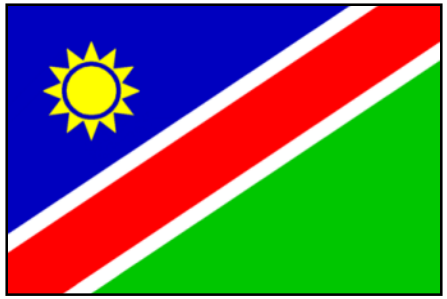
Marine Phosphate Project Namibia

Windhoek Mining Expo - April 2016



Introduction: General

Phosphate uses in brief

- Phosphate: Crucial element in food security required by the growing world population:
  - Fertilizer production (90% of phosphate use)
  - Animal food supplements (animal feed phosphate)

  - Food grade: Soft drinks, dairy, meat and fish products, soups, sauces, vegetables, fruit, toothpaste, detergents, soaps, etc.
  - Phosphate is the structural material for bone and teeth.
  - Too little phosphorous in the body cause dropping of energy levels, muscle weakness, fatigue and low tolerance for exercise.

  - Industrial: Medications, cosmetics, textiles, photography, paint, ceramics, antifreeze, metal industries, plaster, cement, etc.

- There is no substitute for mined phosphate and therefore it is a strategic mineral for food security.











Introduction: General

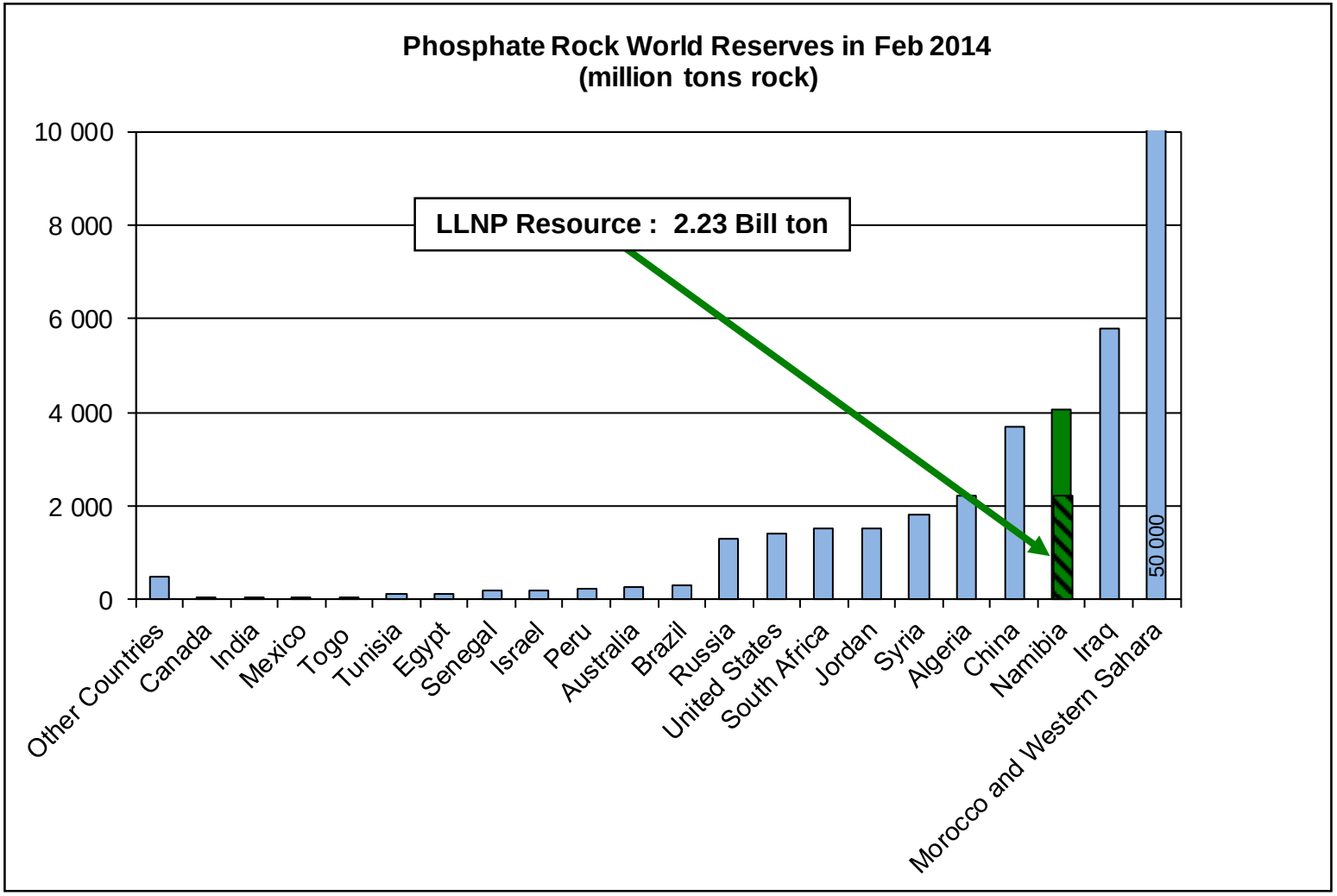
In its lifetime, every baby born today will consume...

- 210 kg Zinc
- 500 Ton Sand, stone & Gravel
- 15,000 kg Salt
- 280,000 liters of Crude Oil
- 5,800 kg Clay
- 17,500 kg Cement
- 425 kg Copper
- 18,000 kg Other Minerals & metals
- 50 gr Gold
- 178,000 m3 Natural Gas
- 240,000 kg Coal
- 12,600 kg Iron Ore
- 8,000 kg Phosphate
- 2,300 kg Aluminum
- 400 kg Lead

1.3 million kg of minerals, metals and fuels in a lifetime

Minerals Information Institute, Colorado

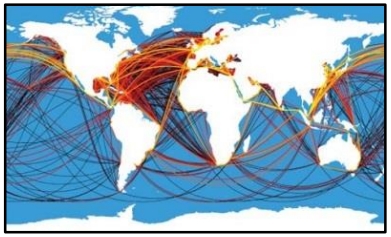
Phosphate Reserves



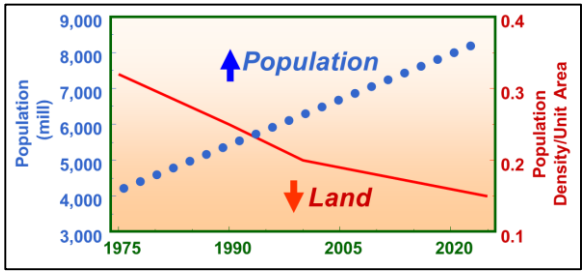
Phosphate Market outlook

Market outlook

- Phosphate reserves and fertilizer production are concentrated in only a handful of countries:
  - Morocco
  - China
  - Russia



- Geo-political instability and export restrictions make security of supply a risk.
- Namibia is stable and is in a position to offset these risks for the SADC region and beyond.
- World fertilizer demand is increasing at 2% per year, with world population increase the primary driver.
- LLNP production will be 0.3 Mtpa, which is 0.7% of the total demand and easily absorbed by the market.



Direct Application Phosphate sand

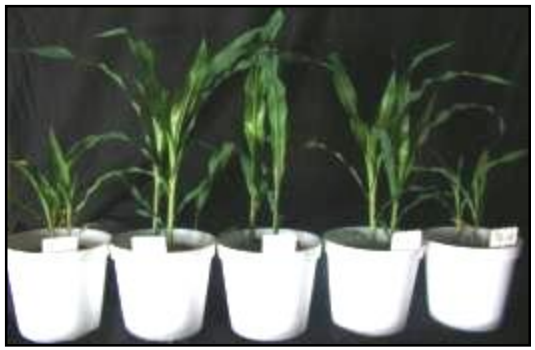
Agronomics study

Agronomics study: Pot and Field trial study on Direct application NamFos blends

- Pot trial tests : Omnia conducted tests of blends consisting of our NamFos sand and expensive fertilizers (MAP, DAP, TSP).
- Field trial tests : The University of Orange Free State (RSA) conducted similar tests in a controlled open field trial.
- Results : Yield is higher/ha with 40% SSP/60% NamFos blend, than 100% SSP.
  Yield is higher/ha with 40% DAP/60% NamFos blend than 100% DAP.

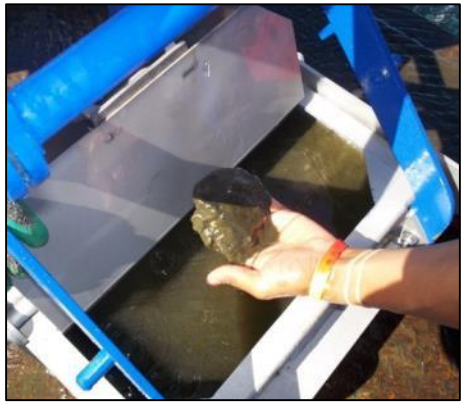
Conclusion :

- Expensive fertilizers can be blended with inexpensive NamFos sand and provide improved benefits to crops with reduced cost to the farmer.
- The Neckartal dam project, 60 km NW of Keetmanshoop will irrigate 5 000 ha of land for agriculture and affordable fertilizer will be the key to unlock this potential.
- Agricultural projects in northern Namibia will benefit from affordable locally produced fertilizer.

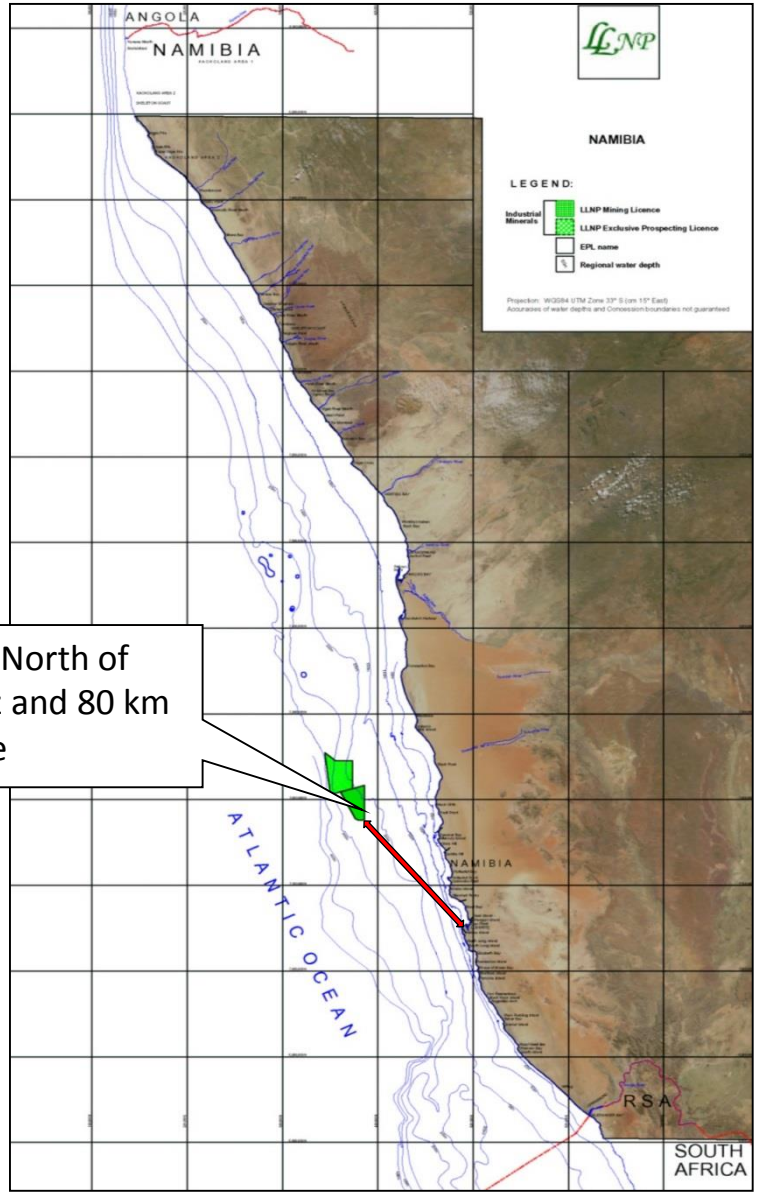


What will happen without phosphorus?

Environmental Aspects

Phosphate Licences



- The areas of potential viable mining in Namibia are likely to cover **< 0.5%** of the Namibian sea floor.

EIA: Beneficiation processes

Beneficiation test work towards EIA study

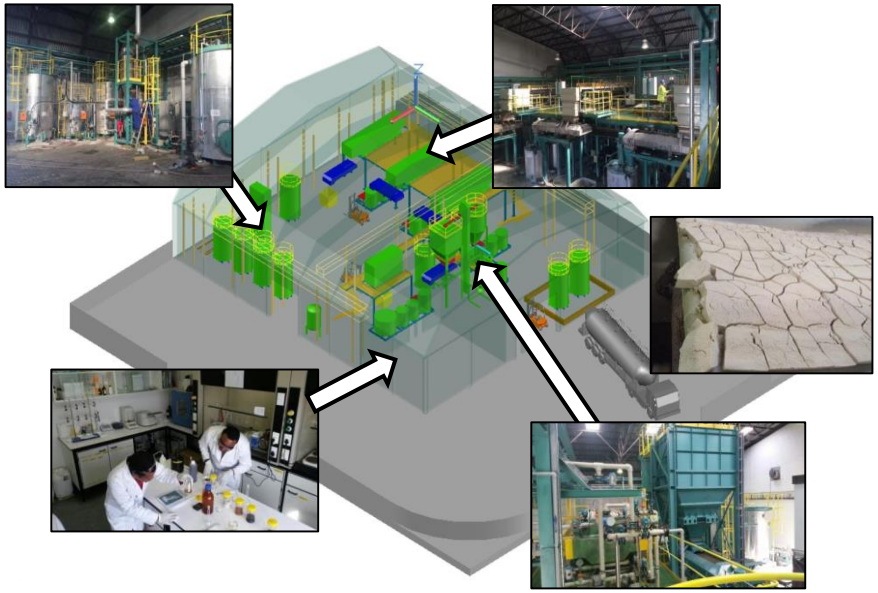
A small scale testing facility was constructed in Lüderitz to simulate the process and to gather real time data towards the EIA study.

Separation test facility

- Mechanical beneficiation
- Environmental evaluation

Demonstration test facility

- Fertilizer production
- Environmental evaluation



EIA: Fertilizer production

- **The following environmental monitoring has been implemented**

- Baseline noise survey
- Air quality and gas emission survey
- Solid waste analysis and treatment
- Liquid waste analysis and treatment

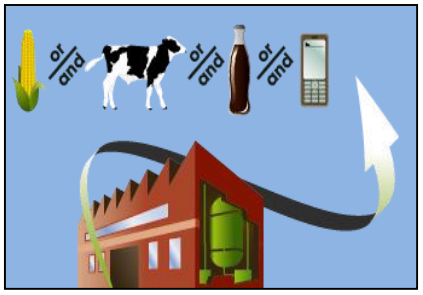
- **Safe and environmentally friendly fertilizer technology**

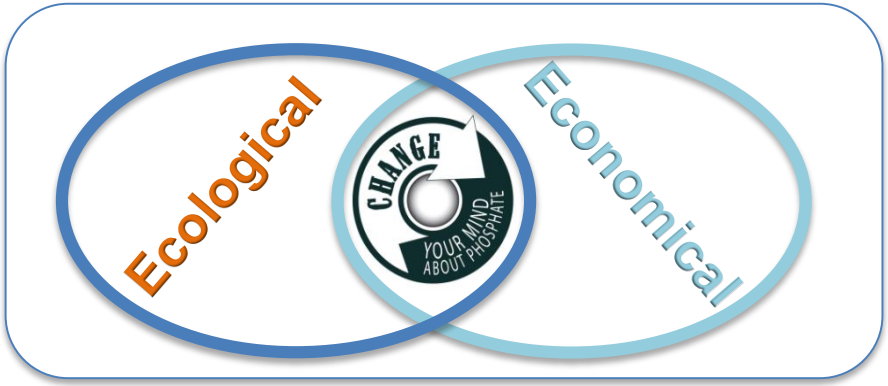
- Safe process with zero use of volatile solvents.

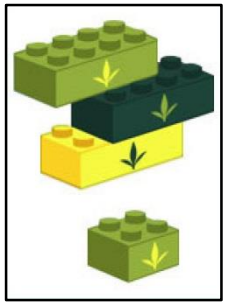
- Effective use of sea water instead of fresh water.

- Traditional technology produces large volumes of phospho-gypsum as a waste, whereas this technology produces pure gypsum as by-product, convenient for plaster boards, pharmaceuticals and cement industry.

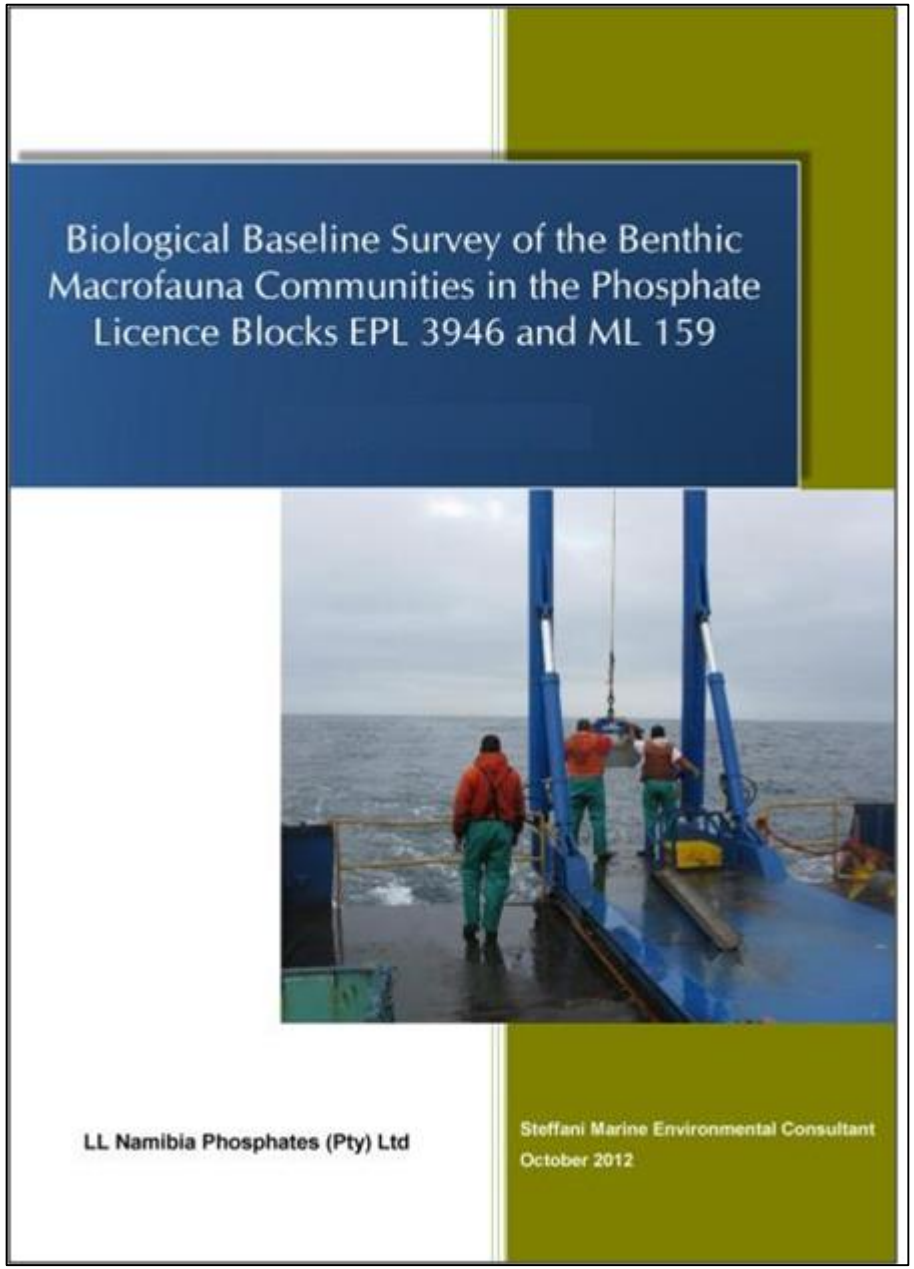
- Flexible technology allows for entering all market segments (fertilizer, animal feed, food).







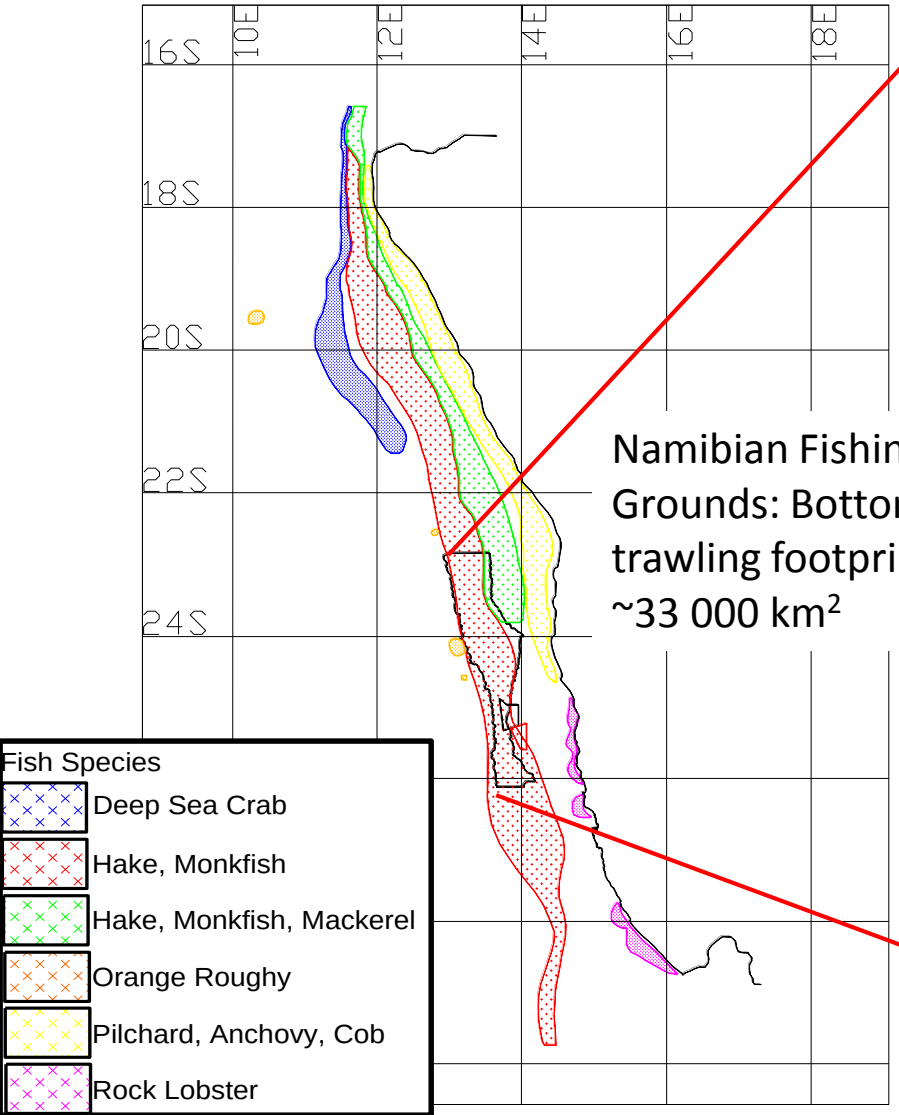
Environmental Baseline Studies



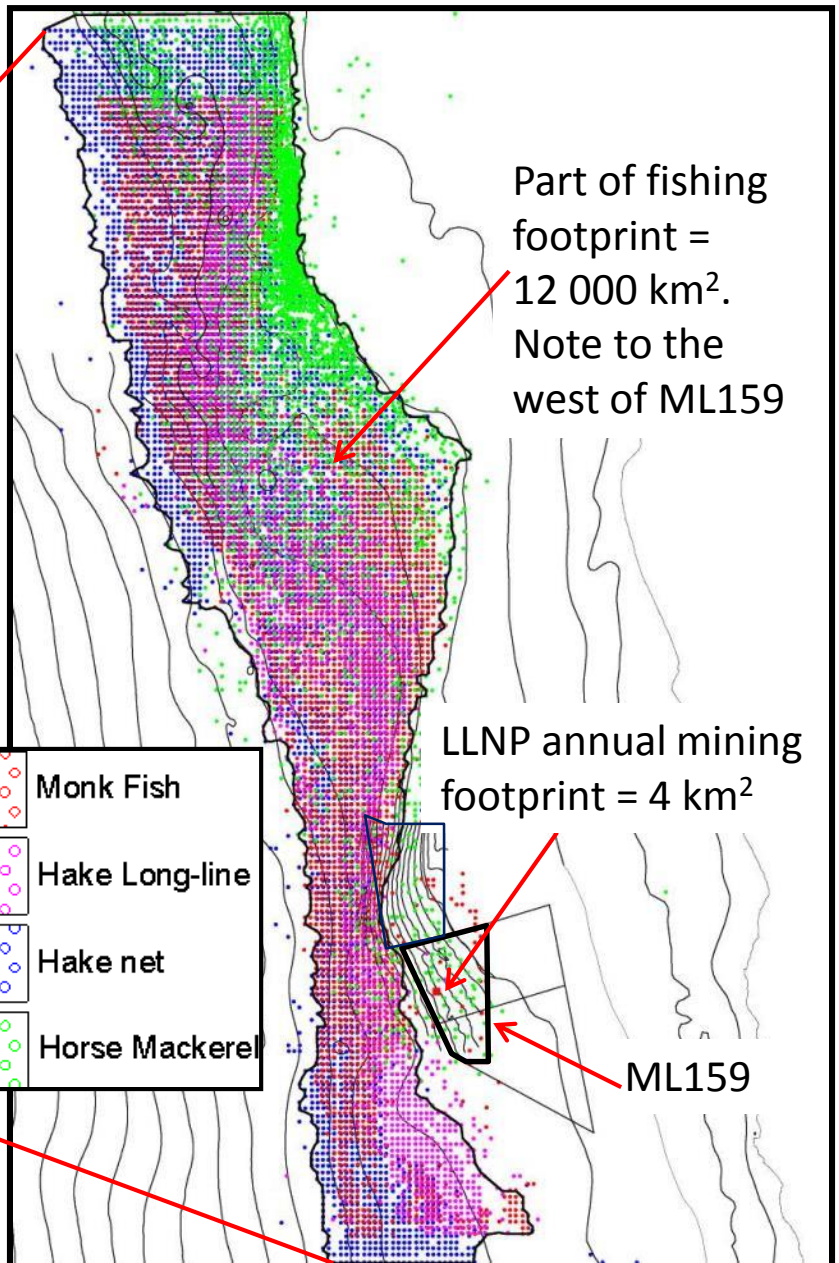
Potential impact on Fishing Industry

Potential impact on Fishing Industry

Note that phosphate licences are east of fishing areas



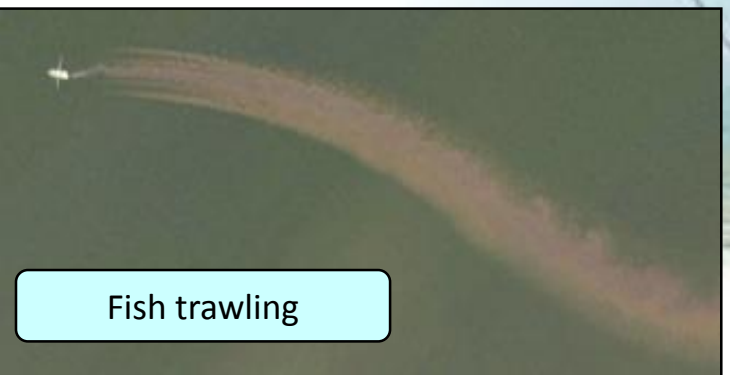
Namibian Fishing Grounds: Bottom trawling footprint = ~33 000 km²



Scale of environmental impact of phosphate, diamond mining and fishing

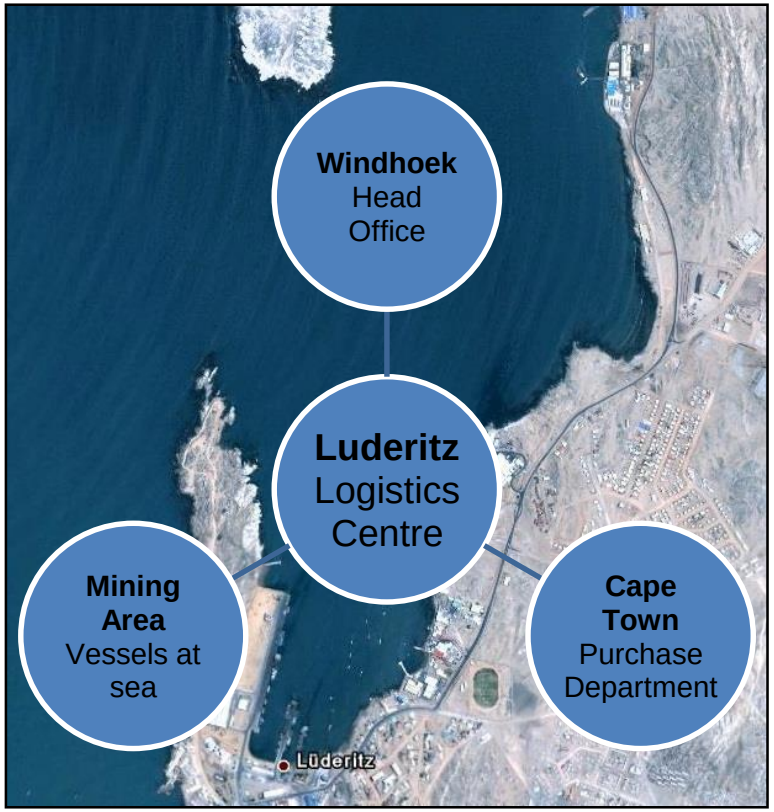
	Phosphate operation	Diamond operation	Fishing
Footprint per year (km2)	4	10 to 12	6600
Seabed depth disturbance (m)	0.3	2	0.3
H_2S, nutrients, heavy metals	Up risers into barge to land	Up risers onto ship and back	Directly into O_2 poor bottom waters

Important to note is that large parts of the sea floor has been bottom trawled for the last 60 years. Were there any serious environmental impact due to seabed disturbance this would have manifest itself decades ago through the activities of fishing and 50 years of diamond mining operations.



Fish trawling

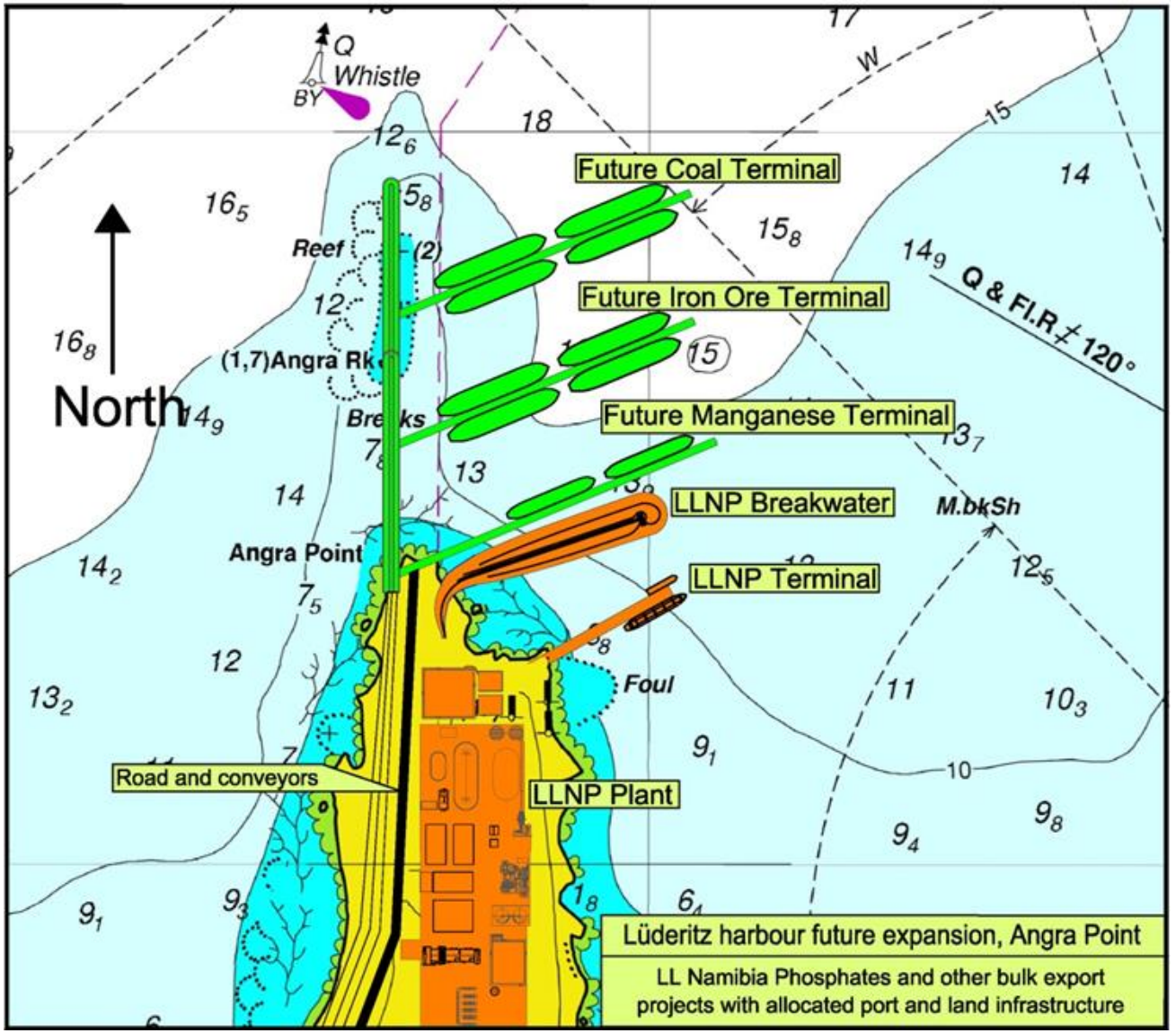
Infrastructure and Logistics



Infrastructure - Namport extension

This Fertilizer project falls within the plans of port authorities of Namibia (NAMPORT) for the deep water extension of the port of Lüderitz to allow bulk export.

*Map from the Namport Pre-Feasibility Study.



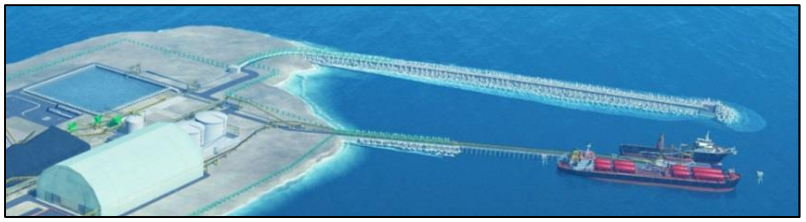
Key Parameters for the Phosphate Project based in Lüderitz

- **Vertically integrated** - Fully vertically integrated project, local beneficiation up to final products.
- **Fertilizers products** - Phosphate based downstream products (DAP, MAP, SSP, TSP, etc.).
- **Deposit** - Independently qualified resource of 2.2 billion tons, +500 year LOM.
- **Operating cost** - The lowest cash operating cost in the world (CRU).
- **Advantage in access** - Logistically well placed for big markets of India and South America .
- **Dedicated port terminal** - Independent and dedicated import/export terminal.
- **Power generation** - Self sufficient with 74 MW generation through steam turbines, balance of 47 MW will be exported to the grid.

- **Fresh water** - Produce own, no dependence from suppliers already under pressure.
- **Full PFS completed** - Resource, mining, fertilizer production and logistics.
- **Financial Viability** - Financial model by SNC Lavalin showed good Return On Investment.
- **FS: Demonstration plant** - Test facility construction and commissioning now completed.

Benefits to Namibia

Project specific



- The project is in line with NDP4 and Vision 2030
  - Manufacturing
  - Value addition
  - Infrastructure and Logistics
  - Self-reliance in Fertilizer Production
  - Various other support industries will be created around this mineral

- Harbour facility - Construction of new deep water harbour which will be a catalyst for the Namport Luderitz harbour expansion.

- Product exports will be via marine transport for international markets and rail transport for Namibian and SADC region, therefore making use of existing infrastructure.

- Project investment - N$ 24 Bill.
- Royalties - On revenues, the project will contribute N$ 50 Mill per year.
- GDP contribute - N$ 3 Bill per year.
- Taxes on profits - Direct taxes of N$ 500 Mill per year after debt return.
- Taxes on PAYE - 2 000 employment.

Benefits to Namibia

Fertilizer, Animal feed and Food range of products

- Product 1, Fertilizer - Top end export products and low cost fertilizers for local market and agricultural initiatives like the Neckartal dam project, Green Scheme and others.
- Product 2, Gypsum - Pure gypsum will fuel peripheral industries in the manufacturing of plaster, drywalls and cement.
- Project expansion - Animal feed and food grade phosphates.



Namibia suffers from a 28% unemployment rate and the National objectives are to reduce this to below 5% over the next 14 years

- Employment 1 - 3 000 during construction phase of 3 years.
- Employment 2 - 2 000 direct permanent jobs,.
- Employment 3 - Indirect through support services, housing, schools, medical services, logistics, retail, etc.
- For every job created in the mining industry, an est 7 jobs are created in associated industries.

- Skills development - Training will be provided from high to low skill levels.

- Economical growth - The town of Luderitz and the greater Karas region will benefit hugely from this employment and support industries.

- Sustainability - It is important to understand that for reason of food security and size of the deposit (+500 years) these benefits are deemed to be classed as sustainable.

Thank you

Please visit our booth

"…We may be able to substitute nuclear power for coal, and plastics for wood, and yeast for meat, and friendliness for isolation. But for phosphorus there is neither substitute nor replacement."

Isaac Asimov
1920-1992