. V. Malango**	Telephone: +264 61 237925
Organization: **Chamber of Mines Namibia**	Fax: **+ 264 61 222638**
Designation: **Chief Executive Officer**	E-Mail: **dmeyer@chamberofmines.org.na** **vmalango@chamberofmines.org.na**
Postal Address/City: **PO Box 2895 Windhoek. – No.3 Schutzen Street Windhoek**	

My interest in this project:
Representation and participation from the mining industry of Namibia

COMMENTS:

The Environmental Impact Assessment Regulations: Environmental Management Act 2007, requires, under Section 3 – Duties of the Proponent: the proponent must:

a) Designate an environmental assessment practitioner (hereinafter referred to as the EAP) to manage the assessment process.

   This has not been undertaken by the proponent. It was made clear by SINTEF that they are only undertaking scientific investigations.
   An EAP has not been appointed. (the steering committee is not an EAP)
   This is a critical process failure in the SEA scoping (pilot) phase undertaking.

b) During the I&AP consultation phase, from the presentations made the consultants (SINTEF & IMR) it is not clear that at the end of the Scoping phase (Pilot study) that an objective and balanced outcome will be provided from which the authorities will be able to assess the significance of the risks associated with the proposed phosphate mining, and therefore be in a position to determine the status regarding the moratorium.

   It is evident from the presentations to date that at the end of the Scoping phase (Pilot study) that a work scope & cost for the Main Study will be provided. The determination here, being that the pilot study is in reality little more than a paid for assessment of what is to be undertaken in the Main Phase.

c) Socio-Economic assessments are an integral (fundamental) component in an SEA (strategic) Environmental Assessment, or a CEA (cumulative) Environmental Assessment. Failure to assess such, then removes one of the primary evaluator components of the undertaken assessment and makes the assessments invalid. It was stated at one of the I&AP consultation meetings by the Chair of the Steering Committee that the Socio-Economic component is beyond

From: **Crispin Clay** <diaspeak@iway.na>
Date: Mon, Jun 23, 2014 at 10:47 AM
Subject: Re: Mining of Phosphate off the Namibian Coast - Pilot Project
To: Administrator <seabed.ea@gmail.com>

To The Administrator Namibia Seabed Environmental Assessment Project and to all Concerned:

The **Pilot** Project Phase 1 has already **begun** next to the port of Luderitz.

Herewith our IAP comments to the Pilot Study to assess ecosystem impacts from phosphate mining off the Namibian Coast.

Following recent public meetings about the **initial** project to **investigate** the potential effects of marine phosphate mining near Luderitz, a few issues need to be addressed. That last meeting here was obviously not the right place to raise them: after 2 hours a ''delegate'' asked, ''What are these phosphates you are talking about?'' Ignorance is the first issue.

We **support** economic upliftment and new enterprise and we **fully understand** that such **specific**, comprehensive and concentrated **research** work has **never** been done before. The issues below, among others, have been raised and should be addressed, initially in the **public Draft Scoping Report** on the **Pilot Project which has already begun:**

1. What experience does the research group **SINTEF** have in specifically **phosphate**-related research? Their website does not accentuate its experience in any current **MINING** activities **or** their impact on the **marine** environment. Bibliography and credentials?

2. **Who specifically** have they sent here for the duration of the project? Their relevant credentials? Contacts?

3. Does the Mining **Applicant** pay anything DIRECTLY to SINTEF? If so, is their objectivity not compromised? (He who pays the piper calls the tune!) One ''assumes'' that Norwegians would be impartial - even quite concerned about **our** fish and other bio-resources - but **are** they? Monitors?

4. **Differences** in relevant impacts between marine **oil/gas, diamond** operations, **bottom-trawl** fishing and proposed **phosphate** mining? What studies have **already** been done on the effects and impacts of those operations along **our** coast since the 1960s - the height and decline of the crayfish industry, the collapse of the pelagic resource, pre-independence hake-fishing (ICSEAF), and the start of marine diamond operations near Luderitz? Inputs from past and current miners, divers, fishermen, researchers and observers?

5. Why do **Australia - and last week New Zealand -** NOT allow any such activity along their own coasts? Would **Israel** allow it if such deposits were found in a rich **fishing** and **diverse breeding** area off Israel's coast?

6. Is there a similar deposit off the west coast of **Chile** / **Peru**? Any plans/activity there? If not, why not? If so, some relevant comparisons, conclusions, info please.

7. What effects have **inland iron**-ore mining **and** related transport of material by road/rail, conveyor, ship, wind, flood etc had on **Australia's or South Africa's** coastal ecologies? Run-off, spillage, plumes? Any relevance here?

8. Does this kind of operation comply with the Benguela Current Large Marine Ecosystem, the Benguela Current Convention and Strategic Action Programs; also The UN Strategic Plan for International Waters, Rio+20, ocean-use treaties, agreements, policies, plans, goals, conferences, documents; the Namibian Constitution, visions and legislation?

9. Like all minerals, phosphates are ''finite''. Phosphates are also essential for all kinds of life-processes in nature. How much can be extracted before man upsets THAT balance?

Check the **basics** at **http://en.wikipedia.org/wiki/Phosphorus_cycle**

10. What happens to the **diamonds** that will inevitably (secretly?) be recovered during the extraction of ANY seabed material? The massive full Phosphate Project is after all an extension of the Israeli diamond industry. Oversight?

11. Lessons learnt from **Phosphate mining on Nauru** in the Pacific - see Wikipedia and Google: very instructive not to say frightening.

http://en.wikipedia.org/wiki/Phosphate_mining_in_Nauru

http://www.infoplease.com/country/nauru.html

(AFTER Nauru's independence in 1968: ''Mining has stripped and devastated about 80 per cent of Nauru's land area, and has also affected the surrounding Exclusive Economic Zone; 40 per cent of marine life is estimated to have been **killed by silt and phosphate runoff.''** .[39][55]

Photo - air and seabed pollution while loading phosphates, Nauru.

As a non-profit, non-political, open forum of concerned people here and further afield, The Luderitzbucht Foundation's core values through the 1980s and 1990s were, and remain, the **promotion** of Luderitz and its environs, **preservation** of its heritage and safely sustainable **development** of its potential. Though recently dormant through some ''boom years'', the Foundation nevertheless feels bound to voice concerns when it perceives potential threats to the town's future, especially to the live marine resources on which so much of our population and economy depend.

This letter is in response to the message below; **your** own reactions and responses will be welcomed. Other issues will be raised **after** sight of the **Draft Scoping Report and IF** this project progresses to Phase 2.

Crispin Clay, Chairman Luderitzbucht Foundation, Luderitz, Namibia

Namibia Phosphates (Pty) Ltd

For and on behalf of LL Namibia Phosphates (Pty) Ltd

Attention: SINTEF ENVIRONMENTAL CONSULTANTS

NAMIBIA SEABED ENVIRONMENTAL ASSESSMENT PROJECT

Tel : + 064 – 4101000
Fax: + 064 – 404385
Email: seabed.ea@gmail.com
Project Office: National Information and Research Centre
P. O. Box 912
NAMIBIA

Re: List of comments and queries regarding the Namibia Seabed Environmental Assessment Project from LL Namibia Phosphates (Pty) Ltd

From: LL Namibia Phosphates (Pty) Ltd (Holder of ML159 and EPL3946) 3rd June 2014
P.O. Box 3498
Windhoek

Dear Administrator

Please find below LL Namibia Phosphates official list of comments and queries to Sintef on the background information document regarding the Namibia Seabed Environmental Assessment Project to be considered for inclusion in your Terms of Reference and/or scoping study:

1) According to the background information document the study proposed is a Strategic Environmental Assessment (SEA). The International Association for Impact Assessment **(IAIA)** and most other countries around the world have developed codes of good practice for SEA's. Most of these codes have social and economic aspects as one of the main pillars required for a SEA. The background information document states *"This study **does not** address the socio-economic aspects associated with services from either living marine resources or marine phosphate (phosphorite) recovery. However, it is acknowledged that such studies would be greatly beneficial to the decision-making process". Does t*his imply that this internationally accepted good practice norm will not be followed? However, on page 5 of your background information document it then provides the GDP and employment statistics of the fishing industry. Further on it states "*Marine fisheries are well-established…….and provide considerable income and employment to the nation*", while on the last page it notes "*The potential contribution to the Namibian economy by marine phosphate mining would depend on several aspects not presently known, importantly driven by market demand and the global commodity price*". Two phosphate mining licence holding companies have already conducted feasibility studies with financial assessments and marketing studies and therefore economic data for this new industry is readily available. The background information document has already brought in economic data with respect to fisheries, so inclusion of the economic data of the fertilizer industry with respect to of this standard, good practice SEA item should surely pose no problem?

2) In the background information document it is clearly pointed out that the SEA will study: "*impacts on the marine ecosystem from potential bulk seabed mining of industrial minerals, specifically phosphorites, off the Namibian coast*". LLNP assume that this SEA will need to assess the current state of the ecosystem. In order to accomplish this, the impacts of fishing/trawling, marine diamond mining, oil and gas exploration, commercial boating and sea-side recreational activities will need to be assessed, (bear in mind that the current impact by the phosphate mining industry is zero, as no mining has yet been conducted), as these other industries are at this point in time fully responsible for the current state of the ecosystem. Further on in the background information document it states "*the focus and scope……is on investigating the* ***cumulative*** *impact of bulk seabed mining*" Without investigating the cumulative impacts of these existing industries operating in this environment how is it possible to evaluate further impacts by the phosphate mining industry, particularly when there are none yet available to investigate? Again this comprehensive approach to determine cumulative impact is a standard, good practice principle for an SEA. Should this study's purpose be to establish the baseline state of the ecosystem, post disturbance from the other industries mentioned, then it is simply a "Baseline Study", not an SEA.

3) Many EPL's have been issued to companies hopeful to join the Namibian offshore phosphate mining rush. However, as in most cases in the mining industry very few areas will ever become mines. Will Sintef investigate the percentage of west coast continental shelf where phosphate grades are sufficient for feasible mining? Phosphate grades have been mapped in detail through exploration programs and are readily available thus this should be simple to conduct. In order to investigate "*the* ***cumulative*** *impact of bulk seabed mining*" it must be determined what area could feasibly be mined. For example if there are currently 50 EPL holders with a combined area of 20 000km^2 but grades and volumes only allow 1 viable mining operation within a 100km^2 area then it is a singular impact and not a cumulative one. In fact there is no way of accurately determining cumulative impact without having an estimate of the potential area to be mined.

4) In the background information document it says "*the SEA will allow for the assessment of the* ***long-term impacts*** *on the marine ecosystem of potential bulk seabed mining*". Practically how is Sintef planning to investigate the impact of marine phosphate mining on the Benguela ecosystem when no mining will have taken place and no mining will occur in the near future due to the Moratorium in place against this activity? Will Sintef bring their own dredge vessel to simulate and then monitor effects of bulk seabed mining?

5) The background information document states that "*the existence of several coastal and marine deposits around the world has been known for decades, though none yet has been mined*" and further on it says "*Bulk removal of seabed for mining of phosphates from the ocean has not been permitted anywhere else in the world*". This is not accurate. Marine phosphate mining is being planned offshore in Mexico and they are currently preparing an environmental impact report that includes extensive analysis, tests, reports and models using international experts and environmental scientists on this mineral deposit. Furthermore in New Zealand, Chatham Rock Phosphate obtained their Mining Permit in December 2013 and has submitted their formal marine consent application. On the same vein the information document continues, *"…therefore there are no international regulatory measures to follow and there is no information available on the consequences expected with regard to marine life*". This is also not accurate for the reasons stated above. In fact in recent years there has been a shift to focus on extraction of marine resources as onshore resources become increasingly depleted, for example the Nautilus Minerals deep sea mining project off Papua New Guinea. Furthermore, the UK aggregate dredging industry has been removing, on average, 20Mil tons of seabed since 1982 (As opposed to about 7Mil/t/yr envisaged by the current two phosphate mining licence holders), in essence the same mining process as that which will occur in Namibia. This

industry has been very carefully environmentally monitored and the UK aggregate dredging companies have been working in harmony with their fishing industry with no impacts of such a nature that they cannot be mitigated. Will Sintef examine relevant environmental documentation from the UK aggregate dredging industry? Will Sintef use the vast volumes of environmental data from the Namibian west coast diamond mining industry, much of which has taken place in the Diatomaceous mud belt which is known to have the highest concentrations of nutrients, heavy metals and hydrogen sulphide/methane gas? Will relevant information collected by the vessel Dr Fridtjof Nansen on the Namibian seafloor areas already disturbed by bottom trawling, (i.e. where any nutrients, heavy metals and gases would have already been released into the water column and are thus no longer present to be disturbed by phosphate mining), be examined in Sintef's study? This information should be highly relevant as it offers a large database on the impacts to the Benguela ecosystem from the disturbance of bottom sediments based on many years of real-time data. In a recent paper by Pusceddu et.al.,(2014) entitled: "**Chronic and intensive bottom trawling impairs deep-sea biodiversity and ecosystem functioning**" they conclude that: "…compared with untrawled areas, chronically trawled sediments along the continental slope of the north-western Mediterranean Sea are characterized by significant decreases in organic matter content (up to 52%), slower organic carbon turnover (ca. 37%), and reduced meiofauna abundance (80%), biodiversity (50%), and nematode species richness (25%). We estimate that the organic carbon removed daily by trawling in the region under scrutiny represents as much as 60–100% of the input flux. We anticipate that such an impact is causing the degradation of deepsea sedimentary habitats and an infaunal depauperation. With deep-sea trawling currently conducted along most continental margins, we conclude that trawling represents a major threat to the deep seafloor ecosystem at the global scale". Trawling represents one of the most common fishing practices along the coastal oceans of the world. Pusceddu et.al.,(2014) continue by saying: "it (*bottom trawling*) can have a plethora of impacts on the sea bottom, including stock impoverishment, alterations to the sea-bottom morphology, sediment resuspension, and increased bottom-water turbidity, epibenthos mortality, altered nutrient cycles, and alteration of the benthic biodiversity". When comparing the dredging disturbances between bottom trawling and phosphate mining there are many similarities with the most noticeable differences being the significantly small areas the mining disturbs (i.e. per 5 years - 20km^2 by LLNP mining as opposed to 33,000km^2, by the bottom trawling industry). Many of the phosphate mining and exclusive prospecting licences have already been bottom trawled, although in all likelihood not chronically, and therefore are no longer pristine. Will Sintef evaluate the extent of existing disruption to the seabed by trawling which will then form the baseline for any further disruption by the phosphate mining industry within concession holder's specific licences?

6) The background information document states that "*The wide, deep continental shelf and slope comprises soft organic-rich sediment*". Again this is a generalisation as even the supporting diagram shows that organic-rich sediment varies considerably across the continental shelf. Further on it states "*Oxygen concentrations in the sediments are largely anoxic and contain hydrogen sulphide as a breakdown product*". This is true for most marine sediments below a certain water depth, anywhere in the world. However, it is the volume of hydrogen sulphide trapped in the sediments that determines whether it is environmentally significant impact factor or not. Studies by MFMR and BENEFIT (e.g. Dynamics of methane and hydrogen sulphide in the water column and sediment off the Namibian shelf - Volker Brüchert [1], Bronwen Currie [2], Kay-Christian Emeis [3], Rudolf Endler [4], Thomas Leipe [4], Kathleen R. Peard [2], Thomas Vogt [5]) and other studies and papers are well known and the location of these organic and hydrogen sulphide-rich sediments have been mapped on the Namibian sea floor. Were these organic and hydrogen sulphide rich sediments present across the whole Namibian continental shelf, as the background document suggests, then there would be no Benguela ecosystem as everything would have died. Will Sintef be looking at defining the relative position of sediments containing potentially high gas, nutrient and heavy metals, relative to existing phosphate licence areas, based on the numerous studies that have already been conducted?

7) The second last page of the background document says "*The biological marine system off Namibia contributes many goods and services to the nation*". Does this suggest by inference that phosphate mining will not? Does this indicate that Sintef has already concluded that phosphate mining cannot coexist with other industries in Namibia that it cannot contribute toward the Namibian economy? LLNP thought that the Sintef study's purpose was to independently determine the impact of phosphate mining in Namibia. Statements like this one in the background document do not reflect an open minded intention to find a solution as to how all industries working along the west coast can work in a spirit of cooperation, while collectively mitigating environmental impacts. Prof. Gabriel Filippelli of the Bureau of Oceans and International Environmental and Scientific Affairs in a talk at the US Embassy in Namibia recently summed up his presentation on, "**Phosphate Rock Resources and Global Food Security**", with the following: 1) Reduce population growth rate; 2) Balance food production; 3) Recycle phosphorous; 4) Revolutionise agricultural systems **BUT there is NO alternative for P**. The phosphate mining industry is important in the future of Namibia not only economically but from a food security point of view. With this in mind Sintef should be assessing the phosphate mining industry in the same light and with equal importance to the well-being of Namibia as the other established industries operating along the coast.

The Kiel Institute for the World Economy, in a paper, "**Global Availability of Phosphorous and its Implications for Global Food Supply**", states: "*Considering the paramount importance of phosphate rock for phosphate fertilizer production and its essential role in supplying phosphorus for today's agriculture system a potential scarcity could be expected to have grave consequences for global food production and security". According to UN estimations, the world population will be around 9.3 billion in 2050 and 10.1 billion in 2100. The demand for phosphorus follows the size of the population and is thus predicted to increase at the same pace as the global population*". Namibia is the very fortunate position where they can provide for their own phosphate needs and ensure food security from their own Resources in the future. Will Sintef in their study take into account the carbon footprint and excessive import costs of importing fertilisers and also the loss of foreign exchange, tax revenue, Luderitz service industries and other related environmental, social and economic impacts should Namibian phosphate mining not proceed?

According to an article by the World Wildlife Fund (WWF) they estimate that: "*over 80% of fish species are either, fully exploited (53%), overexploited, depleted, or recovering from depletion (32%). If overfishing does not decrease, it is predicted that stocks of all species currently commercially fished for will collapse by 2048*". Seafood Watch estimates that: "*The global fishing fleet is estimated to be 250% larger than needed to catch what the ocean can sustainably produce*". While these estimates may be slightly inflated should WWF's predictions prove to be accurate for the Namibian west coast too, then phosphate mining with >300 years Life of Mine Resources is ironically "more sustainable" than the fisheries industry from a socio-economic point of view. Recently, Chief Samuel Ankama, Deputy Minister of Fisheries, at the Henties Bay Aquaculture Conference even emphasised that: "*mariculture is the fastest growing food source in the world and currently makes up 42% of the world's fish production*" stressing that this industry should be focussed on in relation to Namibia's natural fishing sector. Namibia has a large section (i.e.12,000 km^2) of the Benguela ecosystem along its coast now allocated to Marine Protected Areas (MPA). These areas are specifically set aside to ensure viability and sustainability of the fisheries, nurseries and the ecosystem. While the impact of mining cannot be avoided, the small seabed areas (i.e. 4 km^2/yr by LLNP) disturbed by marine phosphate mining should be offset by these far larger areas being protected, that lie within the MPA's. Will the role of these MPA's and their intended purpose be taken into account when Sintef examine the utilization of Namibia's marine resources by all stakeholders and industries?

8) The aim of this study: "*The results of the study will be used by the Government to inform decision-making on marine mineral resource extraction*." This document is described as the process which will lead to the definition and Terms of Reference (TOR) for a larger SEA. However, other industries will be excluded (e.g. marine diamond mining, with similar impacts) from what is being proposed to be studied focusing solely on the phosphate industry. How can the results of this limited study then allow Government to make an informed decision? For the time and budget to be invested in this study, the proponents should ensure that it is of such a nature that well informed decisions can be made and that it does not culminate in inconclusive results that cannot be used to map a way forward for the cooperative use of all Namibian resources, while mitigating environmental impacts.

9) The average size of the phosphate pellets is 0.1 to 1mm not "*less than 0.3mm*" as stated in the BID.

At the briefing held in Walvis Bay in December 2013 Sintef expressed that they would be conducting an independent scientific study. As a reputable international company Sintef should be aware that the phosphate mining licence holders have already conducted a significant amount of research on the environmental impacts and mitigation measures that can be applied while mining phosphates along the Namibian west coast. This research has been conducted by well recognized, independent, international experts and results are known. Furthermore, there are hundreds of peer reviewed, scientific papers spanning decades of research that have already been conducted on the Namibian west coast that can be cited and used to cross-reference results obtained during the proposed project. LLNP trust that Sintef's work in this upcoming study will be of a standard that is in line with their reputable, international standing.

LLNP fully support any environmental work being carried out to preserve the Benguela ecosystem and will assist Sintef in any way possible. Given the nature and small scale of our planned operations together with results from environmental assessment studies carried out by ourselves and other mining licence holders we are confident that impacts from our activities will be small and that we can work in a cooperative manner with all stakeholders, including the fishing industry. Sintef's research will show that very few of the exclusive prospecting licences (EPL's) applied for in the "marine phosphate rush" contain deposits with grades and volumes that can be viably mined and thus, in our considered opinion, cumulative impacts will also not pose a threat to the ecosystem. While marine phosphate mining is relatively new, companies like Chatham Rock Phosphate in New Zealand obtained their Mining Permit (December 2013) and has submitted their formal marine consent application after undergoing vigorous environmental assessment procedures. United Kingdom Aggregate Dredging companies, who mine in a similar way to that proposed by the phosphate mining industry (although at much larger scales), work in harmony with other industries, sharing their countries living and non-living resources in an equitable manner. The aggregate mining industry's environmental impacts have been carefully monitored for over a decade and while seabed disturbance does occur, measures are in place to monitor and minimise impacts and aggregate mining is still ongoing. Were their environmental impact of such a nature that it was irreparably destroying the environment this industry's mining activities would have been terminated by the British government's environmental regulators years ago.

Should you require additional information or have any queries please contact Mr K. Kapwanga (Administration) in our Windhoek office (Tel +264 61 386 100) or Mr G. Rau (Chief Geologist) or Mr H. Hückstedt (Project Manager).

Yours faithfully

K. Kapwanga
Director

H. Hückstedt
Project Manager

Reg No. 2007/0279
LL Namibia Phosphates (Pty) Ltd
Ruhr Street, Northern Industrial, P O Box 3498, Windhoek, Namibia
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Directors : E Nefussy (Israel), K Kapwanga

Strategic Environmental Assessment of the Cumulative Impacts on the MarineEcosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

Title, Initial & Surname: Mr G. Rau	Telephone: (061) 386100
Organization: LL Namibia Phosphates	Fax:(061) 249253
Designation:Chief Geologist	E-Mail:grant@sakawe.com

Postal Address/City: P.O.Box 3498, Whk, Namibia

My interest in this project: Key Stakeholder, Mining Licence (ML159, EPL3946) holder

COMMENTS:

1. A wealth of relevant, peer reviewed, international, scientific papers on most of the topics considered to be of environmental concern (as raised at the meetings held), already exist for the Namibian west coast. These papers have been produced independently of any of the parties with vested interests in the outcome and results from the studies. They have been undertaken in all seasons, over numerous years and represent the most comprehensive database available on the Benguela ecosystem. However, from the IAP meetings attended it would appear that Sintef will only conduct a cursory examination of this literature in their baseline study, rather concentrating on collecting new data at great expense (both time and monetary wise). Like any other appointment of a contractor, the Gvt must be mindful of getting their money's worth and not allow yet another study to start from first base and not using the wealth of existing data as the starting block. This has been done so many times before that each group try and reinvent their own study at huge costs. Sintef should not be allowed to write their own scope to extract maximum work at the cost of Gvt.
2. It was suggested that already in the scoping phase, or during an intermediate step between scoping and the main study, Sintef could collect 5t of the raw phosphate material (or the companies could provide it) and conduct analysis of the phosphate pellets and interstitial water to assess the significance of any increases in concentrations of heavy metals, nutrients, chlorophyll a etc. that may occur as a result of their release from the sediment.These elutriate concentrations can then first be compared with international water quality guidelines (i.e. potential result: acute, chronic or no effects depending upon the circumstances) for the protection of marine biota and the ecosystem. Toxicology studies could be conducted simultaneously using the water produced from the washing of these sediments. While it is understood that the results obtained may only be broadly indicative, and cannot replace information gained by Sintef based on a 2 year study, they may be clear and can thus save the Namibian government millions of dollars. For example, if this preliminary test shows that the phosphate sediments contain little to no gas (H_2S), low levels of nutrients, toxicity to fish is zero and bio-available heavy metals (i.e. below international levels for affecting biota) and that clay/silt/mud levels are low and thus cannot create large plumes then Sintef's proposed

long-term study is unnecessary as it will already be clear that no environmental damage can be done by phosphate mining on the ecosystem. This result could feasibly have been obtained within the budget and time frame (18 months) provided by Cabinet to assess the potential impacts of this new mining venture on the west coast. Results from this simple trial could then be combined with the wealth of information that already exists on these topics (refer point 1) to determine whether phosphate mining can proceed or whether the full, new study being quoted for by Sintef is required. Sintef pointed out that the "Pilot Project" is aimed at "filling knowledge gaps" but then added that no phosphate material would be collected and tested at this stage. How do they determine what the most significant impacts of phosphate mining will be on the environment without having tested the phosphate sediments to ascertain what they contain? What if the phosphate sediments are tested and are completely inert, then what do Sintef intend to examine? Surely the material that is at the crux of the Moratorium should be tested up front as at least the very starting point and basis for where most time and effort should be concentrated during any follow-up studies?

3. Sintef plan to include a swath bathymetry survey of a very large portion of the Namibian coast to determine the bathymetrical setting of the phosphate deposits. If they examine the existing literature they would see that the viable deposits are situated on the middle shelf which has practically no topographical relief at all. To run swath bathymetry over this flat, featureless area is not productive. The Namibian tax-payers money could be spent far more wisely on other aspects of the study.
4. In the presentations given the phosphate deposits were shown to include all P_2O_5% values over 4.5%. This clearly illustrates the need for Sintef to include "economics" into their SEA study as companies that have conducted feasibility studies on this issue will attest to the fact that grades this low and cannot possibly be mined economically. Grades in the 15% to 18% range are being mechanically processed to get to the 25% range in order to make the deposits viable. When comparing areas this translates into 18 400km^2 at >5% versus 7 500km^2 at >15% almost one third of the area and commensurately the potential environmental impact. This also has repercussions on potential cumulative effects as the scales of impact are completely different. This again should be at the crux of the study as without having an indication of the "scale of impact" how can SIntef even determine the Terms of Reference? For example if phosphate mining were to affect 0.01% of the Benguela ecosystem the study scope would need to be totally different were it possible that it could impact on 20% of the ecosystem. This particularly in light of the fact that no chemicals or other additives are involved in phosphate mining.
5. Sintef made it clear that their main study would thoroughly investigate the Benguela ecosystem baselines and establish threshold values and ranges (based on international standards) for different monitoring elements,based on their investigations. Dr Arff then stated that these thresholds would apply to all activities and users of the ecosystem (Refer: your Swakopmund stakeholder minutes – Mike Woodborne - NMP question). However, at the IAP public meeting in Swakopmund that evening Dr Solbakken did not reiterate this standpoint during his presentation, suggesting that this monitoring would only apply to the phosphate mining industry. This important matter must be properly addressed. How can environmental thresholds and monitoring obligations be set for the phosphate industry alone? What happens, for example, if a phosphate dredge is mining and a few kilometers away (up-current) there are 5 fishing boats bottom trawling. Their tailings plumes are drifting through the mining licence area and contributing toward measured levels at the phosphate companies monitoring stations, creating levels that are above threshold. How does the governing body then determine who is at fault for exceeding allowable limits? Or will all disturbances exceeding allowable thresholds then be attributed to the phosphate industry whether they are responsible for the environmental disturbance or not? Sintef study should be aimed at protecting the ecosystem and thus all users exceeding set international environmental thresholds should be subject to the same standards and

monitoring requirements or else legal action will be impossible to implement.

6. Key stakeholders were asked to attend these Sintef meetings to provide feedback and input on the work-packages (WP). However, these work packages were presented as broad, one-line sentences. How are the industry/stakeholders/IAP's meant to give considered feedback when the detail of the work packages is so vague? Dr Solbakken said that he would discuss with the steering committee the option of providing more detail on the website prior to the closing date for the current feedback(Refer: your Swakopmund stakeholder minutes – Mike Woodborne NMP question) but nothing is yet available. Other items that were to be posted on the website include
   a) Appointment letters of steering committee and scope of work and terms of reference for Sintef and the steering committee.
   b) Appointment of an Environmental Practitioner to steer the process (as per Environmental Management Act, 2007).
   c) A copy of the Environmental Clearance Certificate registration application made to MET.
   d) A copy of the exact wording of the Moratorium by the Cabinet against bulk seabed mining of industrial minerals.
7. In the public IAP meeting at Swakopmund Dr Solbakken in his presentation said "we will not collect old figures/data….just new information for the main study". This is in contradiction to Work Package 1 (WP1). Besides this, what is Sintef then suggesting, that these data are not valid? That the decades of peer reviewed, international scientific papers by leading world scientists, spanning decades (various seasons, years, El Nino, La Nina events) on the west coast will not be used is incomprehensible? Many of the fish related studies were even done by the Dr Fritzjof NANSEN which Sintef is proposing to use in the new study. Does this then suggest that Sintef believe that their 2 years of "new" data will outweigh decades of existing information or that the ecosystem would have changed dramatically over the last 10 – 20 years?All this bearing in mind that there is no disturbance yet from phosphate mining, as no companies have commenced operations.
8. Following on from the point above - some diamond mining companies have been mining in the marine environment on the Inner/Middle shelf inflection, for over 50 years now. Large areas are mined (2000m^2/d), with the majority of the sediments released directly back into the water (far greater plumes than that proposed in the feasibility and technical studies undertaken by the phosphate mining industry). Detailed environmental performance assessment reports (EPAR), EIA's and various other environmental studies) done by these companies have monitored plume effects on biota using mining areas versus control areas over long periods of time. These are "real-time" studies and are housed at MET and are freely available to the steering committee members that work for that department. Are we to correctly understand that Sintef proposes to use their in-house modeling with artificially generated inputs (i.e. as there are no phosphate mining impact inputs currently existing) in preference to these real data? We have heard the argument that phosphate mining is different in that it removes the sediment while diamond mining returns it to the seabed and that different technology is used (during the presentations and discussions). This again illustrates the proponent's current lack of knowledge on the subject due to insufficient background research on existing west coast operations, prior to the consultative meetings. The Vasco De Gama (then the largest trailing suction hopper dredger in the world) did trials in two company's diamond mining licences. In one of these trials the marine sediments were removed and deposited onshore for processing through a land-based diamond plant. This process is precisely the same as that proposed by the phosphate industry. Furthermore, detailed environmental studies (including plume studies, effects on benthic fauna, fauna recovery rates based on control blocks etc.) were completed concurrently and are freely available at MET and are thus at the steering committees immediate disposal. These data by far supersede mathematically modeled results using inputs from short term monitoring of baseline conditions with no real phosphate mining condition inputs in

existence to draw from. Does it make sense to spend 100's of millions of dollars on collecting data over a 2 year period to feed a model which gives a result that is far less scientifically constrained and significant than "real-time" information that is free and currently available?

THANK YOU FOR YOUR PARTICIPATION

All relevant documentation will be placed on the web-site:
http://www.nodc-namibia.org, under NAMSEAP
Please be sure to visit the web-site to stay informed as the project progresses.

Strategic Environmental Assessment of the Cumulative Impacts on the MarineEcosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

Title, Initial & Surname: Mr G. Rau	Telephone: (061) 386100
Organization: LL Namibia Phosphates	Fax:(061) 249253
Designation:Chief Geologist	E-Mail:grant@sakawe.com
Postal Address/City: P.O.Box 3498, Whk, Namibia	

My interest in project: Key Stakeholder, Mining Licence (ML159, EPL3946) holder

COMMENTS:

1. With respect to the last I&AP meeting in Swakopmund, LLNP would like to note that the question regarding the shareholding of the phosphate mining companies was totally inappropriately dealt with for the following reasons:
   a) The question is not relevant at all to the Sintef study or work packages and therefore the chairman should have responded as such to the IAP and not allow this question at all. The fact that this question was allowed by the Chairman and subsequently not answered by the phosphate companies, left an atmosphere of the phosphate companies trying to hide something.
   b) The shareholding of the phosphate mining companies is publically known and the delegates at the meeting are under no obligation to respond to this type of question that has nothing to do with the meeting or Sintef's work packages. If the phosphate company's shareholding is to be discussed then why restrict it to that, why not then go into all other stakeholders' shareholding including fisheries, diamond mining, oil and gas and all other operators, working in the Benguela ecosystem.
   c) Lastly that Dr Serigstad should then strongly accost the phosphate industry delegates and say that "they are here in the audience and should answer" and state that "the process is not starting off well and that the phosphate industry should be transparent" in front of all the I&AP was not professional and suggests bias toward the industry by the Sintef experts and would be equally perceived as such by all the I&AP sitting in the audience.Sintef was very unprofessional in the manner in which they entertained this exchange which is not relevant at all to their work packages and scope.

   The phosphate companies were not holding the I&AP meetingand therefore are not required to respond to questions from the audience. This process was punted from the outset, by Dr Solbakken, as being a fair process and that they were not against any specific industry. This message certainly was not demonstrated by the scientific team in this encounter and draws suspicion as to the fairness of the whole Sintef proposal and future scientific evaluation.

THANK YOU FOR YOUR PARTICIPATION

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Swakopmund Matters

Crucial decision by New Zealand's Environmental Protection Agency regarding marine mining

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New Zealand's Environmental Protection Agency (EPA) refused a mining consent application to Trans-Tasman Resources Ltd - the company proposed to excavate up to 50 million tonnes of sand per year from the seabed around 30 km offshore.

The EPA outlined that the decision was made mainly due to the uncertainty around the scope and significance of the potential adverse environmental effects, and those on existing interests, such as the fishing interests.

Trans-Tasman Resources could not overcome technological hurdles and fears among scientists and environmentalists that mining could destroy fragile fisheries and exotic creatures at the bottom of the ocean.

Its Chief Executive, Tim Crossley, said the company was extremely disappointed with the decision. "We have put a significant amount of time and effort into developing this project including consulting local communities and undertaking detailed scientific research to assess environmental impacts of the project,"

However the lobby group Kiwis Against Seabed Mining (KASM) saw this as a huge victory for New Zealand's environment. KASM Chair Phil McCabe said:

"This decision is a victory for common sense and environmental protection".

Trans-Tasman Resources hoped to have started mining in 2016 as it already had a mining license, but needed the marine consent from New Zealand's EPA.

This was the EPA's first test of regulating mining in the country's territorial waters. Its next is an application from Chatham Rock Phosphate Ltd, seeking to mine phosphate several hundred kilometres off the east coast of the South Island.

In the Executive Summary of the decision the EPA made these remarks:

"The uncertainties in the scope and significance of the potential adverse environmental effects, the lack of confidence we find in the extent to which existing interests will be appropriately taken into account, the lack of clarity about the extent of economic benefit to New Zealand outside of royalties and taxes and the economic value of the adverse effects, cannot be remedied by the imposition of other lawful conditions that we could require based on the evidence before us.

In summary, on the evidence presented, we are not satisfied that the life-supporting capacity of the environment would be safeguarded or that the adverse effects of the proposal could be avoided, remedied or mitigated, nor do we consider that the proposed conditions (including the adaptive management approach) are sufficiently certain or robust for this application to be approved, given the uncertainty and inadequacy of the information presented to us about the potential adverse effects.

Overall, we think this application was premature. More time to have better understood the proposed operation and the receiving environment and engage more constructively with existing interests and other parties may have overcome many of the concerns we have set out in this decision. It is conceivable that at least some of these matters could have been addressed contemporaneously with the other investigative work the applicant undertook prior to lodging the application for consents. Ultimately, the information upon which we had to make our decision, while voluminous, was too uncertain and inadequate, and we did not have sufficient confidence in the adaptive management approach proposed

to address that uncertainty and inadequacy to enable the activity to be undertaken. For all of these reasons, the application as presented to us does not meet the sustainable management purpose of the EEZ Act".

The full document (248 pages) on the decision as released by the EPA can be accessed with this link:

http://www.epa.govt.nz/EEZ/trans_tasman/decision/Pages/default.aspx

The significance of this decision and the reasoning behind it should not escape the minds of those in Namibia who have an equally important task in protecting and preserving Namibia's marine environment and its resources.

Swakopmund Matters

18 June 2014

(For *Swakopmund Matters* the environment of the Namibian coastline and its ocean matters)

Strategic Environmental Assessment of the Cumulative Impacts on the Marine Ecosystem from Bulk Seabed Mining of Industrial Minerals, specifically Phosphates, off the Namibian Coast

REGISTRATION and COMMENTS

Please send by Fax: +264 64 404385, or E-Mail: seabed.ea@gmail.com

Title, Initial & Surname: Ms Heidi Potgieter	Telephone: 081 302 5207
Organization: Feike Resource Management Advisers	Fax:
Designation: marine environmental lawyer	E-Mail: hcurrie@feike.co.za
Postal Address/City: Swakopmund	

My interest in this project:

as a concerned Namibian citizen, regarding the meaningful protection & management of our country's finite, living, natural resources

COMMENTS:
Please use this space for any comments, or matters of concern.

It is time our government took their international – & national legal obligations, to conserve & protect the environment, seriously. Constitutional, environmental democracy requires that the mining companies & other dominant, financial interests take account of the real well-being of the majority of Namibian citizens. Fair & meaningful Transparency is crucial.

THANK YOU FOR YOUR PARTICIPATION

All relevant documentation will be placed on the web-site:
http://www.nodc-namibia.org, under NAMSEAP.
Please be sure to visit the web-site to stay informed as the project progresses.

Cdr T.J. Van Niekerk
Superintendent Maritime Safety Information - SA Navy Hydrographic Office

In terms of results and data gained from any survey operations conducted in the area of interest, we as the South African navy Hydrographic would be interested in any data from any surveys conducted. We are responsible to chart the Namibian coastline and adjacent areas. We will therefore be grateful for any relevant data, which could impact on existing charts.
Further, this office must be informed of all survey operations in order for us to send the relevant navigational warnings to warn other mariners of potential dangers.

Paolo Esposito | Special Counsel

International
Mining & Dredging
Holdings

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With reference to your email below, we kindly request you to keep us informed as to the development of the EAP. Our operations manager Mr Lappas already requested registration as IAP for the Pilot Study, having our Namibian subsidiaries interests in EPLs for heavy minerals (including phosphates).

In view of the said circumstance, and while we are unable to submit any comment at present (being our survey data being still under evaluation and the feasibility of the mining operations therefore not been fully assessed), we request to inform us of any development in the aforementioned matter, which will directly affect our phosphate operations and forthcoming business strategy.

Mr. Woodborne

Namibian Marine Phosphate (Pty) Ltd 30 June 2014-10-31

1. Requests for comments on the scope and content of the proposed study and specific work packages as presented by Sintef, has been invited. In this regard, it is our position that an additional work package providing an assessment of the socio economic impacts of the marine phosphate industry in the Namibian economy must be included as an essential component for the proposed studies. Socio economic information on the fishing industry was already provided in the Background Information Document circulated by the proponents. The rationale to exclude such a study on the basis that it is not yet an ongoing concern is fundamentally flawed. If the strategic environmental assessment to be done by Sintef does not provide the Government of Namibia with all the information required to make a balanced strategic decision then it will then fail to meet its mandate of delivering a complete strategic assessment.
2. Is the EIA process that Ministry of Fisheries and Marine Resources has registered being rununder the guidance and direction of the Ministry of Environment and Tourism? If so, can full details be provided of the exact process and timelines that will be followed to completion andsubmission of the final documents?
3. It has been stated that the purpose of this study is to assess the cumulative impact on the ecosystem. Given that there are trans-boundary issues related to certain components of the ecosystem, such as fish stocks, currents etc., can you define exactly where the boundaries of the study are to be and why?
4. Referring to work package 4 and work package 8, it has been stated that Sintef will intend todefine an environmental baseline that will effectively also include the current effects of the existing marine diamond mining industry and the fishing industry. Sintef have also noted the intention to carry out modelling of the anticipated plumes from dredging of the marine phosphate material using the DREAM modelling software. It is already well established that trawling also generates a substantial disturbance and sediment plume on the seabed. The work packages need therefore to include a detailed study of the seabed disturbance and plumes generated by the existing seabed trawling activities in order to determine the ranges of key parameters such as toxicity, dissolved metals, suspended sediment, hydrogen sulphide release, bacterial disturbance etc. that the ecosystem and environment are currently being exposed to in the vicinity of the proposed mining activities as well as in the defined area of the ecosystem to be included in this study.
5. Regarding work package 8, it was stated that Sintef will be putting forward a set of recommendations for operational thresholds and levels of various contaminants. Will these recommended contaminant thresholds and levels be applicable then to all sectors operating in the marine environment or are they intended to be applied solely to marine phosphate mining. If so, then why?

Baobab Equity Management (Pty) Ltd.
6 Luther Street, Unit No. 4
Windhoek
Namibia

Baobab Equity Management (Pty) Ltd.
Jerome Kisting, Managing Director
30 May 2014

jerome@baobabcapital.ca

30 May 2014

The Chairperson
Namibia Seabed Environmental Assessment Project
National Marine Information and Research Centre
P. O. Box 912
Swakopmund
Namibia

Dear Sir/Madam:

Baobab Equity Management would like to submit the following letter as our position for on the environmental assessment stakeholder consultations scheduled for June 2 – 5, 2014.

We propose that the project consider the following:

1. The Technical Steering Committee include the following stakeholders a) MFMR, b) MET, c)
MME, d) Chamber of Mines, e) Confederation of Fishing Associations (or Hake Association), f) Benguela Current Commission (BCC) and the marine phosphate Mining License and EPL holders. The objective of the committee would be to use the best available, and as far
feasible to generate new scientific information and data (including social and economic) to determine whether marine fishing and phosphate mining can co-exist. The specific functions/ tasks of the TC could include;
a. Compile and consolidate all available baseline information and data from fishery and environmental/ oceanographic surveys, EIAs carried out on the marine environment (not only marine phosphate but others of relevance/ geographic overlap). This will result in an extensive inventory of data with remarks about availability, quality, validity, accessibility, frequency of generation, etc. (i.e. metadata). Based on this inventory the TC can agree if the data is sufficient for an EIA of marine phosphate operations or not;
b. Review all available information and data and reach consensus on; i) the existing baseline and its status (i.e. complete, incomplete, etc.), ii) important existing

information and data gaps that need to be met within the moratorium timeframe for due consideration of the EIAs and the TC's process, iii) the responsibilities, resources commitments and timeframes to achieve certain results to firm up the baseline. The latter would have benefits for both public and private sector as, the public would benefit from an improved knowledge base about the seabed environment and the data generated by the private sector to upgrade the baseline. The private sector would benefit from more exploration sampling to determine ore volume and extent and thus the feasibility of mining.

c. Determine the current and future feasibility of the hake industry by using available abundance, landings, catch-per-unit of effort (CPUE) and other data. This would also entail looking in detail at the social and economic contribution the hake industry makes annual and projected for 5 to 10 years (to be in line with mining projections to determine feasibility). Scientists could also ascertain the impact from this fishery on the ecosystem using historic and cumulative catch analysis and attaching a monetary value to that. This would enable comparing the social and economic feasibility of hake fishing to marine phosphate mining as it would show indicators such as employment, average income per employee (relating to the Gini coefficient), GDP and export earnings contributions, and the multiplier effect (i.e. based on average household size the total number of people potentially benefitting from employment in fishing or mining.

d. Compare the feasibility analysis of mining to that of fishing and, based on the rigorous and objective analysis, to note the specific areas of the analysis where one sector shows more potential than the other for sustainability and to meet ecological, social and economic goals. This is crucial so that the TC can demonstrate a knowledge-based approach to the analysis, outcomes and subsequent recommendations.

2. To ensure scientific rigour in the analysis and transparency of this process, the BCC could attract one or more international experts as independent facilitator(s) and reviewer(s) of the process. Given Norway's relationship with Namibia and their experience with the co-existence of oil production and fishing may offer such skill and expertise.

3. The main aim of this process is to determine if the sectors can co-exist given the seasonality of fishing and the mere expanse of sea between the mining area and the fishing grounds. Specifically it would aim; a. To safeguard current social and economic benefits by proposing practical ways to secure current employment or to enable absorbing people in alternative employment, e.g. if the sectors cannot co-exist and a trade-off is accepted;

b. To safeguard the living marine resources at all costs, the backbone of the fishing sector. This process could find that by substituting marine phosphate mining with hake fishing could result in more employment, greater macro-economic benefits over a longer period of time and, the recovery of the hake fishery in the absence of any or limited fishing. Hence the study would aim to be genuinely cutting edge and innovative in finding sustainable development solutions that suite our context and situation;

c. To foster partnership among sectors, fishing and mining, and between the

government and the private sector. The end result could be more cooperation for development of Namibia and the benefit of its people instead of sector competition and finger pointing. In addition, the government could recognise the private sector as a meaningful development partner that contributes immensely to meeting environmental, social and economic goals. Vision 2030 would become an easier milestone to reach when MFMR, MET and MME take a different approach through this process to demonstrate partnerships with the private sector.

4. Examine approaches and experiences in other jurisdictions. We are aware of two environmental consent applications currently under review in New Zealand by that country's Environmental Protection Authority. The one application is a marine phosphate mining application involving a company called Chatham Rock Phosphate (www.rockphosphate.co.nz) while the other is a marine iron ore mining application submitted by Trans Tasman Resources. The Chatham application is a 452 page document which represents four years of research and an investment of $25 million. It will be available on the New Zealand Environmental Protection Authority's website from 12 June 2014 and can be accessed at www.epa.govt.nz . The expected duration of the review process is six months.

The most exciting component of their efforts to ensure the co-existence with the environment has been their work with NIWA (National Institute of Water and Atmospheric Research) in New Zealand to develop a spatial planning process that identifies areas of the ocean with high biodiversity or resource potential and supports development decision that balance conservation and economic benefit. We believe the work of Chatham, NIWA and its partners have done can serve as a test case to investigate the methodology used and what implications it has for Namibia's own policies related to marine spatial management, broadly, but more specifically for marine phosphate mining that co-exists with the conservation of marine biodiversity.

Yours sincerely,

Jerome Kisting
Managing Director
Baobab Equity Management (Pty) Ltd.

On Mon, Jun 16, 2014 at 4:20 PM, Jerome Kisting <jerome@baobabcapital.ca> wrote:
Dear Administrator,

Please see information below regarding the developments in the marine consent application filed by Chatham Rock Phosphate for seabed mining off the coast of New Zealand.

Please let me know if you require any information or assistance connecting with the New Zealand EPA.

Regards,

Jerome Kisting

---------- Forwarded message ----------
From: **Jerome Kisting** <jeromekisting@gmail.com>
Date: Mon, Jun 16, 2014 at 11:17 AM
Subject: Fwd: How to support CRP's marine consent application
To: "jerome@baobabcapital.ca" <jerome@baobabcapital.ca>

Jerome Kisting

Alternate email: jerome@baobabcapital.ca

twitter: @townshipcrier

Linkedin: http://www.linkedin.com/pub/jerome-kisting/7/82/588

---------- Forwarded message ----------
From: **Chris Castle** <chris@widespread.co.nz>
Date: Mon, Jun 16, 2014 at 8:06 AM
Subject: How to support CRP's marine consent application
To: Chris Castle <chris@widespread.co.nz>

How to support CRP's marine consent application

The Chatham Rock Phosphate marine consent application is now open for public submissions. As a shareholder you can help our application succeed by making a submission in support. Groups opposed to our application will be asking their supporters to submit, so we're encouraging our shareholders to have their say.

We've included below a summary of key benefits of the project, which might help you with some ideas as to what to say. Below is some information from the Environmental Protection Authority website to make the process as easy as possible for you.

The EPA says a submission is not a vote for or against an application; it's what your submission says that's most important – not how many people say the same thing.

Further guidance is available from the information sheet 'How to make a submission on an EEZ marine consent'. **See the submission information sheet**

The EPA must receive submissions no later than **5.00pm (New Zealand Standard Time) on Thursday 10 July 2014**. To make your submission using the online form click **Online submission form** . You can attach a Word or pdf document at the end of the online submission form if you want to add further information.

Please note you must complete the online submission form **within half an hour** or it will time-out, in which case you will need to fill out the form again from the beginning.

Alternatively you can email, post or deliver a submission using this Word document Submission form (Word, 200 kb) It must reach the EPA and CRP before **5.00pm on Thursday 10 July 2014 by email, post or delivered in person.**

If you're emailing, send to **CRPapplication@epa.govt.nz** and format the subject line of your email with your name and Chatham Rock Phosphate Submission. If you email your submission to the EPA, it'll be automatically forwarded to CRP.

Alternatively the postal address is - Environmental Protection Authority, Private Bag 63002 Waterloo Quay, Wellington 6140 and if you deliver in person take it to Environmental Protection Authority, Level 10, 215 Lambton Quay, Wellington

If you're posting you'll also need to send to - Attention: James Winchester, Chatham Rock Phosphate Limited, C/-Simpson Grierson, PO Box 2402, Wellington 6140, New Zealand.

If you're delivering in person please mark it - Attention: James Winchester Chatham Rock Phosphate Limited, C/-Simpson Grierson, Level 24, 195 Lambton Quay, Wellington New Zealand.

If you need further information to guide you in preparing your submission check out **'Having your say about an activity'** If you have questions about making a

submission or don't understand parts of the submission form, please email **CRPapplication@epa.govt.nz** or phone 0800 382 527 or +64 4 916 2426 if calling from overseas.

Information about our Marine Consent proposal

Chatham Rock Phosphate (CRP) has now applied for an environmental marine consent to undertake seabed mining at 400 m water depth, about 250 km from the Chatham Islands and 450 km from the South Island.

The marine consent process has a six-month prescribed timeframe so interested parties can make submissions and be heard at public hearings. The EPA has appointed a panel of experts who will base their decision on the scientific evidence they hear. Environmental considerations are balanced against economic benefits. Assuming we receive consent at the end of the year we expect to start production in 2017.

Background

To recap, New Zealand scientists discovered the rock phosphate resource on the crest of the Chatham Rise in the 1950s. Mining the resource has only become viable with the rising price of phosphate and advances in marine technology. CRP has identified at least 35 million tonnes within the mining permit area – more than a 20-year supply at expected production rates.

While we have applied for a large area we are proposing to mine an average of just 30 km^2 a year – the equivalent of what the fishing industry bottom trawls in just 8 hours.

Our technical partner, international dredging company Boskalis will use conventional dredging technology attached to a long pipe to suck the top 30 cm of sandy silt up to a

large mining vessel. Mechanical sieving will separate the phosphate nodules (2 to 150 mm in size) and discharge the finer sand and silt from another flexible pipe near the seabed**. No chemicals are involved.**

CRP has spent more than $20 million on scientific research, including six CRP-funded surveys to the Chatham Rise. We have a highly skilled technical team (including three scientists who collected and interpreted most of the data in the 1970s and 80s) and our focus has been to:

- evaluate the likely environmental impact of the project
- identify ways to minimise and monitor effects
- define the resource and develop a mining plan

Stakeholder involvement has been central to the project. After talking to anyone with a potential interest (including environmental groups, the fishing industry, iwi and imi, media, etc) we've identified and investigated their concerns and provided information and mitigation options.

Environmental benefits

The project will have localised environmental effects on the seabed within our permit area but will also have significant environmental benefits. Some arise from substituting our product for phosphate fertiliser now sourced from Morocco and other distant locations.

The benefits of using local phosphate include:

It reduces water pollution from run-off when used as a direct application fertiliser because it releases slowly, requiring less frequent applications than conventional fertilisers, further reducing its carbon footprint

- **It's an organic New Zealand-origin product**
- **It offers security of supply**
- **It'll reduce the carbon footprint by lowering transport distances**
- **It has one of the lowest known concentrations of cadmium of any phosphate rock, which will help prevent cadmium accumulation in New Zealand soils, which in some areas is already at high levels**

- **The rock is highly reactive, heightening its effectiveness as a fertiliser, and has strong liming qualities**.

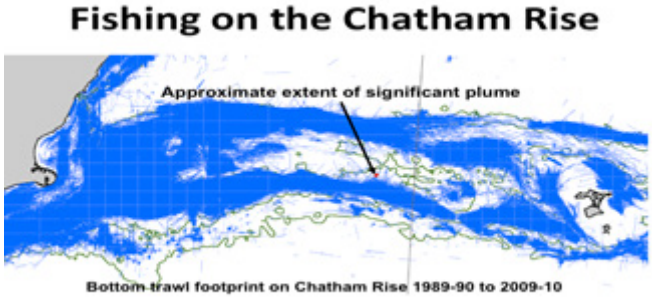
Benefits for NZ and Chatham Is

CRP expects to sell the product to New Zealand and export to at least eight countries in the Asia-Pacific. The project also has significant economic benefits, including making New Zealand $900 million richer, according to the New Zealand Institute of Economic Research.

It will have particular benefits for the Chatham Islands. We'll be able to supply cheap fertiliser; little is applied there because of prohibitive transport costs. Chatham's Federated Farmers representatives estimate fertiliser could increase farm production 10-fold and add 350 new jobs. Given the current population is below 600, that increase in farm production could transform the local economy and improve the affordability of infrastructure such as power and transport.

What about fishing concerns?

Our mining permit area – covering less than 1% of the Chatham Rise - is not a fishing area. The research predicts sediment effects will be confined to a few kilometres of our mining area, about 250 km from the Chatham Islands.



The Deep Water Fishing Group is concerned about possible impacts on commercial fishing. The key environmental effect will be sediment plume from the return of the fine material to the sea floor.

Modelling predicts those sediment plume effects will be very localised, with sensitive organisms affected up to 7 km from the mining ship. Scientists predict silt and clay concentrations higher than 100 mg per litre will last for no more than a few days in the immediate mining area. Sediment won't rise more than 50 m above the seabed – well below the most biologically productive part of the water column where most fish are.

Chris Castle

Chief Executive Officer

Chatham Rock Phosphate Limited

Email: chris@crpl.co.nz

Cell: +64 21 558 185

Skype: phosphateking

www.rockphosphate.co.nz

RE: NAMIBIA CHAMBER OF COMMERCE AND INDUSTRY (NCCI) STAKEHOLDER COMMENTS/ INPUTS TO THE PROPOSED STRATEGIC ENVIRONMENTAL ASSESSMENT OF THE CUMULATIVE IMPACTS ON THE MARINE ECOSYSTEM FROM BULK SEABED MINING OF INDUSTRIAL MINERALS, SPECIFICALLY PHOSPHATES, OFF THE NAMIBIAN COAST

1. INTRODUCTION

NCCI mission is to promote business for economic development in Namibia. The NCCI Luderitz Branch is focusing on business and economic development of the town. NCCI was aware from the start of the exploration for marine phosphate and its possible contribution to business and economic development of the town. This is happening when the businesses which sustained the town of Luderitz is stagnating. Both fisheries and marine diamond mining in Luderitz are currently stagnant. NCCI therefore wants to put forward issues which should be considered in the study.

. **OBJECTIVES OF THE STUDY**

The objectives of the study should not be to stop or delay the mining of marine phosphate and other industries associated with it. The main objective should rather be to find ways how to mine it without negatively affecting the other existing industries such as fishing, diamond mining, tourism, etc.

3. SOCIOECONOMIC ISSUES

This study seems to be biased against marine phosphate mining. The fact that it is suggesting that the proposed Environmental Assessment will not cover socioeconomic issues of marine extractive industries is an indication of biasness. Therefore, NCCI strongly object to this exclusion because it will provide a bias and skewed results in the assessment. Why is the study in its current form covering the socioeconomic issues of fisheries? This study in its current form does not present a complete picture of the role of the marine environment to the socioeconomic landscape of Namibia which can only be achieved if all the facts are present equally.

We therefore propose that the socioeconomic benefits of phosphate mining be fully covered in the study.

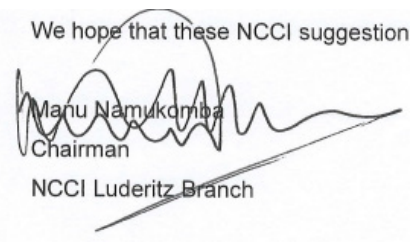
4. The study should further cover the effects to the environment of other industries such as trawling, diamond mining, fishing industries, etc. It is on when we can assess the cumulative effect of phosphate mining.

5. The other issue is how to study the effects of phosphate mining when no such mining is taking place. This will render the study to be nothing but a desk-top study rendering it to be easily twisted to be biased.

It is our proposal that phosphate mining should be allowed to take place with certain conditions in order to be able to quantify its effects on the environment.

We hope that these NCCI suggestions should be fully taken into account.

Signed:



Mr G. Murta Mariculture industry 26 June 2014
I would like to have obtain some clarification on the pilot study that was presented and if possible understand how phosphate mining can affect aquaculture industry (positive/negative).

- I would like to understand what will be the output of the pilot study and study. From what I understood from the meeting I attended in Swakopmund, there will only be delivered a “master plan” with information of what needs to be studied and what is already available. Is this idea correct or for example there will be outputs from the modelling interpretation regarding what mining will be allowed or not allowed. What levels of contaminants can be critical in the water column to threatening the aquaculture industry?

- My second question would be regarding the model, what information can be obtained concerning the impacts in aquaculture farms. As you are aware there are two main aquaculture locations in Namibia, that is Walvisbay and Luderitz. Mostly aquaculture is done at the bays, yet there are already farmers extending the production to offshore locations and other farmers swapping between walvisbay and luderitz due to natural events. Will this model have in consideration the sensitivy of the filter feeders that are produce locally?

From: **Namibian Dolphin Project** <nam.dolphin.project@gmail.com>
Date: Mon, Jun 30, 2014 at 10:12 PM
Subject: Re: IAP comments to Pilot Study to assess ecosystem impacts from phosphate mining
To: Administrator <seabed.ea@gmail.com>, simon elwen <simon.elwen@gmail.com>

Dear Sir/ Madam .

Sorry for the late response. In relation to the project, we would like to represent the interests of the cetacean (Whale and Dolphin) community. As key members of the ecosystem they can be affected greatly by ecosystem change and many stocks are still recovering from commercial whaling. There is a high density of dolphins (Heaviside's, dusky, and some bottlenose) in the inshore region in Luderitz, and in the offshore region there are large data gaps, making baseline data collection crucial. We therefore recommend that baseline monitoring includes surveys and /or passive acoustic monitoring for cetacean density and distribution using moored hydrophones.

Please do contact me if you would like further information regarding this recommendation.

Kind regards,
Dr Tess Gridley - Namibian Dolphin Project

Appendix J

Responses to Comments and Concerns

Responses to Comments and Concerns Received in Writing during/after theMeetings in Swakopmund and Lüderitz in June 2014.

Answers/comments to Dr. J. Kemper

The comments on seabirds are received and will be considered in the Pilot Project while specifying the content of the Main Project.

Comments to David Russell:

Your comments and viewpoints regarding fishing are received and will be considered in the Pilot Project while specifying the content of the Main Project.

Answers to J.J. Midgley

Answers/comments to PDF 001:

Roar Solbakken (SINTEF) is the EAP

Answers/comments to PDF 002:

- The Environmental Management Act (2007) does not contain any provision or condition for EAPs;
- The EIA Regulations 2012 includes the cited clause;
- The TSC intends/has agreed to advise the competent authority (MFMR) and the Environmental Commissioner to include a Namibian EAP as associate of the international EAP in the further SEA process

Answers/comments to PDF 003:

Noted; referred to committee

Answers/comments to PDF 004:

Noted, referred to committee

Answers/comments to PDF 005:

With reference to the Environmental Management Act 2007, please note that section 36(1)(c) use the word "may" in the context of "public hearing"

Answers/comments to PDF 006:

Noted, referred to committee

Answers/comments to PDF 007:

Your additional and concise information is noted with appreciation.

Answers/comments to PDF 008:

Regarding extraction methods and rate, of course this is interesting and necessary information regarding input modelling. We look forward to receive information on this topic. Belongs to the Main Project.

When it comes to bottom trawling and diamond mining, these are existing industrial activities what have been running for decades. Bottom trawling and diamond mining will of course influence the seabed. It is not possible to move back in time to the pre-fishing and/or pre-diamond mining ages. This means that the baseline studies/measurements will include the impact of these existing industries. Thus, the baseline studies will give pre-phosphate bulk mining data, and pre-phosphate land based processing activities for the marine ecosystem off the Namibian coast.

Answer/comments to PDF 009:

Noted, referred to committee

Answer/comments to PDF 010:

This doc is read, we have no comments except that we have the understanding that there is a monitoring program during the ongoing dredging activities in the Port of Walvis Bay.

Answer/comments to PDF 011:

No particular comments, except that pre-mining data/baseline data will include possible impacts of all existing activities. Baseline data means all data before marine seabed bulk phosphate mining activities and the following land-based phosphate processes on the marine ecosystem. Referring to comments for PDF 008.

Answer/comments to PDF 012 to 016:

Noted, referred to committee

Answer/comments to PDF 017:

Your comments regarding meetings with industry scientists are acknowledged, however the mining industry had the opportunity to come with scientific input during the consultative meetings for the industries in Lüderitz and Swakopmund in June 2014.

Answer/comments to PDF 018

Noted, referred to committee

Answer/comments to PDF 019:

Your comments regarding the BID document are acknowledged.
Food safety is a separate task focusing on potential contamination of the seafood. Socioeconomic aspects are not within the scope of the Pilot Project/Main Project.
We agree that the Norwegian oil/gas operations are different from marine bulk phosphate mining operations. The purpose with the Norwegian example was to show that knowledge and relevant data are essential for developing good management plans to enable co-existence between different industries. Additionally knowledge is essential to develop good control and audit systems.

Answer/comments to PDF 020:
Noted, referred to committee.

Answers/comments to Chamber of Mines Mr. V. Malango

1. The EAP appointed by MFMR is SINTEF, project leader Roar Solbakken.
2. The Pilot Study will not produce results or recommendations.
3. Socio-economic assessment is not included in the Pilot Study.
4. The proponent is the marine ecosystem, examining only impacts (from the proposed phosphate mining) on the system. Information on phosphate mining is assumed to have been made publicly known already, as licences (exploratory and mining) are publicly listed/awarded.
5. Referred to committee: the interministerial steering committee is appointed according to Cabinet Directive.
6. Referred to committee: the scoping report will follow required procedure for environmental assessment.

Answers/comments to Crispin Clay

Add question:
SINTEF is a multidisciplinary organization with experts on physical and biological oceanography being experienced in monitoring and modeling of the marine environment. Our researchers have carried out marine environmental and impact assessment studies on commission for Norwegian authorities, municipalities and industries, including Norwegian mining industry. IMR's main task is to provide advice to Norwegian authorities on aquaculture and the ecosystems of the Barents Sea, the Norwegian Sea, the North Sea and the Norwegian coastal zone. The aim of research and management advice provided by IMR is to ensure that Norway's marine resources are harvested in a sustainable way. The Institute is heavily engaged in development aid activities through the Centre for Development Cooperation in Fisheries.

1. For further information:
    a. http://www.sintef.no/home/SINTEF-Materials-and-Chemistry/About-us/Departments/Environmental-Monitoring-and-Modelling/
    b. http://www.sintef.no/home/Fisheries-and-Aquaculture/Topic/Marine-Resources/Competence-and-services/
    c. http://www.imr.no/radgivning/en
    d. http://www.imr.no/forskning/utviklingssamarbeid/en
    e. http://www.mareano.no/en
2. The representatives from the SINTEF-IMR team attending the public consultations in June 2014 were:
    a. Roar Solbakken, Senior advisor SINTEF, specialist in nutrition, food safety, geology and the marine environment. Roar.Solbakken@sintef.no
    b. Johanne Arff, Laboratory manager/Research scientist SINTEF, specialized in marine science having thorough experience from physical, chemical and biological monitoring of the marine environment. Johanne.Arff@sintef.no
    c. Bjørn Serigstad, Researcher IMR, specialized in marine science having senior experience from both the oil and gas industry and marine ecotoxicological studies. Bjorn.Serigstad@imr.no
3. The pilot project is financed by the Ministry of Fisheries and Marine Resource.
4. Please refer to draft report from the Pilot Project to be delivered during the fall.
5. SINTEF and IMR are commissioned as independent organizations and will not have any opinions on political matters.
6. Not within the scope of the Pilot Project.
7. Not within the scope of the Pilot Project.
8. No comments.
9. Not within the scope of the Pilot Project.
10. No comments.

11. The purpose of the Pilot Project is to develop the technical specifications for a marine baseline study describing the pre-mining environmental situation (i.e. proposed Main Project). The results from the Main Project will be the basis for an informed decision on wherever Namibia will allow for marine phosphate mining or not.

Answers/comments to LLNP dated 20140603:

Add comments/queries no.:

1. Your comments regarding the BID document are received. Socioeconomic aspects are not within the scope of the Pilot Project/Main Project.
2. Please refer to draft report from the Pilot Project to be delivered during the fall.
3. Referring to your question in this section; it is not within the scope of the Pilot Project nor the Main Project.
4. The purpose of the Pilot Project is to define the content of a Main Project. Models that can predict the environmental impact factor will be included in the Main Project (please refer to Arff's presentation http://www.sintef.no/home/Fisheries-and-Aquaculture/Projects/2014/Environmental-Impact-Assessment-off-NAMIBIA--a-pilot-project/).
5. Your comments are received. As far as we are informed there is yet no large scale mining of marine phosphates and there is no knowledge or experience on how marine phosphate mining will influence the marine ecosystem.
6. Not within the scope of the Pilot Project nor the Main Project.
7. Socio-economic studies are not within the scope of the Pilot Project nor the Main Project. Your comments on MPAs are received and will be considered in the Pilot Project while specifying the content of the Main Project.
8. The purpose of the Pilot Project is to define the content of a Main Project that will include a pre-mining environmental study (please refer to presentations held by Solbakken, Arff and Serigstad http://www.sintef.no/home/Fisheries-and-Aquaculture/Projects/2014/Environmental-Impact-Assessment-off-NAMIBIA--a-pilot-project/).
9. Your input is received.

Answers/comments to LLNP Mr. Rau

1. Your comments are received. All available data will be inspected for the studies.
2. The Main Study will be planned to investigate all aspects thoroughly.
3. Your comments are received and noted.
4. Your comments are received. The Main Project will realistically consider cumulative effects from extraction and processing.
5. Your comments are received and noted. The Main Project will realistically address the additive impact of phosphate mining to other impacts.
6. Detailed work packages will be outlined in the Main Study. Comments forwarded to steering committee: Procedural information as required according to regulations will be in the scoping Pilot Study report.
7. Past data will be accessed and inspected. Future collection of data will fill gaps needed for purpose of environmental assessment of impacts from phosphate mining of the seabed.
8. Thank you for your information. The available information will be inspected for the pre-mining environmental study.
9. Noted

Answers/comments to Swakopmund Matters

Your comments noted. The Pilot Study and Main Study is looking only at the Namibian EEZ.

Answers/comments to Heidi Potgieter

Your comments noted.

Answers/comments to Commander T.J. Van Niekerk
Superintendent Maritime Safety Information - SA Navy Hydrographic Office

Received and noted.

Answers/comments to Paolo Exposito, International Mining and Dredging Holdings

Received and noted.

Answers/comments to Namibian Marine Phosphate Mr. Woodborne

1. Socio-economics are not included in the study for which SINTEF is contracted.
2. Referred to committee: Procedure will be according to the regulations.

3. The boundaries are Namibia's EEZ. The study is contracted for Namibia only.
4. The pre-environmental study will include all present impacts.
5. The recommended thresholds etc. will be associated to mining and processing of phosphate and will be recommendations only. The Government of Namibia will decide the implementation.

Answers to Jerome Kisting Baobab Equity Management (Pty) Ltd (meetings submission)

1. The interministerial steering committee will steer only and not perform the tasks of compiling and examining data: This will be carried out by the contracted party on the Main Study.Socio-economic aspects will not be analysed: the project examines ecosystem impacts only.
2. There will be strict validation and quality control of data used in the Main Study
3. Co-existence of different sectors requires a strong scientific basis: this is the aim of the Main Study
4. There is as yet no established knowledge resulting from impacts observed from phosphate mining anywhere in the world. The Namibian environment will be specifically studied in this regard.

Answers/comments to Jerome Kisting (post-meeting submission)

The study will be dedicated to Namibian seabed mining only. The Clatham Rock Phosphate procedure is received.

Answers to Chairman NCCI Manu Namukomba

1. Co-existence may be achieved based on good science
2. Impacts from other industries will be included in sections 2.1-2.3
3. Socio-economics are not included in this study
4. The ways to assess impacts before any mining activity takes place are possible through the proposed studies.

Answers/comments to G. Murta, Mariculture

The Pilot Study outlines the Main Study that will be needed to assess the impacts. No results are given in the Pilot Study.

In the Main Study modeling can be used to model hotspots e.g. mariculture sites. Threshold and critical levels will be determined in the proposed toxicological studies in the Main Study.

Answers/comments to Namibian Dolphin Project.

The comments on cetaceans are received and will be considered in the Pilot Project while specifying the content of the Main Project.

Appendix K

Work Scope and Methodology

Work Scope

This Scoping Phase or Pilot Project as it has also been referred to will:

- Develop the Main Project tasks or work packages
- Describe the scientific content of the Main Project, which will
  - Assess pre-phosphate mining state of the marine environment off the Namibian Coast
  - Cover all seasons: this will involve field studies and laboratory analyses/tests
- Calculate the costs of the Main Project.

The work packages are described in the Report

Methodology

The content of the work packages for the report was derived from:

- A cursory evaluation of the research done in the Namibian Marine Ecosystem to date
- A cursory evaluation of the available data from research done in Namibia
- The inputs from the public meetings held with various institutions, industry players and the general public
- The experience of the team of scientists that make up SINTEF and IMR
- The current technological capabilities of SINTEF and the Namibian Government Ministries

Appendix L

Metadata

Metadata received from MFMR on:	Provided by
ADCP on RV Mirabilis	Dr. Anja van der Plas
Automatic weather station in Swakopmund	Dr. Anja van der Plas
Demersal resources	Mr. Paul Kainge
Environmental surveys in Lüderitz area	Ms. Kolette Grobler
Environmental surveys in Walvis Bay area	Dr. Anja van der Plas
Environmental surveys in Terrace Bay area	Dr. Anja van der Plas
German research programs	Ms. Bronwen Currie via Prof K-C Emeis, Dr. Anja Eggert
Benthic and sediment collections	Ms. Bronwen Currie
Ichthyoplankton	Dr. Anja Keiner
Intertidal sampling	Dr. Anja Keiner
Mariculture baseline information	Ms.Heidi Skrypzeck
Marine mammals Pelagic resources Radionucleotides and heavy metals	Mr. Ipeinge Mundjulu Mr. Beau Tjizoo Mr. Deon Louw

Additional metadata sources

- Ministry of Mines and Energy: Methodology for mining (may be inspected by project EAP from licences at the Ministry)
- NAMCOR: availability of EIA studies from offshore drilling activities (with confidentiality agreement)
- GENUS: German research-vessel cruises: metadata from cruises carried out in Namibian waters since 1997: 30 cruises; 1319 CTD stations Entered data e.g. in Pangaea data-base: 624 data sets on watercolumn and 1985 datasets on sediment.
- Ministry of Fisheries and Marine Resources and Confederation of Fishing Associations: Regulatory control of fishing activities and fishing methodology

Appendix M

Namibia Waves – further description of Wave Height Modeling

NAMIBIAWAVES

The WorldWaves software package and data for all Namibian waters

Reference No: Q551244

Date: March 2014

Fugro OCEANOR AS
Pir-Senteret, N-7462 Trondheim, Norway
Tel: + 47 73 54 52 00 Fax: + 47 73 54 52 01
e-mail: oceanor@oceanor.com

Quote Reference:		Q551244	
Document Reference:		**Q551244**	
	Name	**Signature**	**Date**
Originator:	Stephen Barstow Senior Ocean Wave Climatologist		20th March 2014
Checked & Approved:	Jan Petter Mathisen, Head of Department, Seadata, Trondheim		20th March 2014

TABLE OF CONTENTS

1. INTRODUCTION

This document provides information on data and products available from Fugro OCEANOR for Namibian waters.

Fugro OCEANOR has developed a range of tools to provide historical data to support the offshore, shipping and ocean renewables industry, and to provide simple interfaces to the data. This proposal provides the cost for provision of satellite and model wind and wave data anywhere worldwide and related products. Our objective is to provide the highest quality data available. Estimates of accuracy are provided as the model data are fully calibrated against satellite data, these data having similar accuracy to buoy data for significant wave height. A major attraction of these data sources is that they are routinely updated, and the client would be able to access model data during periods of data collection, marine incidents etc.

In the following, we first describe our main data sources, the satellite data under the World Wave Atlas product and the comprehensive WorldWaves product for Namibian waters (Namibiawaves).

2. WORLD WAVE ATLAS

World Wave Atlas (WWA) is the collective name for a series of comprehensive high resolution interactive wind and wave atlases capable of providing accurate wind and wave climate statistics for any country or region worldwide. A simple Graphical User Interface replicated below provides access to satellite data and if required model data.

World Wave Atlas has both geographical and statistical modules allowing the user to analyse and present most commonly used wave and wind statistics (univariate and bivariate frequency distributions, exceedence curves, extreme statistics for significant, maximum and crest wave heights, spatial and temporal variability including along track variations, seasonal and inter-annual variability, direction roses etc.). Any area or time period can easily be selected for analysis.

A demonstration version is available from the Fugro OCEANOR website:- http://www..com/products/wwa/registration/registration_form.htm.

The WWA 2.0 software package contains satellite altimeter data at full resolution from the following missions:

- ***Geosat*** (1986 –1989)
- ***TOPEX*** (1992 – 2002)
- ***Topex/Poseidon*** (September 2002 – 2005); this is still the Topex altimeter, but moved in September 2002 to a new ground track midway between the original Topex tracks, now occupied by Jason
- ***Jason*** (January 2002-2008); On the same orbit as Topex
- ***EnviSat*** (October 2002 – October 2010)
- ***Geosat Follow-On*** (January 2000 – 2008); on the same ground tracks as Geosat.
- ***Jason-2*** (July 2008 – ongoing); on the same orbit as Topex and Jason
- ***Jason-1s*** (February 2009 – March 2012) on the same orbit as Topex/Poseidon-1s

Measurements of significant wave height and wind speed are made about each 6 km along the tracks each time the satellite passes. The satellite data have been validated through extensive intercomparisons against buoy data from around the world carried out by OCEANOR and others. For example, we earlier compiled an offshore data set consisting of co-located NOAA buoy and Topex altimeter data. The reference data set contained quality checked data from 13 buoys, totalling 1,365 data records. The data were quality controlled by a careful manual inspection, and only data from tracks that passed within 100km and 1h with respect to the buoy observations were included. The resulting scatter plot between the buoy and altimeter wave heights is shown below. If the data are corrected for satellite dependent systematic biases, accurate wave height statistics can be provided anywhere worldwide only limited by the spatial and temporal characteristics of the satellite orbits. In fact, the accuracy of the satellite wave heights is close to that from buoys.

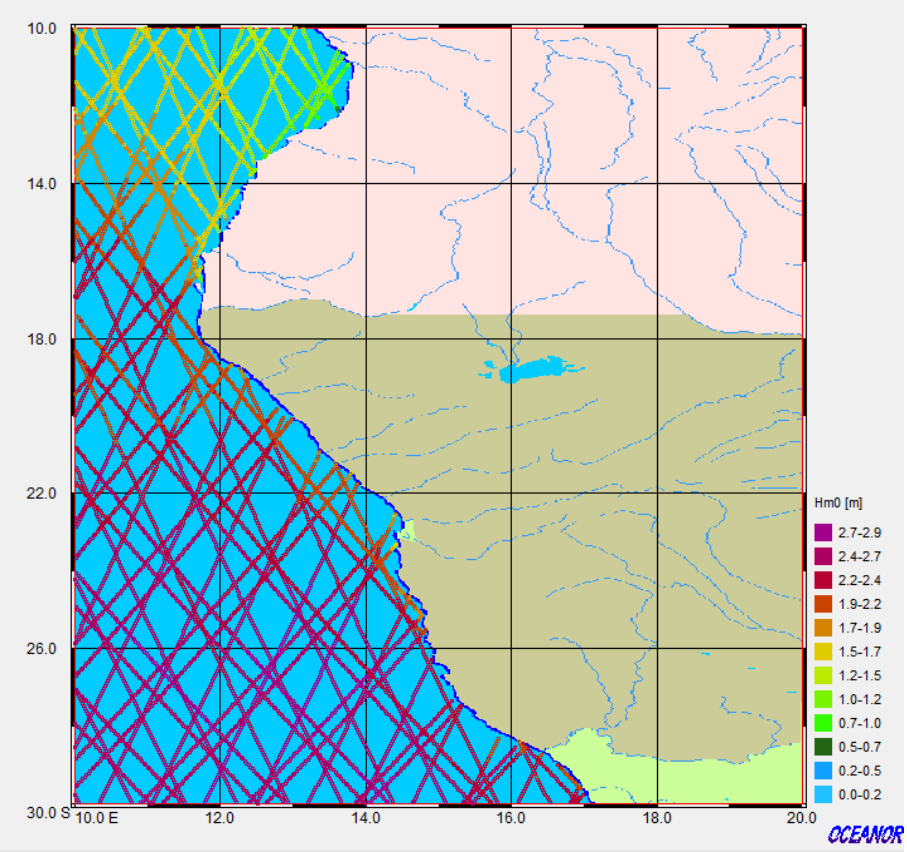


Figure 2.1 Mean multi-year seasonal wave heights in all Namibian waters from Topex/Poseidon, Jason, Geosat Follow-on and Envisat satellite altimeter missions. Long-term satellite altimeter Hs data are used to validate and calibrate the model data to be supplied.

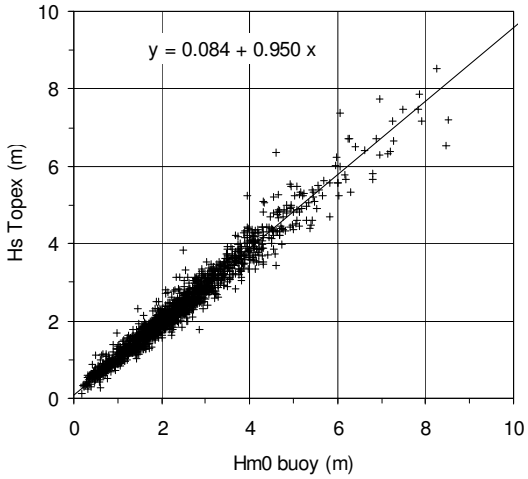


Figure 2.2 Comparison of Topex satellite altimeter data and simultaneous buoy significant wave heights. This confirms the very high quality of the satellite data. The other satellite altimeters show similar performance. The accuracy is close to that of a buoy.

It should be noted that the repeat cycle of satellites is of the order of 10-35 days. Therefore the data contained in the data set do not represent high temporal resolution of measurements. Also, only

significant wave height and wind speed are available from the altimeter. In order to provide high resolution directional wave information needed for applications in the coastal zone, we combine these high precision satellite data with the best available model data. These data are discussed below.

3. WORLDWAVES MODEL DATA

Fugro OCEANOR has developed the WorldWaves global model database. This is a global database of wind and wave data. The data are derived from the European Centre for Medium-range Weather Forecasts' (ECMWF) operational model and are calibrated by Fugro OCEANOR against satellite data, and where available in-situ buoy data. Data are available on a 0.5° grid at 6-hourly intervals for the period December 1996 to December 2013 (updated monthly in 2014) (see Figure 3.1 for the available grid points worldwide). These data are considered very reliable and represent the highest quality data available. The data are available as parameter data or directional spectra. Longer term data on a coarser grid are also available back to 1957.

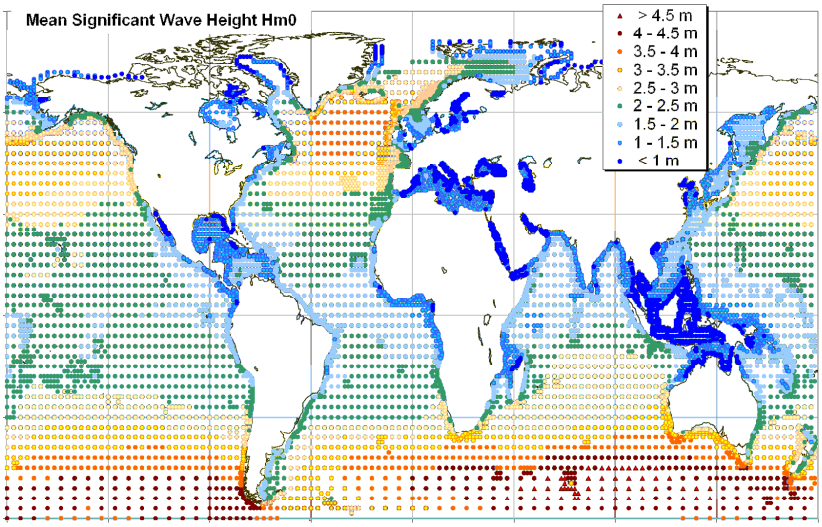


Figure 3.1 Mean significant wave height at all WorldWaves grid points.

For longer term data, Fugro OCEANOR utilise the ECMWF Interim wave model hindcasts. The data are homogenised with the operational data, and corrected to remove any systematic errors (combined with the operational data this allows us to provide over 50-year series of wave parameters and/or directional spectra). It should be noted that the Interim model runs on a 1° grid. We would be pleased to advise on the quality of data prior to delivery. Typically an assessment can be provided through consideration of the correlation coefficient between the model and altimeter significant wave height as illustrated in Figure 3.2.

Data updates are received monthly, and can be used to place short term wave measurements in the long term context, or to support post operational analysis or incidents. Available parameter data are listed in the following table. The spectral partition utilises the local wind conditions to identify the wind sea component, and the remaining energy is assigned to the swell parameter.

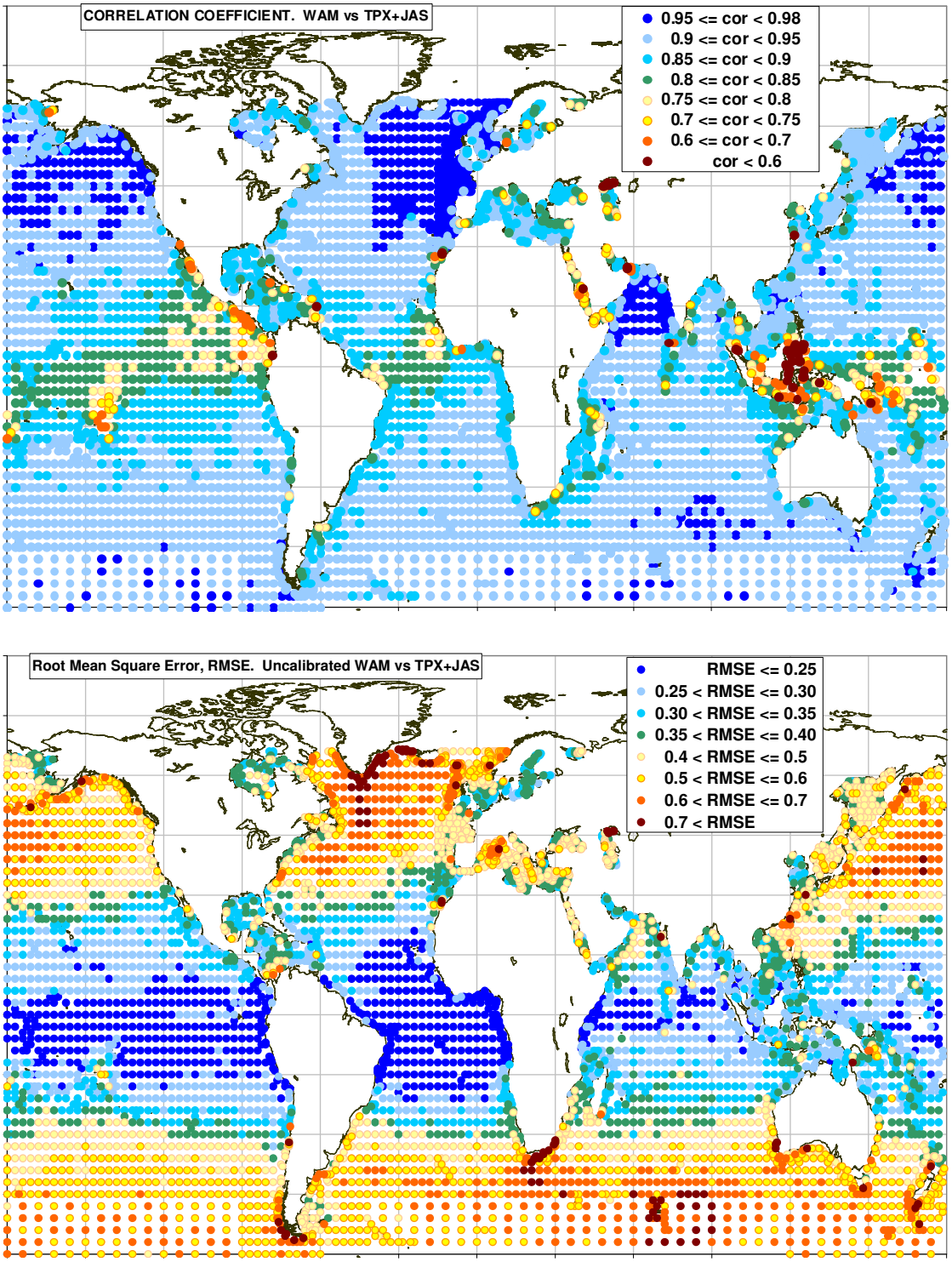


Figure 3.2 The correlation coefficient (above) and root mean square error between simultaneous co-located WAM and Topex/Jason significant wave heights for all global validation points; Operational model January 1997 to December 2006. The quality is very good throughout Namibian waters.

NAME	DESCRIPTION
year	Year of observation
mm	Month of observation
dd	Day of observation
hh	Hour of observation
SWH	Significant wave height Hs (Sea and Swell)
PP1D	Peak period of 1d spectra
MWP	Mean wave period T-10 (Sea and Swell)
SHWW	Significant wave height Hs (Sea)
MPWW	Mean wave period T-10 (Sea)
SHPS	Significant wave height Hs (Swell)
MPPS	Mean wave period T-10 (Swell)
fro	Mean wave direction Theta (Sea and Swell)
frw	Mean wave direction Theta (Sea)
frs	Mean wave direction Theta (Swell)
WD	Wind direction Wdir
WS	Wind speed Wsp

For coastal wave modelling, we recommend using directional wave spectra input.

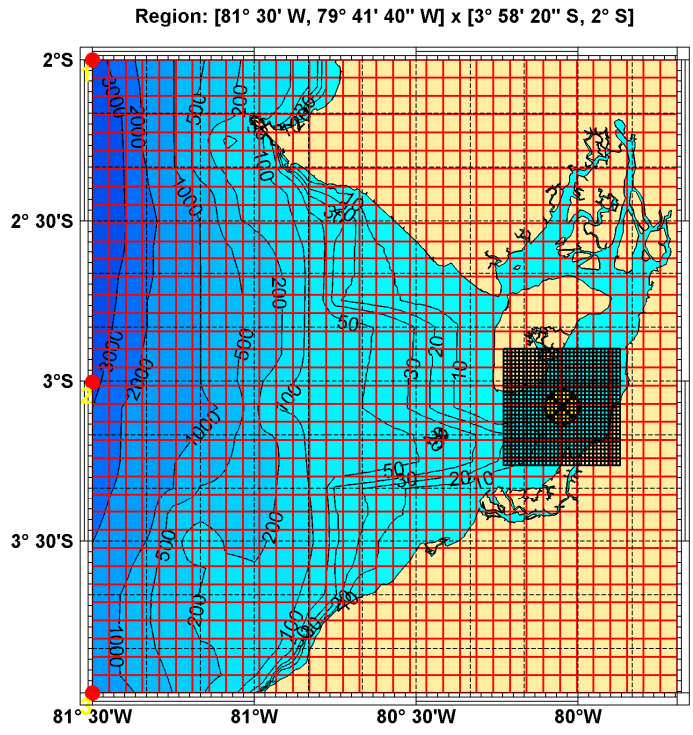


Figure 3.3 Computational grid for a simulation to a coastal location (note that the bathymetry shown is not the best quality and should be improved).

4. WORLDWAVES SOFTWARE PACKAGE

In the last section, we described the ***WorldWaves*** offshore database. ***WorldWaves*** is however much more than this.

WorldWaves is a state-of-the-art software package, developed by Fugro OCEANOR with funding over a number of years from the Dutch dredging industry and within the framework of various European Commission sponsored contracts, notably ***WorldWaves***, EnviWave and Eurowaves. The system simplifies the modelling of wave conditions in coastal waters, resulting in more timely, lower cost but reliable data.

In ***WorldWaves***, the following are integrated under a single Matlab toolbox:

- High quality long-term wave data offshore all global coasts (minimum one grid point has to be purchased) (these data are described in Section 3).
- Global bathymetric and coastline data.
- Two shallow water wave models: SWAN, the well-known third generation wave model and a backward ray-tracing model, CWAVERAY for quick assessments.
- Sophisticated offshore and nearshore wave statistics toolboxes.
- A geographic module allowing the user to easily zoom in on geographic maps together with tools to assist the user in setting up the model grid.
- A bathymetry editing tool allowing easy editing of the bathymetric data.
- A facility allowing users to easily import their own offshore wave data.

A full description of ***WorldWaves*** can be found in the product user manual which can be made available on request.

In the following pages a number of figures will be found demonstrating the capabilities of the ***WorldWaves*** package. ***WorldWaves*** is a complete wave modelling package enabling the users to do their own coastal wave modelling and to analyse offshore and nearshore data statistically. ***WorldWaves*** is completely modular and packages can be put together to fit the client's needs. Due mainly to the cost of the offshore data, a global package would be prohibitively expensive for all but the largest companies to purchase, but a subscription agreement can nevertheless be cost-effective for smaller companies). The Dutch dredging companies van Oord and Boskalis both use the global package on a day-to-day basis as does one of the major European power utilities. Other users have purchased country versions and even single points (the cost of the software is low). Thus, a client can purchase offshore data for just one point or for an entire region. Note that, due to ECMWF's pricing structure, it is much cheaper pr. point to purchase multiple model offshore grid points than single points. The offshore data and/or associated wind and wave statistics can also be purchased independently of the software package.

For the highest quality nearshore statistics, it is important to use full directional spectra input to the SWAN model. Where the highest accuracy is required, the full directional spectra files can be ordered from OCEANOR on a case-by-case basis.

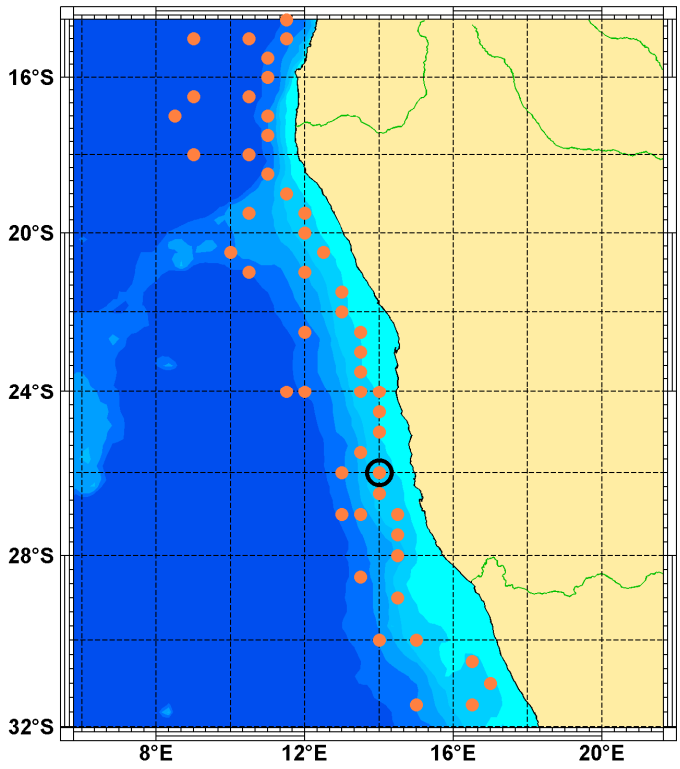


Figure 4.1 Selected grid points off Namibia

Figure 4.2 to Figure 4.6 show examples of the ***WorldWaves*** coastal modelling capability. It takes only a couple of minutes to zoom into an area from a global map, set up a computational area and start a run of the Swan model under ***WorldWaves***. The SWAN model (version 40.51) is a state-of-the-art third-generation fully numerical spectral wave model, developed for the calculation of propagation of random waves in coastal regions and inland waters and accounts for shoaling refraction, wave propagation, wave generation by wind, triad and quadruplet non-linear wave-wave interactions, whitecapping, bottom friction, and depth-induced breaking. However, the bathymetric data under ***WorldWaves*** (from DBDB-V) should be updated/checked before doing a serious wave study. It is easy to replace the bathymetric data in ***WorldWaves*** using the user's own bathymetry on a latitude/longitude/depth ASCII file. OCEANOR can also provide ***WorldWaves*** users with bathymetric data on a case-by-case basis (at cost) from the global Fugro electronic chart database. SWAN can either be run as a single run (user defined offshore boundary conditions for one point in time) or as a time series. In the latter case, ***WorldWaves*** takes the offshore boundary conditions from the offshore data base each 6 hours and then provides nearshore time series of Hs, Tm, Tp and direction. Runtime with SWAN on a modern PC is nowadays so fast that the less accurate raytracing model is seldom used by ***WorldWaves*** users. Generation of a 10-year nearshore series with SWAN may take less than a day. For even quicker assessments, one can do a 10-year simulation with CWAVERAY (this takes a few minutes) and, say, a 1-year simulation with SWAN. The SWAN nearshore data can then be used to calibrate (correct) the 10-year CWAVERAY time series data.

It is also easy to import and analyse statistically wave parameter data from the user's own wave buoys and model data. The following parameters may be included: Hs, Tm, Tp and wave direction (as well as separate wind sea and swell parameters).

Wind speed and direction data are included each 6 hours at each offshore grid point and are also fully validated and calibrated against the satellite data. These data are used to simulate the local wind sea growth during the shallow water modelling and we also believe that they are the best available offshore winds for wind energy studies.

For users of WorldWaves, we also offer a cheap annual subscription to our World Wave Atlas (Section 2) satellite database. This package is very useful for

a) quick look Hs and wind speed statistics (also near the coast)
b) validating the SWAN or CWAVERAY model simulations: in most areas, there are satellite data available quite close to the coast. Adding a second target point on a satellite track allows an assessment of the model transformation to be carried out. Although satellite data are usually not available at the user's target, this provides a good indication of model performance. Time series of Hs can be exported from World Wave Atlas for direct comparison with the model predictions at the same location.

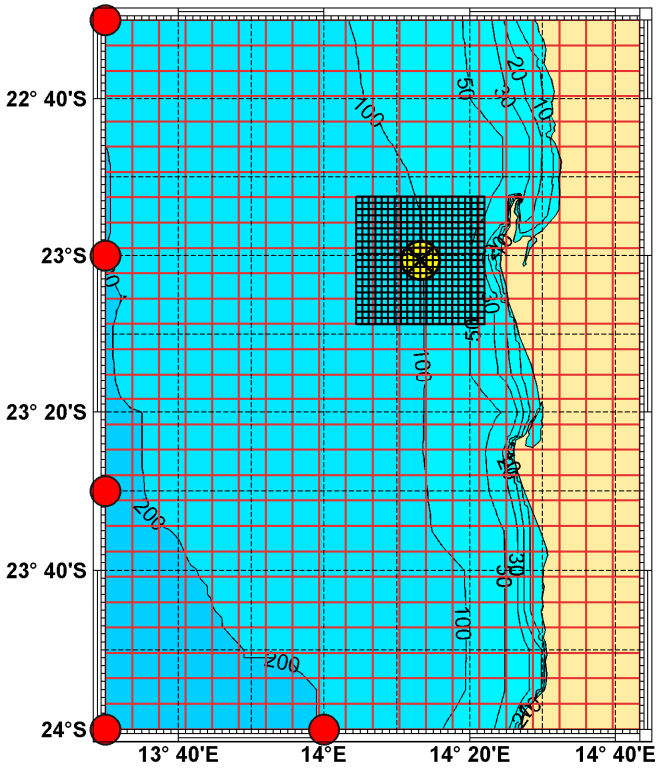


Figure 4.2 For the Swan model, a nested grid is easily set up around the target location at higher resolution. For studies at the coast, fully spectral data are required offshore for accurate results.

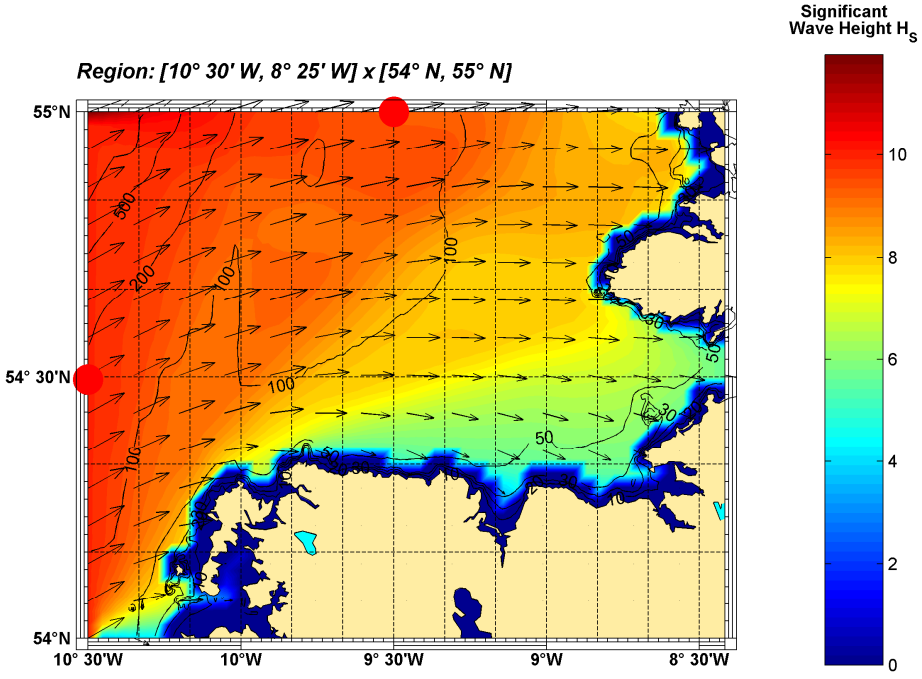


Figure 4.3 Fields of Hs and wave direction from a single run of the Swan model, indicating the spatial variability of the wave energy for an offshore SW storm.

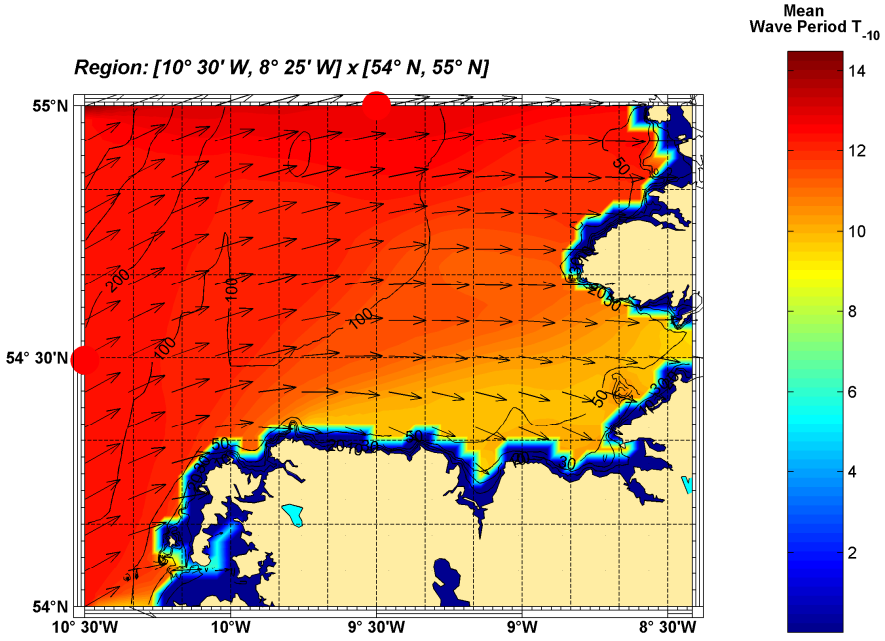


Figure 4.4 Fields of wave energy period from the same single run of the Swan model in Figure 4.3

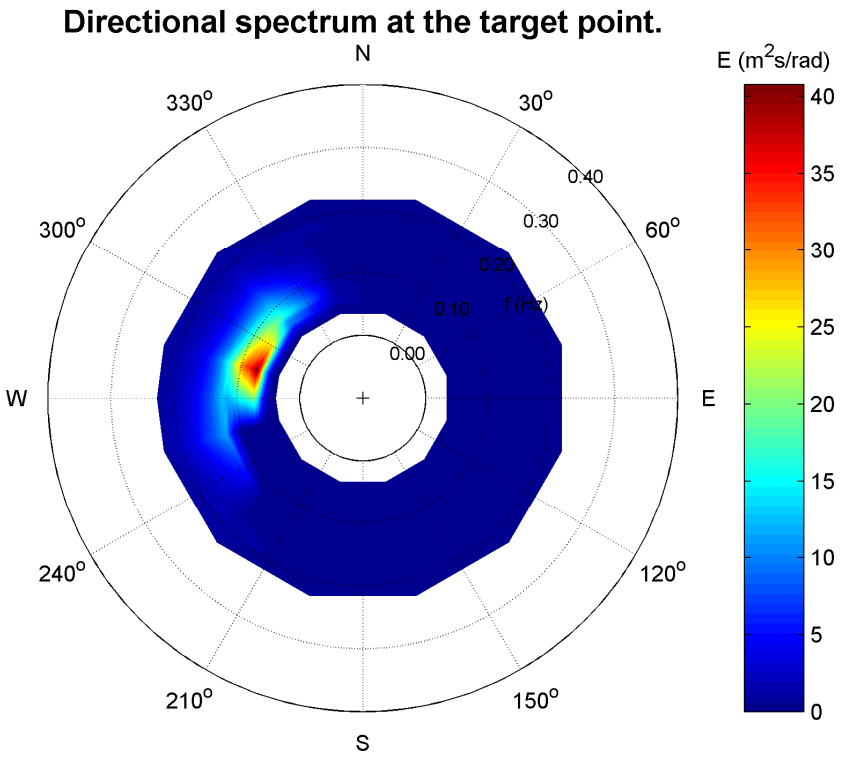


Figure 4.5 Directional wave spectrum at the target point in Figure 4.2.

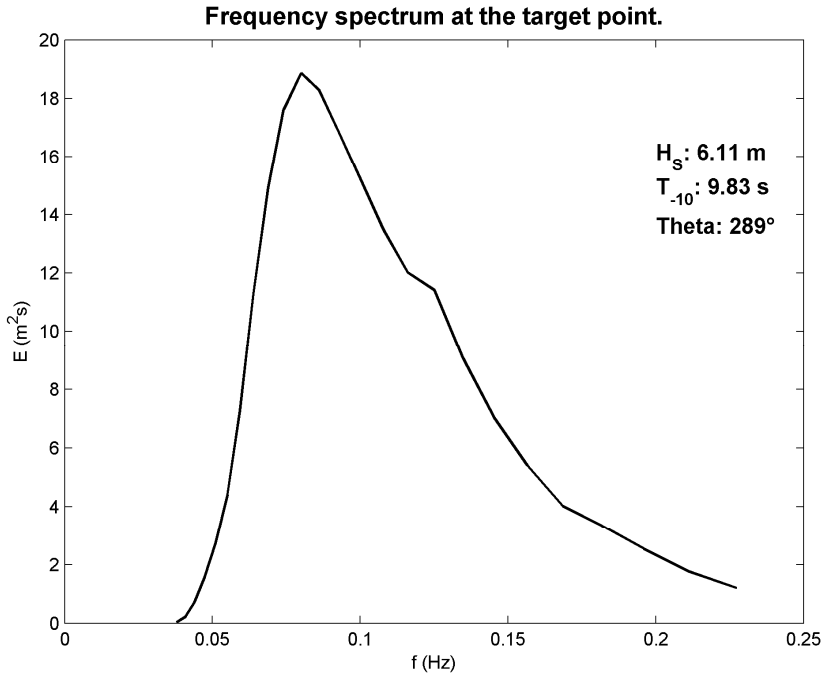


Figure 4.6 Non-directional wave spectrum at the target point in Figure 4.2.

5. COSTS

5.1 NamibiaWaves Software package

There is an initial one-time charge for the software package of ***EUR 7,500 (EUR 9,500 for the global package)***

For about 100 grid points offshore Namibia, we would charge ***EUR 25,000*** for 10 years of parameter data in each location. For longer series, please add 10% for 15 years and 20% for 20 years of data in each point. Alternatively, you can purchase a 5 year subscription where you pay ***EUR 6,600 / year*** *(*for global data, we charge ***EUR 13,000 / year).*** If the client intends to model wave conditions at the coast, it is recommended to use fully spectral data offshore and not the parameter data. These data normally cost 50% more (please ask for quote).

In addition, we advise that you should purchase our maintenance and assistance agreement at ***EUR 3,500 / year (EUR 5,900 / year*** for the global package). This would give you 10 hours of free assistance.

All prices are regulated annually by the Norwegian consumer price index. There are strict limitations to passing on the offshore data to third parties (see also Appendix A).

It is also possible to purchase the global satellite data under the World Wave Atlas software at an additional ***EUR 3,500/ year***.

Note that it is also possible to purchase single grid points or derived statistics as required and data can also be updated on a monthly basis if required (please ask for quote).

It is possible to arrange a Webex live demonstration of the software package on request. The WorldWaves manual can also be made available.

APPENDIX A

WORLDWAVES LICENSE AGREEMENT

WORLDWAVES DATA LICENSE AGREEMENT

This License Agreement is entered into between Fugro OCEANOR AS whose registered office is Pir-Senteret, 7462 Trondheim Norway and the Licensee being: xxx

The time series data supplied, listed below, are licensed for use by the Licensees specified above but with similar access rights to their consultants/engineers.

Deliverables: xxxxxxx

Total Charge: As per this quote.

Fugro OCEANOR reference: Q55xxx

The Licensee agrees to abide by all terms and conditions of the Data License Agreement. Full License details are contained in this document.

We would appreciate that the licensee and their consultants/engineers acknowledge in reports/presentations that the data which are the subject of this license agreement originate from the ECMWF WAM model archive and are validated and calibrated by Fugro OCEANOR against a global buoy and satellite altimeter database.

Authorised signatory for and behalf of Licensee

Name: (Print) ..... Signature:.....

Position:.....

Date: .....

Authorised on behalf of Fugro OCEANOR AS

Name: (Print) ..... Signature:.....

Position:.....

Date: .....

FUGRO OCEANOR AS

WORLDWAVES DATA LICENSE AGREEMENT (Ref. WWDL1)

1. DEFINITIONS

1.1 Terms used herein shall have the following definitions;

FUGRO : Fugro OCEANOR AS , Pir-Senteret, 7462 Trondheim, Norway
THE LICENSEE: Party with whom FUGRO has a contract which refers to these terms, WWDL1.
PRODUCT; is the WorldWaves data.

LICENSE shall be hereinafter defined to mean the use, by the **LICENSEE**, of the **PRODUCT** specified in the applicable contract for an indefinite period.

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4.2 No action, regardless of form, arising out of any transaction under this Agreement may be brought by either party more than one year after the injured party has, or by the exercise of reasonable diligence should have had, knowledge of this occurrence which gives rise to such action.

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5.1 The **LICENSEE** may not assign this Agreement without **FUGRO**'s written consent. **FUGRO** may assign the benefits of this agreement to any other related company of **FUGRO** which shall mean for the purposes of this Paragraph any company in which **FUGRO** shall hold 50% or more of the voting shares. **FUGRO** will provide customer with written notice of any such assignment by **FUGRO**.

6. NOTICE

6.1 Any notice or communication required to be given to or by either party must be given by being sent by ordinary mail to the registered office of either party.

7. GOVERNING LAW AND ENTIRE AGREEMENT

7.1 This License is governed by Norwegian law and the parties agree to submit to the exclusive jurisdiction of the Norwegian courts.

7.2 The parties shall exercise their best efforts to resolve by negotiation any and all disputes, controversies or differences between the **LICENSEE** and **FUGRO** arising out of or related to this Agreement or breach thereof. All disputes, controversies or differences between the **LICENSEE** and **FUGRO** arising out of or related to this Agreement or breach thereof, that are not settled by negotiation shall be unless otherwise agreed between the parties of this agreement, settled by court proceedings brought before Trondheim District Court (in Norway).

7.3 All terms of any purchase order or other ordering document shall be superseded by this License. The Licensee agrees to ensure that neither the **PRODUCT** nor any direct product thereof is exported, directly or indirectly, from Norway without complying with all regulations relating to such export issued by the Norwegian Government.

7.4 If any provision of this agreement shall be found by any court or body of competent jurisdiction to be invalid or unenforceable all provisions not affected by such invalidity or unenforceability shall remain in full force and effect.

Appendix N

CV's

CURRICULUM VITAE

Name: Roar Solbakken
Year of birth: 1954
Nationality: Norwegian
Position: Senior adviser
Institute: SINTEF Fisheries and Aquaculture
E-mail: roar.solbakken@sintef.no
Phone: +47 400 47 410

Education: Master of science (Cand. real.) Nutrition, University of Bergen 1984.

Additional education:
Board Work at Ålesund University College, 2010.
Course in project management at Ålesund University College 2009 and at different emploiers 1990-2002
Cource in Flavoring and Industrial Application of Flavours at Leatherhead Research Assosiate, London 1999.

Languages:

Norwegian – Mother tongue
English – Fluent
German - Knowledge

Countries of work experience:

Norway, Germany, United Kingdom, Chile, Faroe Islands, Namibia

Work Experience:

2011-	SINTEF Fisheries and Aquaculture, Department of International Projects and Consulting, Trondheim, Norway. Senior adviser
2008-2011	The County of Møre and Romsdal, Adviser Fisheries, Aquaculture and Biomarine sector
2006-2007	University of Oslo, Master Student Geology
2003-2005	Terapi-Consult, Adviser fatty acid application
2001-2002	University of Oslo, Student
2000-2001	Akvaforsk, Marketing Director
1999-2000	Roche Norge, Medical Manager
1993-1999	EWOS, Project Manager
1991-1993	EWOS, R&D Coordinator
1988-1993	EWOS, Product Manager
1985-1988	Shering AG, Clinical Research Assosiate
1984-1985	University of Bergen, TA

Main fields of competence:

- Project management (national and international) and process management
- Marine ecosystem dynamics and management
- Cluster development and management of clusters

Sign. _____

- Regional development and policy making
- Food Safety
- Nutrition
- Thorough knowledge of the seafood industry, including research and development
- International experience

Roles:

Member of EWOS Salmon Group

Have been Member of EWOS Marine Group

Have been Chair of EWOS Fish Quality Group

Have been Chair and member of "Vestlandsprogrammet for nye oppdrettsarter"

Have been Member of steering committee for "Marine Møteplass" in Møre and Romsdal

Was Member of a committee to implement "Forvaltningsreformen", coordinated by The Ministery of Costal and Fisheries Affair, Norway

Was Member of a working group for creating guidelines for "Tourist Fishing in Norway", coordinated by The Ministery of Costal and Fisheries Affairs

Was Member of The Marine Resource Group of The North Sea Commission

Working with establishment and bringing European Fisheries Technology Centre to an operative level at SINTEF Fisheries and Aquaculture

Publications and articles

All the R&D papers at the industries for internal use only

Curriculum vitae

NAME: Arff, Johanne M. C.
DATE OF BIRTH: 2nd of January 1966
NATIONALITY: Norwegian
LANGUAGES: Norwegian, Swedish and English
PROFESSION: Marine biologist

EDUCATION

1995	*Cand. scient.* in Marine Biology, University of Trondheim, Norway.

ADDITIONAL EDUCATION/COURSES

2010	SINTEF Internal Course: Project Management in SINTEF
2010	SINTEF Internal Course: Psychosocial factors in Working Life
2009	SINTEF Internal Course: HES in Laboratories and Engineering Workshops
2007	SINTEF Internal Course: Health, Environmental and Safety Work
2007	Norwegian Accreditation: "Søkerkurs ISO 17025"
2006	The Intergovernmental Oceanographic Commission (IOC) of UNESCO: "Certificate of Proficiency in Identification of Harmful Marine Microalgae"

AFFILATION

2012-present	Laboratory manager/Research scientist, SINTEF Fiskeri og havbruk AS
2006-2012	Research scientist, SINTEF Fiskeri og havbruk AS
2003-2006	Project engineer, Fugro OCEANOR AS
1995-2003	Project engineer, OCEANOR – Oceanographic Company of Norway ASA

MAIN FIELDS OF WORK

- Harmful Algal Blooms
- Identification of marine microalgae
- Marine biological monitoring and forecasting
- Marine environmental impact assessment studies
- Marine environmental monitoring technology
- Marine biofouling
- Cultivation of macroalgae
- Ecological physiology of phytoplankton
- Project management
- Quality assurance
- Health, environmental and safety work

MEMBERSHIPS

- International Society for the Study of Harmful Algae (ISSHA)
- Norske Havforskeres Forening (NHF)
- The Norwegian Society of Graduate Technical and Scientific Professionals (Tekna)

MEMBER OF BOARDS/COMMITTEES

2012-present	Leader of the local Tekna board, SINTEF Fiskeri og havbruk AS
2010-present	Member of the committee for SINTEFs working health environmental prize
2007-2012	Head safety representative and member of the HSE committee at SINTEF Fiskeri og havbruk AS (leader of the HSE committee in 2007, 2010)
2007-2011	Member of the local Tekna board, SINTEF Fiskeri og havbruk AS
2003-2004	Member of the board (employee representative), Fugro OCEANOR AS
2001-2003	Member of the board (employee representative), OCEANOR – Oceanographic Company of Norway ASA
1997-1998	Secretary and member of the local Tekna board, OCEANOR – Oceanographic Company of Norway

MAIN PROJECTS

2014	Artificial reefs to create and ensure biodiversity in the ocean as a countermeasure. PE Reefs AS/RFF Agder. Project management.
2013-present	Specification of the content in an EIA in the coastal waters off Namibia. The Namibian Ministry of Fisheries and Marine Resources. Project co-worker

2013-dd	Macroalgae as biological filter for nutrient effluents of landbased fishfarms. Nekton/RFF Midt. Project co-worker
2012-present	Working Health Environment Risk Assessment (WHERA) in SINTEF. Working group member
2012	EIA study in the receiving waters off Norske Skog Skogn. Project management.
2011-2012	EIA study in the receiving waters off Trondheim. Project management.
2011-2012	Surface treatment of spawning mats in wrasse farms. MABIT-programmet. Project management.
2010-2013	The future forecasting and contingency service (i.e. establishment of database for marine microalgae, development of a simple model for algal forecasting in SINMOD). SINTEF Fiskeri og havbruk AS. Project management.
2008-2012	Cultivation of macroalgae for biomass. Forskningsrådet/Statoil.
2006-present	Development of a QA system for algal analyses according to NS-EN ISO/IEC 17025. SINTEF Fiskeri og havbruk AS. Project management.
2004-2006	Sales and deliveries of Fugro OCEANOR buoys/spare parts. The Norwegian Coastal Adminstration, Bergesen Offshore, FOBOX, Sohar Port, Saudi Aramco, The Navy of Peru. Project management.
1997-2002	R&D/testing of biological and chemical sensors (i.e. chlorophyll a, echo sounder/zooplankton, dissolved oxygen, nutrients). National Centre for Marine Research Greece/The Research Council of Norway/The Norwegian Pollution Control Authority/Oslo Airport. Project management/co-worker.
1997-present	Biofouling on marine installations. Offshore - Norsk Hydro, Inshore – Tidal Sails/ACE. R&D – Regional Research Funds in Norway. Project management.
1996-present	Monitoring of algal/shellfish toxins and toxic algae. Norwegian Food Safety Authority (former The Norwegian Food Control Authority/The Norwegian Directorate of Fisheries)/Shellfish Farmers. Project management.
1996-2010	Forecasting and contingency services (i.e. harmful algae, jellyfish, sea temperatures severe weather and sea state) for Norwegian Fish Farmers. Norwegian Insurance Companies. Project management.
1996-1998	Sea temperatures at the Norwegian Coast. Skretting. Project management.
1995-present	EIA studies: Norwegian West Coast - Naturkraft AS, Sør-Trøndelag - the Norwegian Directorate of Public Roads, Trondheimsfjord - Norske Skog/Industrikraft Midt-Norge DA/Statoil/Peterson Linerboard Ranheim/Trondheim harbour/Trondheim and Orkdal municipalities, Nordland - Forsvarets Bygningstjeneste/Vågan and Meløy municipalities, Finnmark - Nordkapp municipality. Project management/co-worker.

SUPERVISION

2012-2014	Henny Førde (MSc, NTNU). Co-supervision.
2010-2011	Jayaprabandh Pudota (MSc, NTNU): Seasonal Variations in Biofouling and Plankton Community Connected to a Large Scale Salmon Farm. Co-supervison.

LECTURES

2011	NTNU course BI1002 Faunistics and floristics. Protista.
2005	Akvaveterinærenes forenings vårkurs 2005. Miljøfaktorer som påvirker fisk i merd: 1) Alger og maneter som påvirker fisk i merd; 2) Prøvetaking og påvisning, biologi for aktuelle arter, konsekvenser og mulige tiltak.
2000	Averøy vgs. Skjellkurs: Algetoksiner, kildearter og innsamling av planktonalgeprøver.
1999	Val vgs. Skjellkurs: Algetoksiner, kildearter og innsamling av planktonalgeprøver.

LIST OF PUBLICATIONS

Forbord, S., J. Skjermo, **J. Arff**, A. Handå, K.I. Reitan, R. Bjerregaard, K. Lüning. 2012. Development of *Saccharina latissima* (Phaeophyceae) kelp hatcheries with year-round production of zoospores and juvenile sporophytes on culture ropes for kelp aquaculture. J. Appl. Phycol 24(3):393-399.

Aune T., T. Torgersen, **J. Arff** & K. Tangen. 2003. Detection of pectenotoxin in Norwegian blue mussels. Proceedings, Xth International Conference on Harmful Algae, Florida, USA, 21.-25. oktober 2002, pp 306-308.

Arff, J. 1995. Absorpsjon av lys og respirasjon hos kiselalgen *Phaeodactylum tricornutum* Bohlin og bakterien *Pseudomonas* sp. Hovedfagsoppgave ved UNIT-AVH. (Thesis, *Cand. scient.*).

LIST OF REPORTS

Arff, J., T. Solvang-Garten. 2014. Bruk av ultralyd for reduksjon av begroing og lakselus i oppdrett. SFH F25991. 8 p.

Floerl, O., N. Bloecher, **J. Arff**. 2013. Preliminary examination of cleaning and filtration performance of the MIC net cleaning system. SFH80 F25746.16 s.

Skjermo, J., S. Forbord, A. Handå, O.J. Broch, **J. Arff**, S.W. Dahle, S. Fredriksen, K.I. Reitan, K.B. Steinhovden, T. Størseth, K. Tangen. 2013. MacroBiomass. En kompetansebase for industriell taredyrking. SFH80 A24186. ISBN 978-82-14-05574-0. 7 p.

Dahle, S. W., **J. Arff,** P. Stenstad, T. Vassdal, E. Eidsvik & I. Overrein. 2013. Overflatemodifisering for å hindre bakterievekst på gytematter i leppefiskoppdrett. SFH F23993. 13 p.

Arff, J. 2012. Miljøundersøkelse i sjøområdene utenfor Norske Skog Skogn. SFH F23276. 21 p.

Arff, J. & K. Tangen. 2012. Environmental assessment of the receiving waters for waste water treatment plants in Trondheim. Summary report. SFH80 F23182. 54 p

Arff, J. & G. Eidnes. 2012. EIA study in the receiving waters for waste water treatment plants in Trondheim. Water quality – winter situation. SFH80 F22912. 14 p.

Arff, J. & G. Eidnes. 2012. EIA study in the receiving waters for waste water treatment plants in Trondheim. Water quality – summer situation. SFH80 F22737. 17 p.

Solbakken, R., K. Henriksen, K.I. Reitan, **J. Arff**, I.H. Ellingsen. 2011. Innsamling og sammenstilling av relevant kunnskap om Sognefjorden. SFH80 A116047.

Arff, J. 2011. Marine biofouling on ThornD. Basic test. ACE report 101/11. 17 p.

Arff, J. 2010. Vurdering av marin begroing på et tidevannskraftverk. SFH80 F102036. 14 p.

Prestvik Ø., U. Erikson & **J. Arff**. 2010. Bruk av Salsnes filterteknologi for fjerning av lakselus fra pumpevann ved et lakseslakteri. SFH80 A104017. 14 p.

Arff, J. & Ø. Stokland. 2010. Miljøundersøkelse i sjøområdene utenfor Peterson Linerboard AS, Trondheim kommune. SFH80 F102007. 15 p.

Arff, J. 2009. Resipientundersøkelse i Sunndalsfjorden. Delundersøkelse Planktonalger. SFH80 F092065. 8 p.

Arff, J. 2009. Miljøgifter i marine organismer i Trondheim havn. Sluttrapport. SFH80 F092053. 18 p.

Arff, J. 2007. Trondheim havn. Miljøgifter i marine organismer 2007. SFH80 F072021. 17 p.

Arff, J. 2007. Miljøgifter i marine organismer i nærområdet til Trondheim 2007. SFH80 A072025. 16 p.

Tangen K. & **J. Arff**. 2007. Micropollutants in relation to contamination of marine organisms near Trondheim, Norway. SFH80 A072017. 33 p.

Winther U., K. Tangen, **J. Arff** & F. Sigurdsson. 2007. Vurdering av risiko for store skader i produksjon av laks og ørret i Norge. SFH80 F076010. 66 p.

Winther U., K. Tangen, **J. Arff** & F. Sigurdsson. 2006. Vurdering av risiko for store skader i produksjon av laks og ørret i Midt-Norge. SFH80 F06677. 53 p.

Prestvik Ø., K. Tangen, Z. Volent, A. H. Hansen, **J. Arff**. 2006. Overvåking av lokalitet for å avdekke årsaker til lite groe og lakselus. SFH80 F064085. 28 p.

Arff, J. 2005. Miljøgifter i marine organismer i Trondheim havn 2005. Fugro OCEANOR C75040/3791/R1. 12 p.

Tangen K. & **J. Arff**. 2005. Storfjordundersøkelsen. Del 1 – Marine planktonalger – betydning for havbruk og skjelldyrking. Fugro OCEANOR 1182/3711. 42 p.

Arff, J. 2005. Varsling og beredskap – Årsrapport 2002-2003-2004. Fugro OCEANOR C75007/3446/R0. 38 p.

Arff, J. 2004.. Overvåking av miljøgifter i marine organismer i Trondheim havn 2004. Fugro OCEANOR C75019/3406/R1. 10 p.

Arff, J. 2004. Miljøundersøkelse i sjøen utenfor Norske Skog Skogn vinteren 2003-2004. OCN R-24017. 13 p.

Arff, J. 2004. Overvåking av deponi i Trondheim havn 2003. OCN R-24003. 10 p.

Arff, J., G. Mørk, J.F. Larsen & Ø. Stokland. 2003. Miljøundersøkelse i Orkdalsfjorden 2002-2003. OCN R-23031. 55 p.

Tangen K. & **J. Arff**. 2003. Høvringen wastewater plant and the environmental quality of the Trondheimfjord. OCN R-23027. 51 p.

Arff, J., K. Tangen & Ø. Stokland. 2003. Miljøundersøkelse ved Fiborgtangen, Levanger kommune, 2002-2003. OCN R-23026. 44 p.

Arff, J. & K. Tangen. 2003. Miljøundersøkelse i Trondheimsfjorden. Vannkvalitet. OCN R-23018. 44 p.

Tangen K. & **J. Arff, J.** 2003. Høvringen renseanlegg og miljøtilstanden i Trondheimsfjorden. OCN R-23015. 43 p.

Arff, J. 2003. Overvåking av deponi i Trondheim havn. OCN R-23007. 10 p.

Arff, J., G. Mørk & K. Tangen. 2002. Konsekvensutredning for utslipp til sjø fra kraftvarmeverk med overflateinntak på Fiborgtangen. OCN R-22003. 73 p.

Arff, J. 1999. Planktonalgeforekomster i Troms uke 21 – 24 1998. OCN R-99007. 5 p.

Arff, J. 1999. Planktonalgeforekomster på strekningen Hordaland – Finnmark uke 18 – 20 1998. OCN R-99007. 5 p.
Arff, J. 1998. Varsling og beredskap for fiskeoppdrettere. Årsrapport 1998. OCN R-98031. 9 p.
Arff, J., G. Mørk, K. Tangen. 1998. Konsekvensutredning for kraftvarmeverk på Fiborgtangen – Utslipp til sjø. OCN R-98010.71 p.
Arff, J. 1998. SEAWATCH Norge. Bøyedrift mars – august 1997. OCN R-98002. 5 p.
Stokland Ø, J.P. Mathisen & **J. Arff.** 1997. Resipientundersøkelse i Meløy kommune, Nordland desember 1996/januar 1997. OCN R-97006. 15 p.
Stokland Ø. & **J. Arff**. 1997. Resipientundersøkelse ved Bodø hovedflystasjon mars/april 1997. OCN R-97016. 20 p.
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Arff, J. 1997. Forekomsten av plankton og begroingsorganismer på oljefeltet Hermod. OCN R-97010. 18 p.
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Stokland Ø. & **J. Arff**. 1997. Resipientundersøkelse for Vågan kommune 1997. OCN R-97029. 13 p.
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Arff, J., Ø. Stokland & K.Tangen. 1996. Forekomsten av planktonalger og begroingsorganismer på olje-gassfeltet Visund. OCN R-96032.
Arff, J., E. Dragsund & K. Tangen. 1996. Varsling og beredskap for fiskeoppdrettere – Årsrapport 1995 og 1996. OCN R-96040. 10 p.
Mathisen J.P., **J. Arff** & Ø. Stokland. 1996. Vurdering av miljøkonsekvensene som følge av bruforbindelse over Frøyfjorden. OCN R-96046. 95 p.
Dragsund E., **J. Arff** & N. Brattenberg. 1995. Registreringer i tareskogen ved Tjeldbergodden. Grunnlagsundersøkelse i sjøresipienten. OCN R-95064. 22 p.

LIST OF ORAL PRESENTATIONS/POSTERS

Arff, J., O.J. Broch, I.H. Ellingsen. 2012. Kan operasjonelle modeller brukes i algevarsling? Algesymposium 28-29 April, Oslo, Norway. Oral.
Arff, J. 2011. Monitoring of harmful algae in Norway. International Workshop on Fish-killing Marine Algae, 10-11 April 2011, Oslo, Norway. Oral.
Skjermo, J, S.W. Dahle, **J. Arff**, I.M. Aasen. 2011. Biofilmdannelse i marint fiskeoppdrett. Biofilmmøte, 3-4 May 2011, Oslo, Norway.
Skjermo, J., A. Handå, S. Forbord, O.J. Broch, T.R. Størseth, I.H.Ellingsen, **J. Arff**, E. Lien, K.I. Reitan & K. Tangen. 2009. Brown seaweed as biomass for biofuel production. EAS Conference, Trondheim, 2009. Poster.
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Tangen, K. & **J.M.C. Arff**. 2007. Operational monitoring and forecasting of environmental risks in fish farming in Norway. The International Symposium on Integrated Coastal Zone Management 10-14 June 2007, Arendal, Norway. Poster.
Dahl, E., **J.M.C. Arff**, E. Gustad, M. Hestdal, T. Johnsen, G.S. Larsen, E. Lømsland, L.J. Naustvoll, K. Tangen. 2007. Monitoring of phytoplankton as a tool in ICZM. The International Symposium on Integrated Coastal Zone Management 10-14 June 2007, Arendal, Norway. Poster.

LIST OF POPULAR SCIENCE PUBLICATIONS

Dahle, S.W., **Arff, J.,** Stenstad, P., Vassdal, T., Overrein, I. & E. Eidsvik. Begroingshindrende overflater i oppdrett av rensefisk. Norsk Fiskeoppdrett 3-2013. p: 48-49.
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Dahl, E., T. Aune, K. Tangen, T. Castberg, E. Gustad, L. Naustvoll, J. Aasen, L. Nguyen & **J. Arff**. 2004. Giftalger og algegifter i norske farvann – erfaringer fra de siste fem årene. Havets Miljø 2004. p 91-95.
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CURRICULUM VITAE (CV) FOR
Karl Tangen

Present affiliation: SINTEF Fisheries and Aquaculture
Profession: Senior Scientist, Department of Marine Resources Technology
Date of Birth: 1 October 1942
Years with Firm/Entity: since Feb. 1, 2006
Nationality: Norwegian
Membership in Professional Societies: Norwegian Society of Ocean Research, Norwegian Society of Chartered Engineers

Key Qualifications:
35 years of experience with work in aquatic ecosystem research; phytoplankton systematics and taxonomy; monitoring, forecasting and contingency related to aquaculture; contingency actions related to coastal and offshore oil spills; EIA studies related to sewage effluents and gas power plants; employed with tasks including:

- project management,
- design, specification and planning of environmental data collection,
- analysis and presentation of collected data, development of environmental design criteria
- teaching at the University of Oslo, and at the Norwegian University of Science and Technology (NTNU) and at several UNESCO International courses in phytoplankton for experienced participants
- member of expert group for biotoxins, Norwegian Food Control Hygiene Authority
- member of expert group in Harmful Algal Blooms, Norwegian Fisheries Directorate
- member of expert group for evaluation of eutrophication, Norwegian State Pollution Agency
- more than 40 international refereed scientific papers including contributions to books.

Languages:
Norwegian (native), English (excellent), German (poor), French (poor)

Education:

1969	Cand.mag. (B.Sc.) in Biology, Chemistry, Statistics, University of Oslo.
1974	Cand.real (corresponds to PhD in Marine Biology, University of Oslo).

Employment Record:

2006-	Senior Scientist, SINTEF Fisheries and Aquaculture
1987-2006	Senior Scientist, Seawatch Department, Fugro OCEANOR
1983-1987	Research Scientist, Norwegian Council for Fisheries Research.
1980-1983	University Fellow, University of Oslo
1974-1980	Scientific Assistant, University of Oslo
1971-1974	Research Hydrobotanist, International Biological Programme, Norwegian Council for Scientific Research (NAVF)

Major projects during the last 10 years:

2000-2007	Environmental Impact Study, Trondheimsfjord. Project manager, reporting (Client: Trondheim Municipality).

2001-2006 Environmental Impact Study, Outer Oslofjord. Water quality. Subcontractor to DNV Det Norske Veritas (Clients: Municipalities bordering the fjord, and the Norwegian Pollution Control Authority).

2000-2001 Implementation of Seawatch India. Project Scientist, teaching and development of environmental applications. (Client: NIOT/NDBP – National Data Buoy Programme).

1999-2000 Environmental Impact Study, Skogn. Project management, data analysis and reporting. (Client: Norske Skog Paper Industry).

1997-2000 Environmental Impact Study, Bodø Hovedflystasjon. Project management, data analysis and reporting. (Client: Forsvarets bygningstjeneste).

1995-1999 Implementation of Seawatch Indonesia. Project Scientist, teaching and development of environmental applications. (Client: BPPT – Ministry of Technology).

1992-2008 Monitoring toxin producing phytoplankton related to seafood safety (Client: Norwegian Food Control Authority).

1991-2008 Monitoring, forecasting and contingency for Norwegian aquaculture industries and insurance companies. Project management, reporting. (Clients: Insurance Companies Gjensidige and Storebrand/If…, Fish Health Laboratories).

1994-1998 Development program, Seawatch System. Project management. Clients: Norwegian Research Council, State Pollution Agency, Shell International, Conoco, Norsk Hydro, Swedish Institute for Meteorology and Oceanography). Metocean design basis for Grane. Client: Norsk Hydro. Tasks: Project management, reporting.

1992-1998 Implementation of Seawatch Thailand. Project Scientist, teaching and development of environmental applications. (Client: NRCT - National Recearch Council of Thailand).

Publications during the last 10 years:

Throndsen, J., Hasle, G.R., **Tangen, K**. 2007. Phytoplankton of Norwegian coastal waters. – Almater Forlag AS, 343 pp.

Tangen, K., Arff, J. 2007. Micropollutants in relation to contamination of marine organisms near Trondheim, Norway. – SINTEF Report SFH80 A072017:1-33.

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Dragsund, E., Aspholm, O., **Tangen, K.**, Bakke, S.M., Heier, L., Jensen, T. 2006. Overvåking av eutrofitilstanden i Ytre Oslofjord. Femårsrapport 2001-2005. – DNV Rapport 2006-0831. 128 pp.

Tangen, K. 2005. Harmful jellyplankton in Norwegian aquaculture and fisheries. – EUROGEL Report, Fugro OCEANOR Ref. 1259/2/2:1-25.

Arff, J., **Tangen, K.** 2005. Resipientundersøkelse I Trondheimsfjorden – Vannkvalitet. – OCEANOR OCN 23018:1-44.

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Aune, T., Torgersen, T., Arff, J., **Tangen, K**. 2004. Detection of pectenotoxin in Norwegian mussels. In: Steidinger, K.A, Landsberg, J.H., Tomas, C.R., Vargo, G.A. (eds.) Harmful algae 2002:306-308. Florida Inst. Oceanogr. & IOC UNESCO.

Dahl. E., Aune, T., **Tangen**, **K.**, Castberg, T., Naustvoll, L., Aasen, J., Nguyen, L., Arff, J. 2004. Giftalger og algegifter i norske farvann – erfaringer fra de siste fem årene. – Havets miljø 2004, Havforskningsinstituttet.

Tangen, K., Arff, J. 2003. Høvringen wastewater plant and the environmental quality of the Trondheimsfjord. – OCEANOR Report OCN R-23027, 51 pp.

Throndsen, J., Hasle, G.R., **Tangen, K**. 2003. Norsk kystplanktonflora. – Almater Forlag AS, 341 pp.

Hansen, A.H., Fredheim, A., Lien, E., McClimans,T., Reitan, K.I., **Tangen, K.**, Olsen, Y. 2003. Bruk av luftbobling og neddykket ferskvannsutslipp som metode for produksjon av giftfrie blåskjell. – SINTEF Rapport STF80 A032090,59 pp.

Hestdal, M. , Aune, T., **Tangen, K.**, Dahl, E. 2001. Overvåkingsprogrammet for algetoksiner 2000. – SNT-Rapport 9:1-71.

Arff, J., Mathisen, J.P., **Tangen, K**., Stokland, Ø. 2000. Resipientundersøkelse for Nordkapp kommune 1999-2000. – OCEANOR Report OCN R-20024:1-26.

Sakshaug, E., **Tangen, K**., Slagstad, D. 2000. Marine primary production and the effects of wind. In: Hanson, R.B, Ducklow, W, Field, J.G. (eds.) The Changing Ocean Carbon Cycle:19-36. International Geosphere-Biosphere Programme Book Series 5. Cambridge University Press.

Bjørnland, T., **Tangen, K**. 2000. Endosymbiosis: Dinoflagellates with fucoxanthins. - Ninth International Conference on Harmful algal Blooms, 7-11 February 2000, Hobart, Tasmania.

Dahl, E., Aune, T., **Tangen, K**. 2000. Shellfish toxicity in Norway – Experiences from regular monitoring, 1992-1999. - Ninth International Conference on Harmful Algal Blooms, 7-11 February 2000, Hobart, Tasmania.

Tangen, K., Sakshaug, E. 1999. Skadelige alger. In: Sakshaug, E., Sneli, J.-A. (eds.) Trondheimsfjorden: 96-102. Tapir Forlag.

Sakshaug, E., **Tangen, K**. 1999. Lyset, Næringssaltene og planteplanktonet. In: Sakshaug, E., Sneli, J.-A. (eds.) Trondheimsfjorden: 83-95. Tapir Forlag.

Dubelaar, G.B.J., Gerritzen, P.L., Beeker,A.E.R, Jonker, R.R. & **Tangen, K.** 1998. Design and first results of the CytoBuoy: an autonomous flow cytometer with wireless datatransfer for in situ analysis of marine and fresh waters. – Cytometry 37:247-254.

Dubelaar, G.B.J., **Tangen, K**., Gerritzen, P.L., Beeker, A.E.R. & Jonker, R.R. 1998. CytoBuoy: In situ optical scanning of individual particles with a buoy mounted flow cytometer. In: Barthel, K.-G. &al. (eds.) Advanced systems, Vol. IV:1500-11.

Tangen, K. 1999. Skadelige planktonorganismer i marint fiskeoppdrett. In: Poppe, T.T. & al. (eds.). Fiskehelse. Universitetsforlaget. 252-265.

Johnsen, G., Volent, Z., **Tangen, K.** & Sakshaug, E. 1997. Time series of harmful and benign phytoplankton blooms in northwest European waters using the Seawatch buoy system. In: Kahru, M. (ed.). Monitoring algal blooms: new techniques for detecting large-scale environmental change:113-141. Landes Bioscience, Austin.

Tangen, K. 1997. Monitoring phytoplankton blooms continuously with SEAWATCH technology. In: Stel,J.H. & al. (eds.) Operational Oceanography: 539-546. Elsevier.

Steidinger, K.A. & **Tangen, K.** 1997. Chapter 3 Dinoflagellates. In: Tomas, C. (ed.). Identifying marine phytoplankton:387-589. Academic Press.

Curriculum Vitae of Mr. Bjørn Serigstad

Personally:

Name:	Bjørn Serigstad
Date of birth:	30.03.1956 in Skien
Address	Østre Natlandsfjellet 13, 5098 Bergen
Phone:	-47 90 999 644
E-mail:	bjorn.serigstad@imr.no
Civil status:	Married, 2 children

Education:

1992	**Norwegian Safety Centre** Offshore Safety Training (Leiro l-3)
1987	**University of Bergen, Norway** Doctor Scientiarum Environmental Physiology
1981-1983	**University of Bergen, Norway** Cand. Scient. Fish Physiology
1977-1980	**University of Bergen, Norway** Cand. Mag. Scientific Discipline
1976	**Military Officer School** (Past Military rank - Captain)

Languages:

Norwegian	Excellent
English	Good
German	Good
Portuguese	Basic understanding
French	Basic understanding
Indonesian	Basic understanding

Experience Summary:

- International Experience from Environmental projects in developing countries in Asia, Africa, South America and in Russia.
- Member of FOA program committee for New Nansen Program
- Development of special tools for marine environmental monitoring/inspection in deep water
- Monitoring of effects from pollution in the water column around oil installations using live fish and mussels in cages. Responsible for design and field operations.
- Development of ESCA- "self illuminating" fishing lure for sports and commercial fishery
- Environmental monitoring of the effects of the tsunami in Indonesia 2004
- Fisheries and aquaculture projects in Thailand. Contribution to reconstruction and development of the fisheries sector after the tsunami.
- ICES projects on monitoring of the pollution in the North Sea.
- Projects under the Nordic Council, Arctic Monitoring and Assessment Program (AMAP).
- Research cooperation with Duke Marine Laboratory, USA
- Research cooperation with University of Odense Denmark
- Responsible for training and scientific cooperation with scientists and officers on the Norwegian built R/V Baruna Jaya VIII in Indonesia.
- Ocean Climate A/S Environmental Consultancy, Research and Development: General Manager 8 years. Development of environmental monitoring technology, sampling technology, fishing technology and oil spill clean up technology
- Appointed as expert for the Norwegian Research Council Evaluation of 14 Environmental Impact Assessment (EIA) from offshore petroleum operations in Norwegian waters
- Norsk Hydro A/S , Bergen, Norway, Safety adviser (Environmental impact) Drilling section
- Statoil, Research Centre, Trondheim, Norway, Environmental advisor
- Institute of Marine Research, Bergen, Norway, Senior scientist. Responsible construction and operation of the IMR Eco-toxicology lab
- University of Bergen, Norway, Zoological Laboratory, Research Scholar, Grant from Shell
- Teaching of Master- and PhD-students at the University of Bergen

Experience:

International cooperation and Norad-projects:

- Bilateral project on Marine sector between Norway (IMR) and Portugal (IPMA) 2014-
- Project coordinator for the bilateral cooperation project on fisheries management between Norway and Angola (2014 -
- Environmental Monitoring - Development of a deep-water ROV based inspection and sampling device for for use in Tanzania (2014-)
- FAO project "New Nansen program" committee member, responsible for the Environmental part of the program. 2013-
- Vessel Design committee for the new Dr, Fridtjof Nansen Research Vessel, responsible for environmental science facilities and equipment 2013-
- Deep water Environmental monitoring in the Nigeria Saõ Tome joint development Zone (JDZ) 2010-2014
- Advice and support for upgrading Environmental monitoring lab at EPA, Accra, Ghana (2012-2014)
- Coordinator for cooperation with Poland on analysis of Marine Benthos Biodiversity (2012-
- Environmental baseline studies prior to start of offshore oil production in Ghana 2009-2014
- Environmental monitoring in Angola field studies 2006-2013
- Special biological baseline studies in Mozambique by use of R/V Dr Fridtjof Nansen 2007
- Fisheries and aquaculture projects in Thailand. Contribution to reconstruction and development of the fisheries sector after the tsunami 2005-2007.
- Environmental monitoring of effects of the tsunami in Indonesia, Field studies in 2005, 2006 and 2007
- Responsible for training projects for ship personnel and scientists to secure optimal use of the new technically advanced Norwegian built research vessel Baruna Jaya VIII, in Indonesia.(1998-1999).
- ICES: Member of the Biological Effect Monitoring Group 1988-1992 and 1998 –2000
- Initiator and responsible for cooperation between IMR and the Indonesian Research Institution LIPI, 10 projects within Aquaculture, Oceanography, Numeric modelling, Environmental Monitoring, Multi beam acoustics, Fisheries acoustics, and Operation of research vessel. (2000-2003)
- Initiator and member of the steering committee for "BecPelag" the ICES Pelagic Workshop with participation of 6 European research vessels and 40 biological and chemical laboratories.(2000-2002)
- Responsible for an International Aquaculture Workshop at Lombok Indonesia. Special focus on development of the aquaculture sector in Indonesia and East Timor. (2002)
- Responsible for the fisheries and aquaculture part of a Coastal Zone Management Projects in Riau Indonesia. (2002 -)
- Responsible for the Oil-Fish projects under the Nansen-program. Initiator for 2 Oil -Fish Seminars in Angola and one in Norway. The main focus for these seminars has been Environmental management and plans for training. (2000-2003)
- Preparation of a draft National plan for environmental monitoring of the offshore oil industry in Angola (cooperation between IMR, SFT, NPD, Angolan authorities and oil industry. (2001-)
- Arctic Monitoring and Assessment Program (AMAP) Chairman of the working group on PAH and oil pollution in the arctic environment. (Cooperation with Russia). 1997-2001

Research and Development

- Development of a "VideoGrab" for sediment sampling, CTD, HD video and photo down to 4000 meters depth. Cooperation with Argus Remote Systems. Funding from Innovation Norway. (2010-2014)
- Water column monito*rin*g in the North Sea. Responsible for caging exposure technique and field operations (2003-2009)
- Environmental effect survey after oil spill in the north Sea using R/V Haakon Mosby 2008
- Development of light flashing fish attractors/lures based energy generated from galvanic cells with seawater as electrolyte (patented and in production)
- BecPelag: Responsible for caging exposure technique and field operations in the North Sea and in the German Bight. (2001)
- Studies of accumulation and discharge of oil components in zooplankton *(Calanus finmarchicus)*, using radioactive labelled oil-components. Funding from Norwegian oil industry (2001)

- Effect studies of the effect of crude oil on corrals. Funding from the Norwegian oil industries deep water association. (2001)
- Effect studies of oil on the behaviour of euphacides and their ability to catch pray in oil polluted water. Funding from the Norwegian oil industries deep water association. (2000)
- Deep Spill - Experimental Underwater Oil Release" Responsible for IMR participation with 2 Research Vessels. One vessel for ROV operations and one vessel for water, plankton and fish monitoring and sampling. (2000)
- Effect studies of oil on deep water zooplankton, using acoustic data from the DeepSpill experiment. Funded by Chevron (2001)
- NOFO – Experimental oil-release at the Frig-field in the North Sea, to test the Norwegian oil spill contingency. Member of the planning committee. Responsible for the oceanographic and biological sampling using the research vessel Johan Hjort. (1998)
- Oil-dispersants; Effect studies on marine organisms. Responsible for two projects funded by the Norwegian Research Council. (1997-1999)
- Responsible for the IMR contribution to the Norwegian Environmental Monitoring manual for oil spills. (1998-1999)
- Responsible for the IMR comments on Environmental Impact Assessments (EIA) and plans for Exploitation and Operations from the oil companies operating in the North Sea.(1997-2001)
- Review of methods for effect studies on marine organisms, cooperation with Sintef Chemistry.
- Referee for the scientific journal Sarsia, issued by the University of Bergen

1993-1997 and 2000-2003 Ocean Climate A/S, General Manager

- Administrative and technical leader for Ocean Climate A/S. The company are involved in research and development of equipment for environmental monitoring, and consultancy for industry and public institutions. The company has close cooperation with the University of Bergen and IMR.. The cooperation includes also teaching at Master and PhD level.
- Development of new in situ monitoring techniques for pollution from offshore and costal sources using live fish. (1995-)
- Appointed as expert for the Norwegian Research Council Evaluation of 14 Environmental Impact Assessment (EIA) from offshore. (The ROS project)(1998-2001)
- Development of techniques using Sphagnum plants for oil spill clean up, cleaning of contaminated soil and handling of waste products from oil industry (1996-) *(Patented)*
- Participation in development of underwater lights using sea water batteries as power supply (*Patented).*
- Field experiments in costal and oceanic area, to assess the potential for using light to attract food organisms for caged fish. Development of new aquaculture technology. Funding from the Norwegian Research Council. 1996.
- Member of expert group for evaluation of environmental impact from offshore oil industry on deep water marine organisms, Cooperation between the oil industry and Norwegian research institutions. (1997-2001)
- Experience from first feeding experiments on fish larvae (1987-)
- Responsible for construction and operation of Eco-toxicological laboratories at IMR and at the University of Bergen. (1986-1992)
- Responsible for the biological effect studies on marine organisms under the AKUP program(the Norwegian inter-ministerial working group on environmental impact from the oil industry (1985-1997)
- Water column monitoring in the North Sea at the Troll-field. **C**aging of cod, blue mussels and SPMD-Membranes. Responsible for exposure technique and field operations (1996)
- Experience from storage by caging of wild fish in Norwegian waters (1986-)
- Study on effects of crude oil from the Troll-field on marine organisms. Special focus on how chemical dispersants can modify toxicity and natural behaviour of marine organisms.
- Oceanographic monitoring and effect studies using caged blue mussels and SPMD membranes at the Statfjord-field in the North Sea. Cooperation with Statoil (1994-1995).
- Five months caging experiment at the oil refinery at Mongstad, Norway. Studies of accumulation and discharge of oil-components in fish. 1995
- Evaluation of environmental sensitive area at the Norwegian coast, Norsk Hydro
- Modelling of distribution an impact from an accidental release of radioactive drilling fluid from Mærsk Giant, Amoco (1997)

- The Brinor project: Evaluation of produced water discharges in the North Sea. Distribution and environmental effects, Financed by the Norwegian Petroleum operator association (OLF). (1993-1997)
- Field studies and modelling of distribution of water and chemicals during discharge from a gas pip- system in the North Sea.
- Leader of the "recipient project" Assessment of distribution and effects from heavy metals from drilling activities on fish. (1992-1997)
- Analysis of hydrocarbons in farmed salmon after shipwreck (1993)
- Preparation of discharge applications for oil-companies operation in Norwegian continental shelf (1993-1997)

1993 Statoil Environmental advisor at the research centre in Trondheim Norway

- Evaluation of effects of produced water on marine organisms
- Proposed work plan for control and reduction of produced water effects on marine organisms
- Ecotoxicological tests on effects of produced water on fish eggs and zooplankton

1992 Norsk Hydro Safety advisor, Drilling department

- Introduction of environmental accounting systems and environmental reporting from the drilling rigs.
- Ecotoxicological evaluation of chemicals
- Discharge and operation applications
- Education related to working environment and natural environment
- Compilation of EIA for Norsk Hydro drilling in Namibia

1986-1992 Institute of marine research (IMR)

- Senior scientist. Head of the Bio-test laboratory. Responsible for construction and operation of the laboratory at the institute, on research vessels and in the field.
- Project leader for the AKUP-project Marine organisms susceptibility to oil as function of age.
- Project leader for the project on seismic surveys "Effects from airgun shooting on fish eggs, -larvae and juveniles
- Project leader; The effect of temperature changes on the metabolism of early stages of cod, herring and capelin in relation to geographical distribution.
- Testing of effects from oil on zooplankton under arctic conditions in the Barents Sea. Field experiments using the R/V G.O.Sars.
- Toxic algal blooms – Responsible for establishing field laboratory and monitoring of effects from toxic algae on fish, during the bloom of toxic algae in Norwegian waters in 1988-1990 and in 1998
- Member of the inter-ministerial expert-group AKUP for Environmental Impact Assessment and Baseline-studies on the Norwegian continental shelf
- Member of the ICES biological effect working group
- Member of the ICES group on Effects of toxic blooms (Chrysocromulina polylepis).

1981-86 University of Bergen, Zoological laboratory

- Research scholar on the project "Fish larval physiology and anatomy, Basic research and effects of oil. The Project was supported by Shell.
- Member of the institute board and the education committee at the Zoological Laboratory
- Duke University, Marine Biomedical Centre. Research fellow 2 months (Toxicology of metals)
- Duke University, Marine Biomedical Centre. Research fellow 3 months (oxygen transport)
- Odense University. Research fellow at professor Roy Weber's physiological laboratory (Electrophoresis).

Teaching at University of Bergen:

- Fish health, Biology, Methods in Experimental Biology, Environmental Chemistry
- Master students,
- PhD students
- Censor in Physiology and Ecotoxicology at the University of Bergen.
- Opponent for PhD examination.

Member of the board in 3 companies

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