Water - Security Concerns for the Mining Industry

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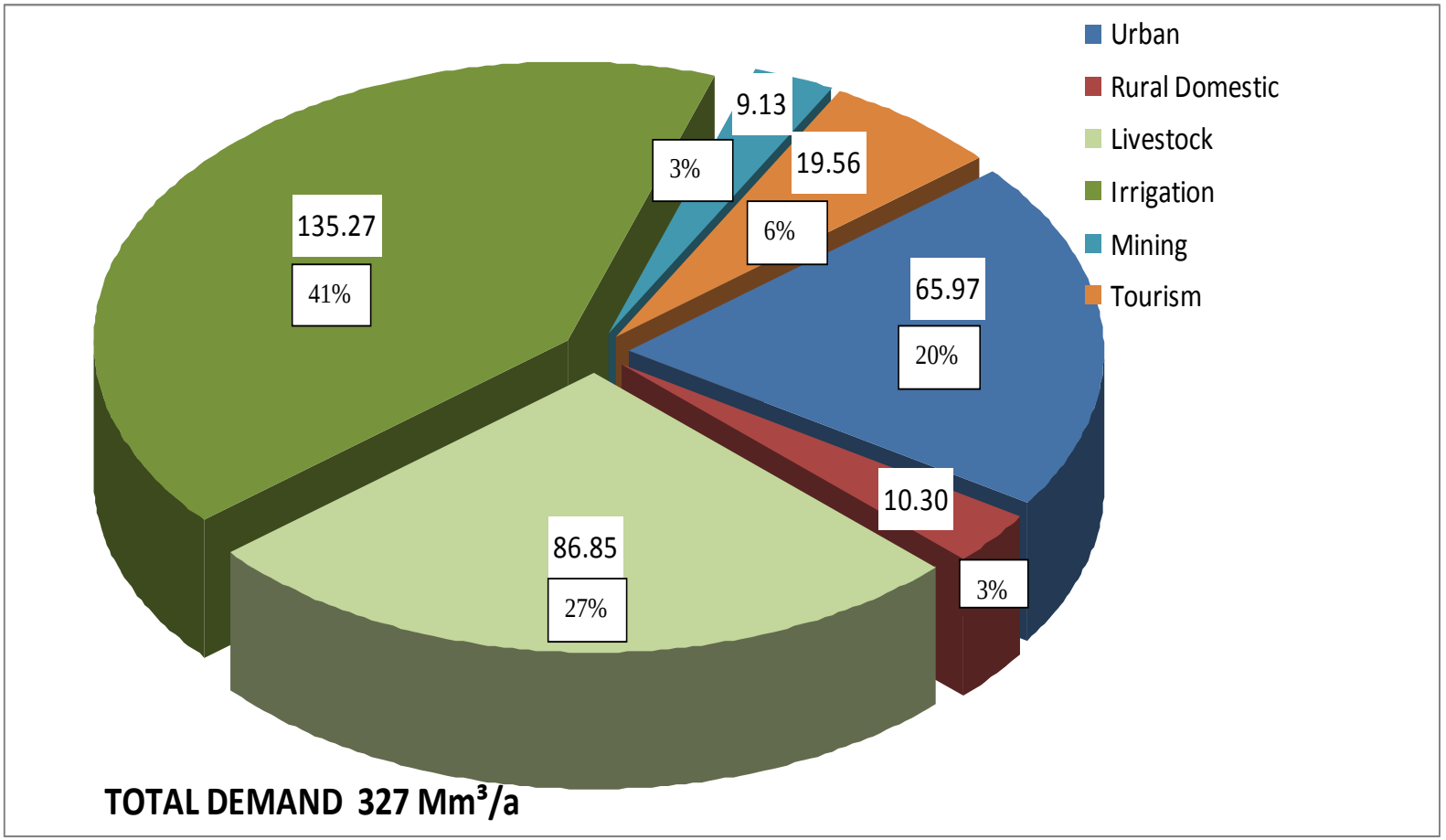
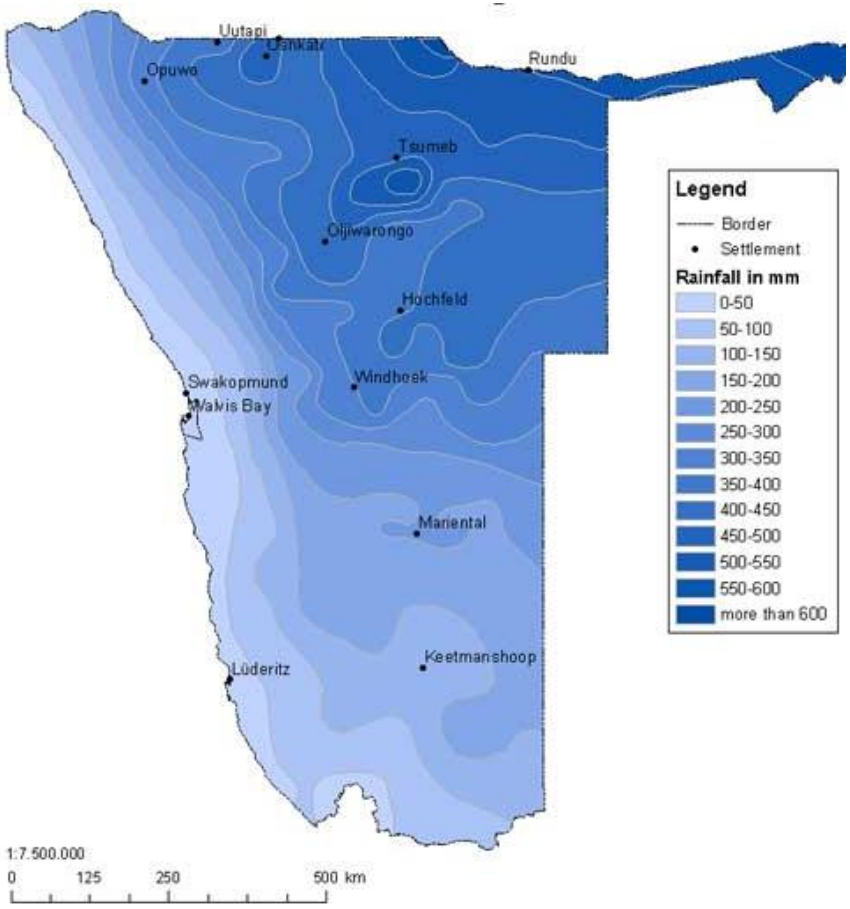
Water supply in Namibia

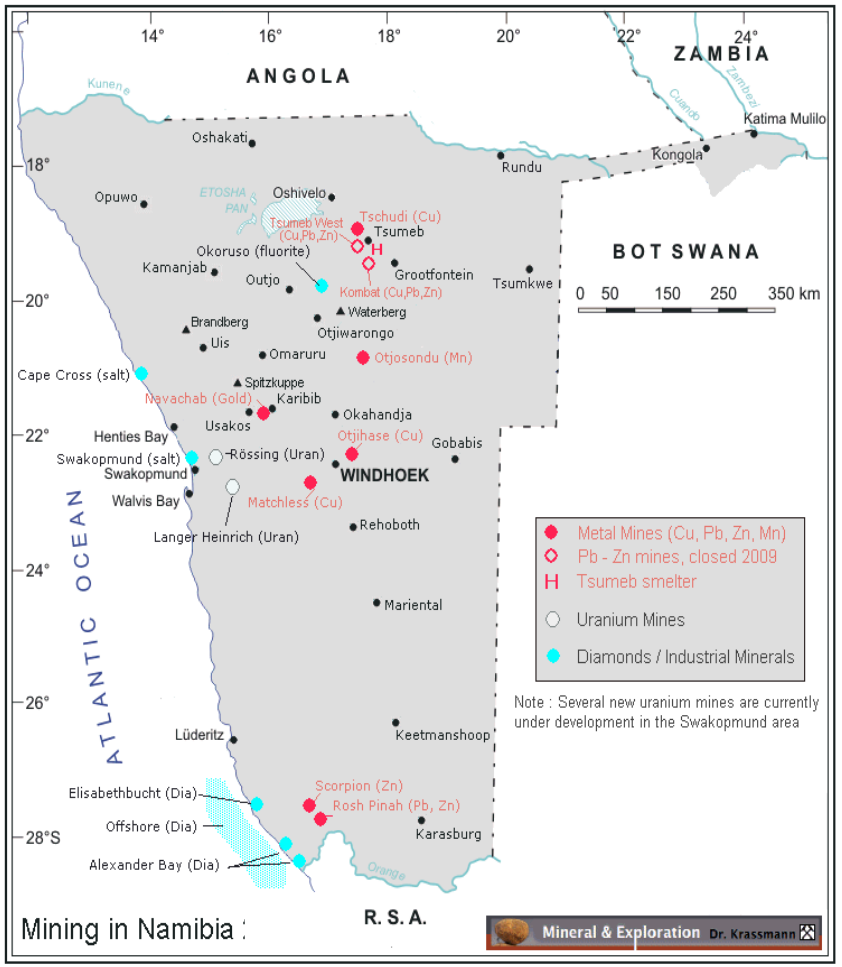
- **Surface water**
  - Perennial rivers along the borders (Orange, Kunene, Okavango)
  - Dams on ephemeral rivers (Von Bach, Swakoppoort, Oanob, Hardap, Naute)
- **Groundwater**
  - Groundwater in porous sediments, e.g. Kuiseb and Omaruru rivers
  - Groundwater in fractured rock, e.g. Windhoek, Otjiwarongo, Grootfontein karst region

Water consumption in Namibia



Climate of the central Namib





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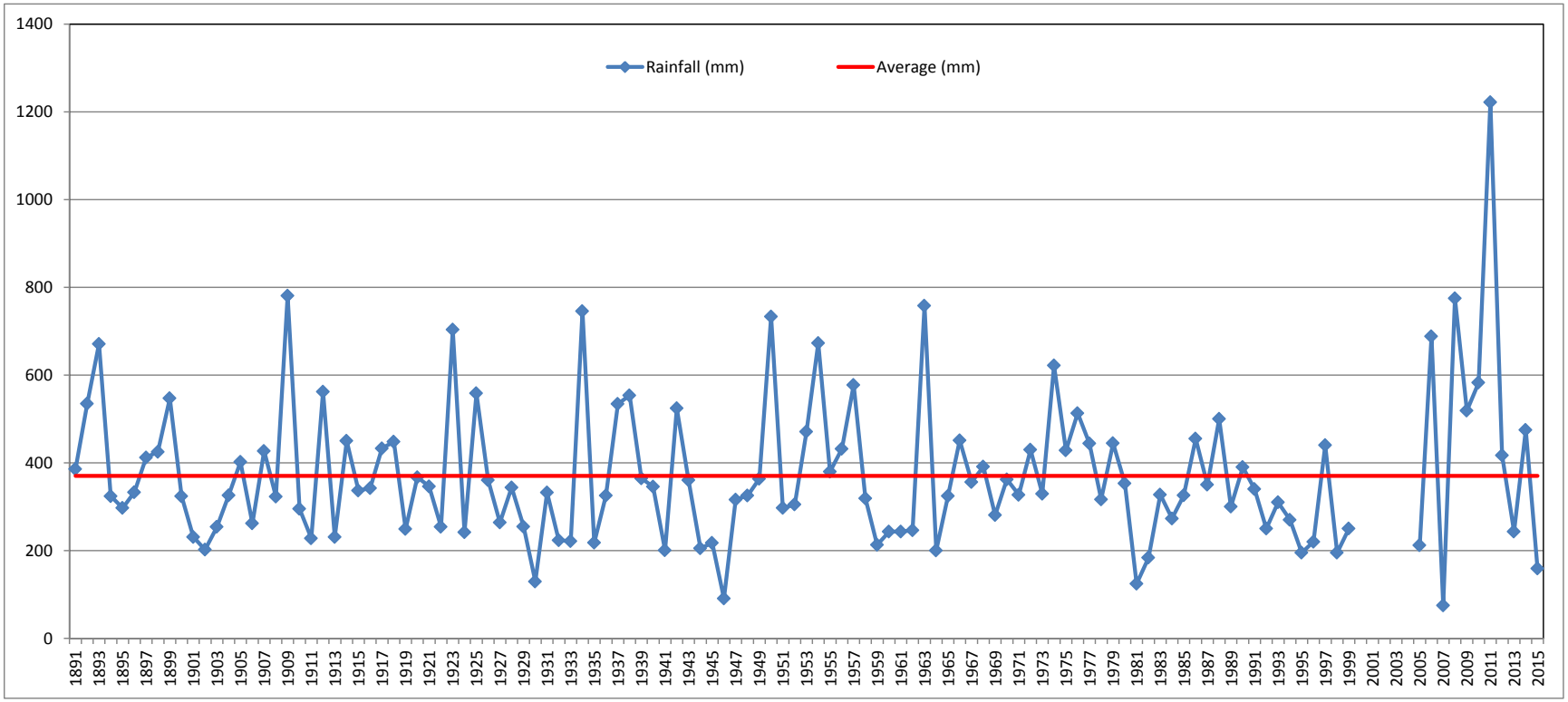
Historic rainfall in Windhoek

Rainfall in Namibia is unpredictable and often below average, high rainfall is very rare



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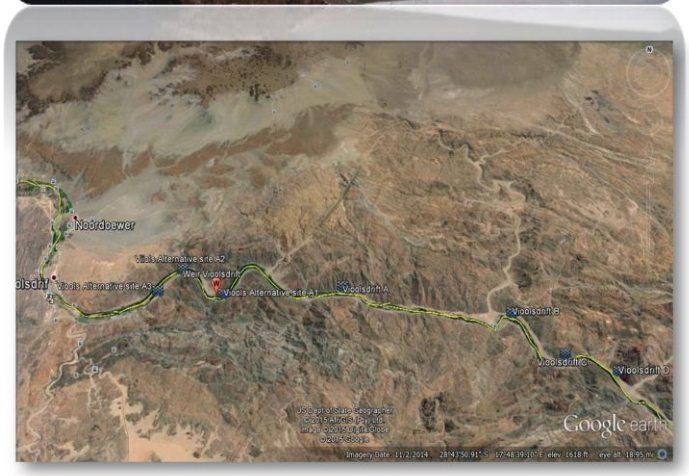
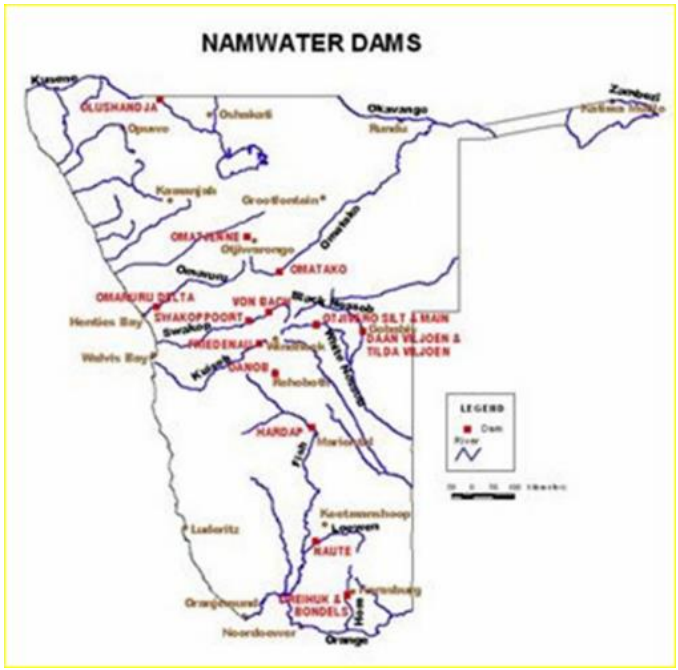
Water supply to the mines in the South

- The southern mines utilises water from the Orange river
- No formal agreement in place with South Africa regarding managing flow in the lower portion of the river
- Discussions between the Namibian and South African Governments ongoing
- Various sites being considered for building a dam in the lower Orange River



Water supply to the Central Region

- Very little inflow was received in the 3 main water storage reservoirs (dams) in the Central Region in Namibia during the 2015/2016 rainy seasons
- Higher rainfall in the 2016/2017 slightly improved the situation
- Water supply to the Central Region is augmented from sources in the north of Namibia
- Current dam levels improved, but water restrictions are still being applied

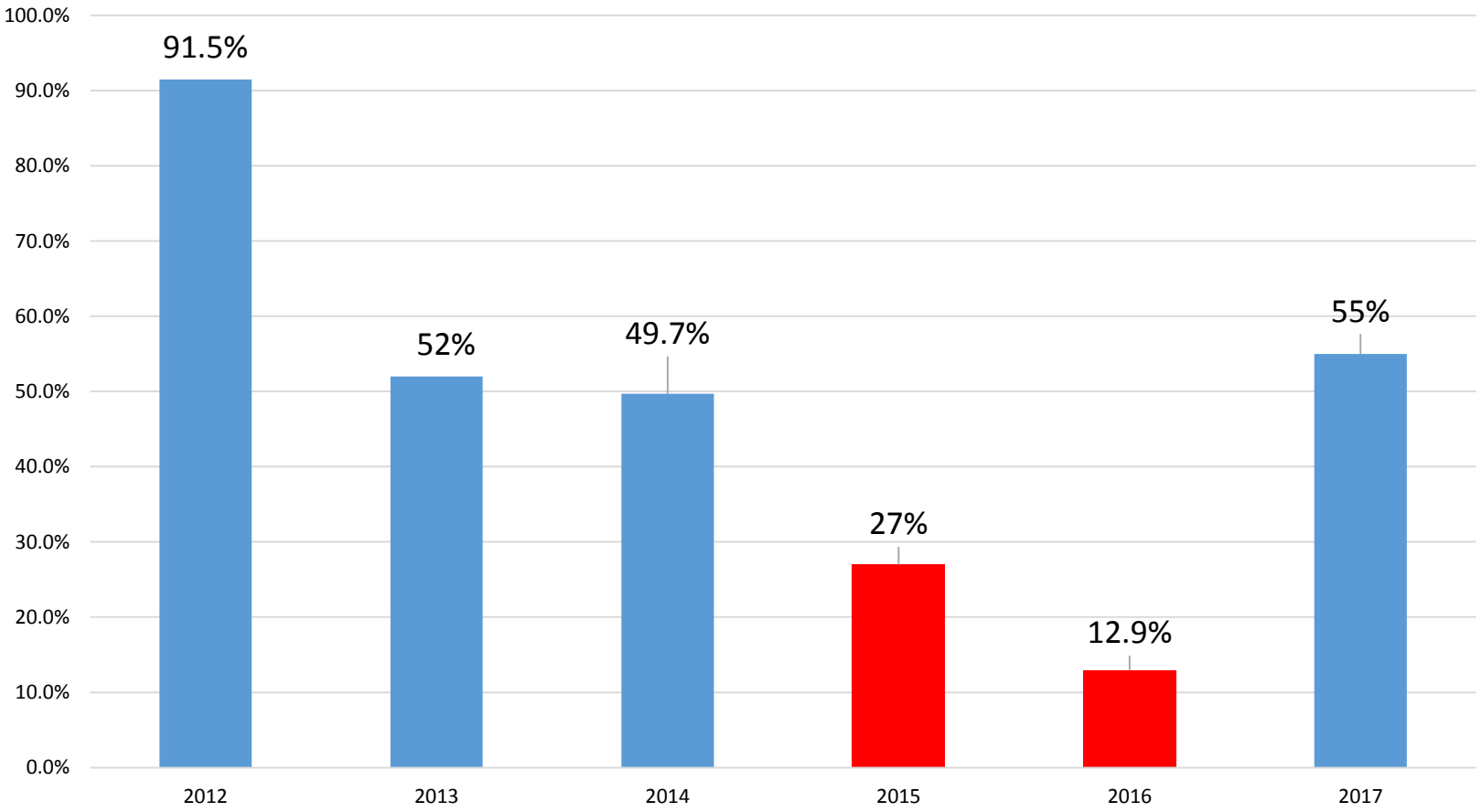


Von Bach Dam

Swakoppoort Dam

Omatako Dam

Central Dam Content - Mid-April



Source: NamWater

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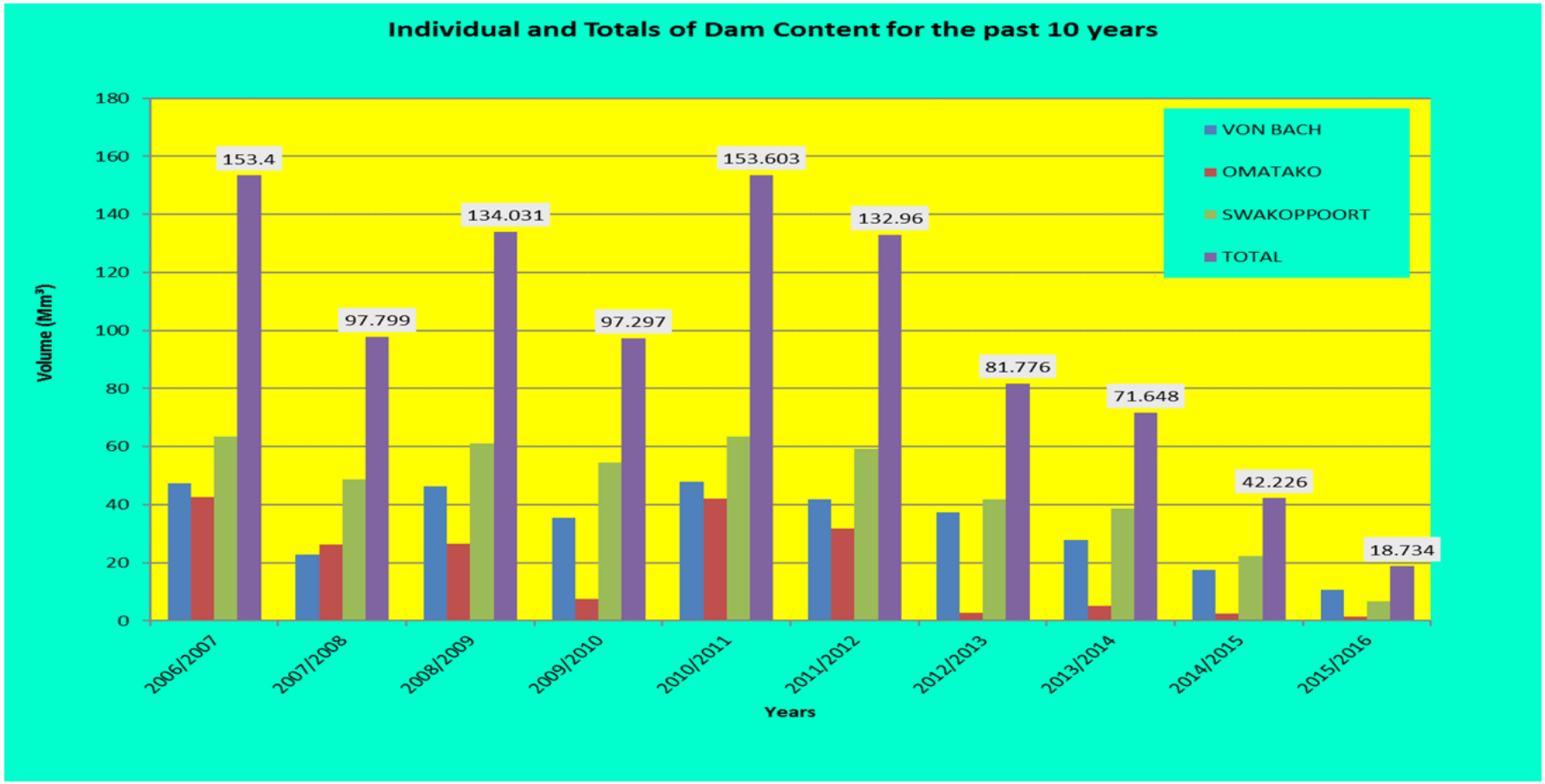
Central Area Dam Levels



- Combined dam contents have decreased over past 5 years
- Even a “good” rainy season will not release the pressure on the supply system
- Central area consumes about 35 million cubic meters per year
- Demand increasing

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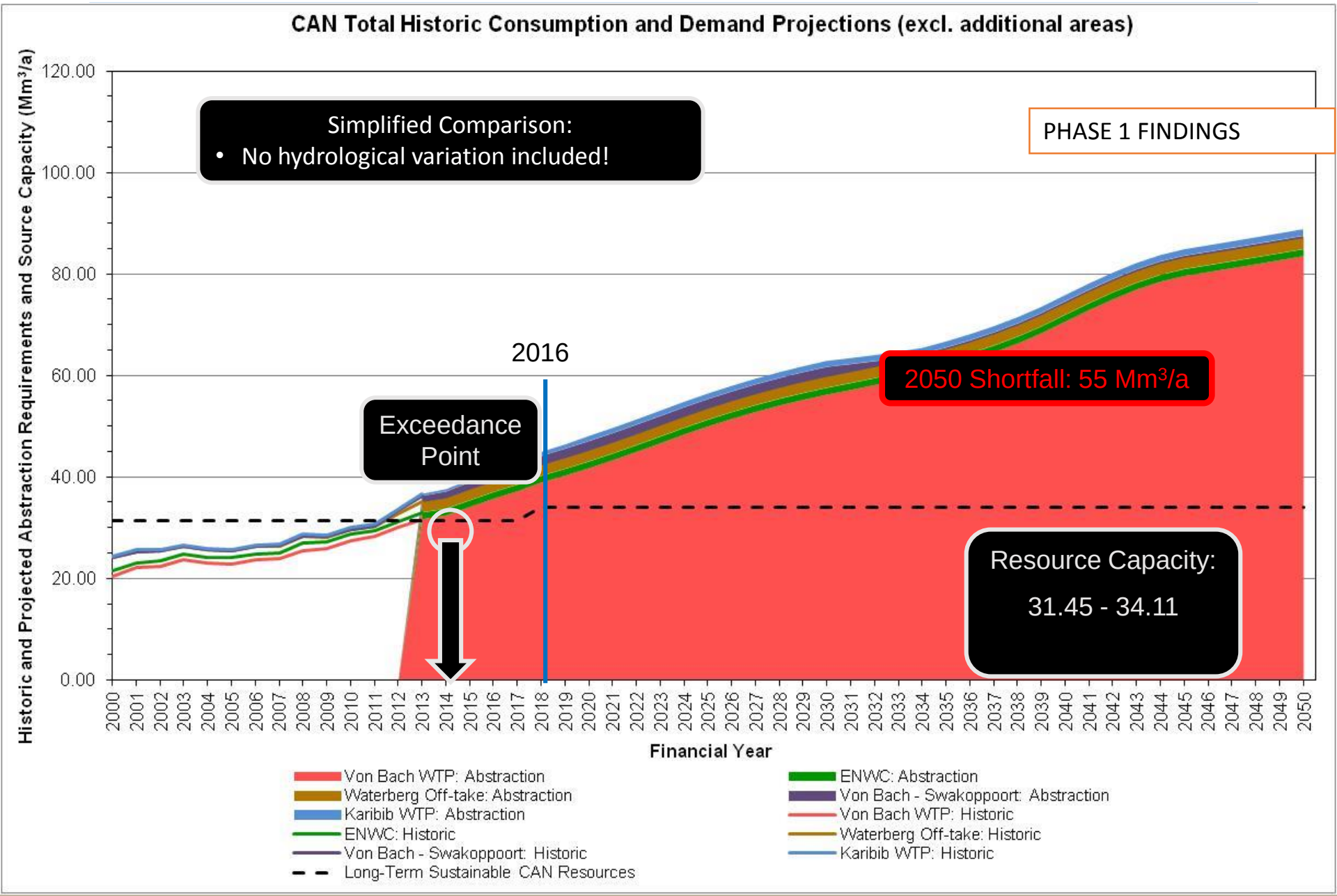
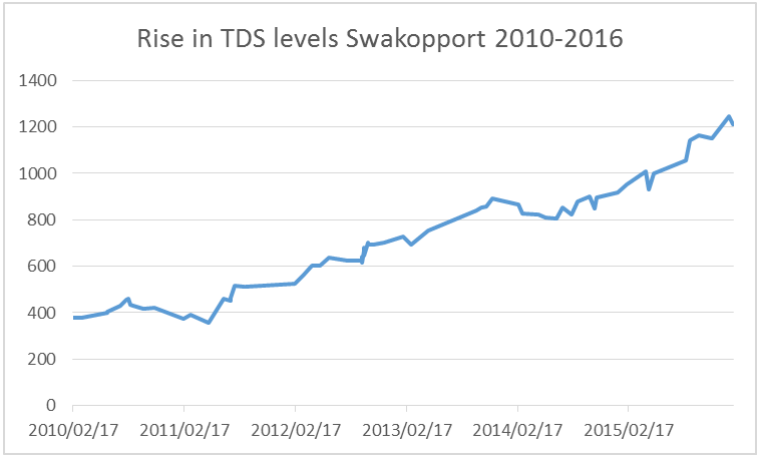
Central Area Water Demand Projections



Impact on Navachab Mine

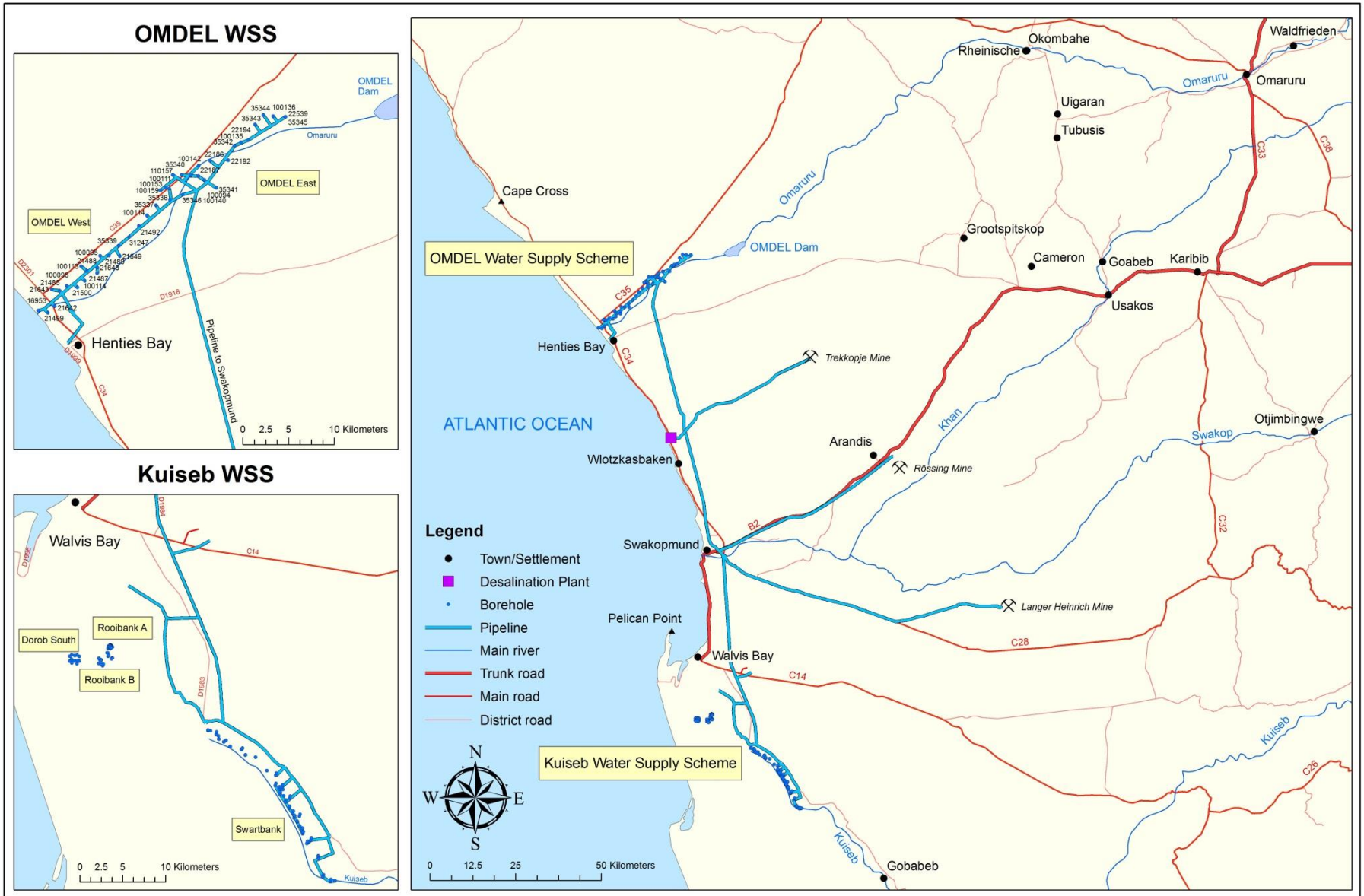
- The water quality is deteriorating This has three impacts on the operation:
  - Increase in Total Dissolved Solids (TDS)
  - High algae content in the water
  - Drinking water becoming unfit for human consumption
- Initiatives to reduce water demand :
  - Installation of vacuum belt filters
  - Replacement of mill motor water cooling system with an air cooling system
  - Clarifying water to be used for gland seal, belt filter lubrication and flocculant makeup
  - Replace boiler with heat exchangers
  - Installing mechanical seals, instead of gland water systems, in the plant where possible
  - Use Dust-a-Side, instead of water, to control dust conditions on the permanent haul roads
  - Awareness campaigns to make employees aware of the water scarcity
- About N$300 million spend to date – fresh water requirements per tonne treated reduced by 40%



Bulk Water Users at the Coast

- Arandis
- Henties Bay
- Swakopmund
- Walvis Bay (WB)
- Langer Heinrich Mine
- Rössing Mine
- Husab Mine

- Smaller Users:
- NamPort
- WB Airport
- WB Army Base
- Farmers along the Swakop River



Central Namib Water Supply Area

Additional sources of water supply

- Findings of NamWater's Central Namib Area Water Master Plans:
- J-line in the dunes south of the Kuiseb river drilled and tested, but pipeline not feasible
- Various dam sites on mid-section of Kuiseb river identified, but they would reduce recharge to the wellfields
- Construction of Omdel dam and enhanced recharge scheme upstream of the wellfield (completed)
- Desalination option given preference (pending)

Desalination history

- Water Master Plan identified seawater desalination as best option
- NamWater ran test plants and looked at Walvis Bay and Swakopmund sites
- EIA was done for Mile 6 north of Swakopmund
- NamWater requested tenders but none of the suppliers was approved
- AREVA built a 20 Mm^3/a plant at Wlotzkasbaken to supply Trekkopje mine – now used for other mines via the NamWater scheme
- Rössing received environmental clearance to construct own desalination plant

Working with Government

- Cabinet Committee on water established by the Namibian President
- Water Council established in 2016
- Chamber represented on Water Council (Jacklyn Mwenze and Sandra Müller as alternate)
- Regulations to the Water Act of 2013 released in January 2017
- Regulations reviewed by CoM via Exploration Committee and submitted to Water Council

Thank You

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