GROUNDWATER CHEMISTRY AND ALTERNATIVE SOURCES OF FRESHWATER IN ARID LANDS, NAMIBIA

***Keywords**: Namibia, Hydrochemistry, salinisation, desalination and fog harvesting*

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SUMMARY

Freshwater makes-up approximately three Per cent of total world water resources. About 70% of the total three- percent are found in icecaps and glaciers, and thus, only 30% are available as surface and subsurface water. However, the freshwater situation is even worse in arid regions. Surface and subsurface water resources are small, and often too saline for human consumption due to the low rainfall and high evaporation rates experienced in these regions.

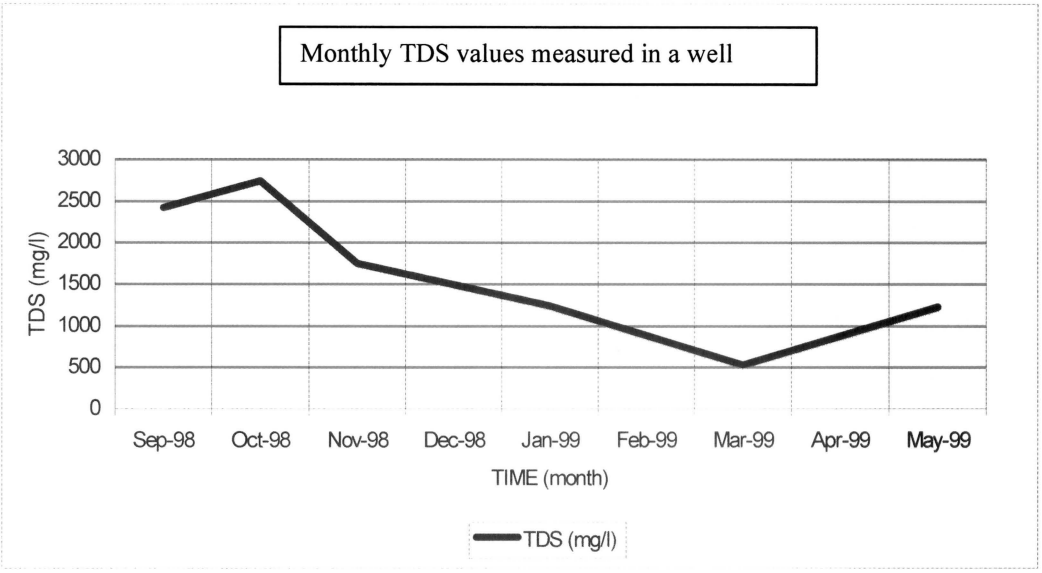
This research aims at understanding/quantifying the groundwater salinity problem as well as at investigating and providing recommendations on inexpensive alternative sources of freshwater for communities in arid lands.

Research areas:

1) ***Understanding the problem**: investigate groundwater chemical evolution, i.e., magnitude, patterns and processes of groundwater salinisation in Namibia's hyper-arid, arid and semi-arid environments.*
2) ***Investigate solutions**: 1) Small-scale desalination*
   2) Fog harvesting

1) Hydrochemistry

Water samples were collected ca. monthly, from drinking water sources in the three study environments from September 1998 to March 2000. Results of the hydrochemical analysis indicate a high temporal hydrochemical variation.

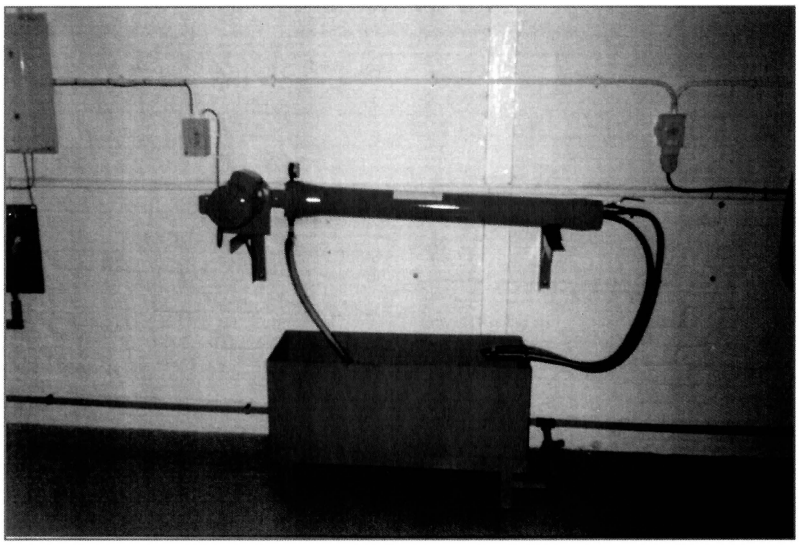


Example of measured hydrochemical parameters in water sources in Northcentral Namibia

2) Desalination

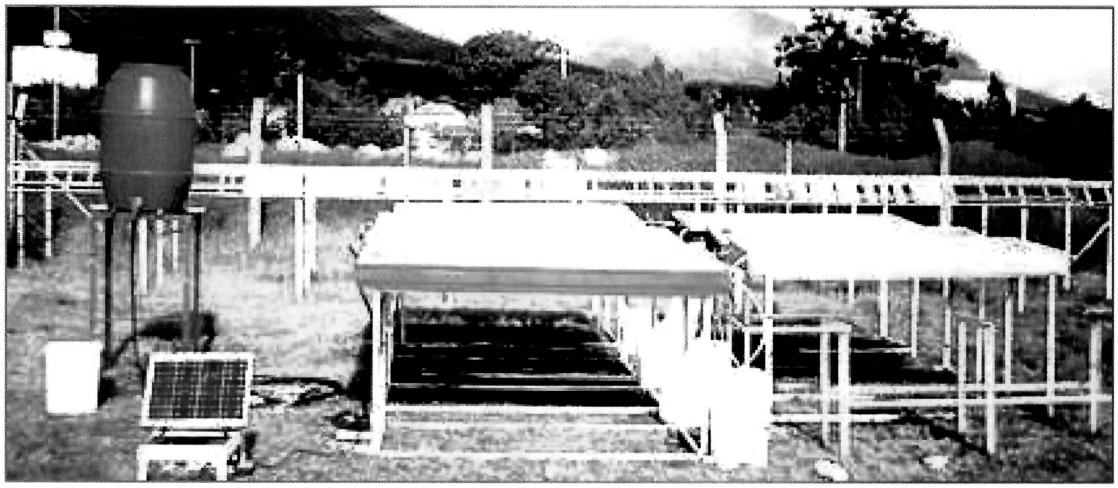
- Conducted low pressure reverse osmosis experiments- feasibility study for development of efficient photovoltaics-based RO unit at MWD, Stellenbosch;
- Constructed and tested low-cost solar distillation units that could be used in poor rural communities;
- To conduct solar distillation implementation trials among rural households in north central Namibia

i) Reverse Osmosis (small-scale)



Small-scale RO experiments at Mineral Water Development, Stellenbosch

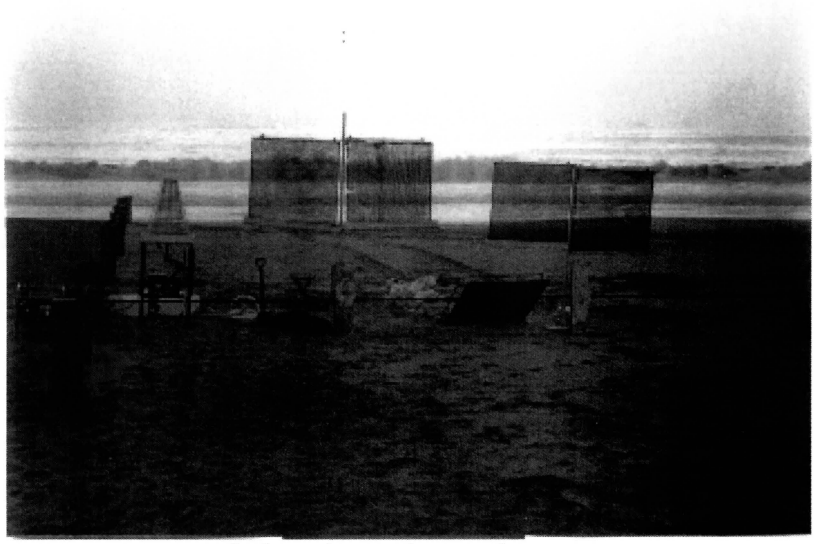
ii) ***Solar distillation***



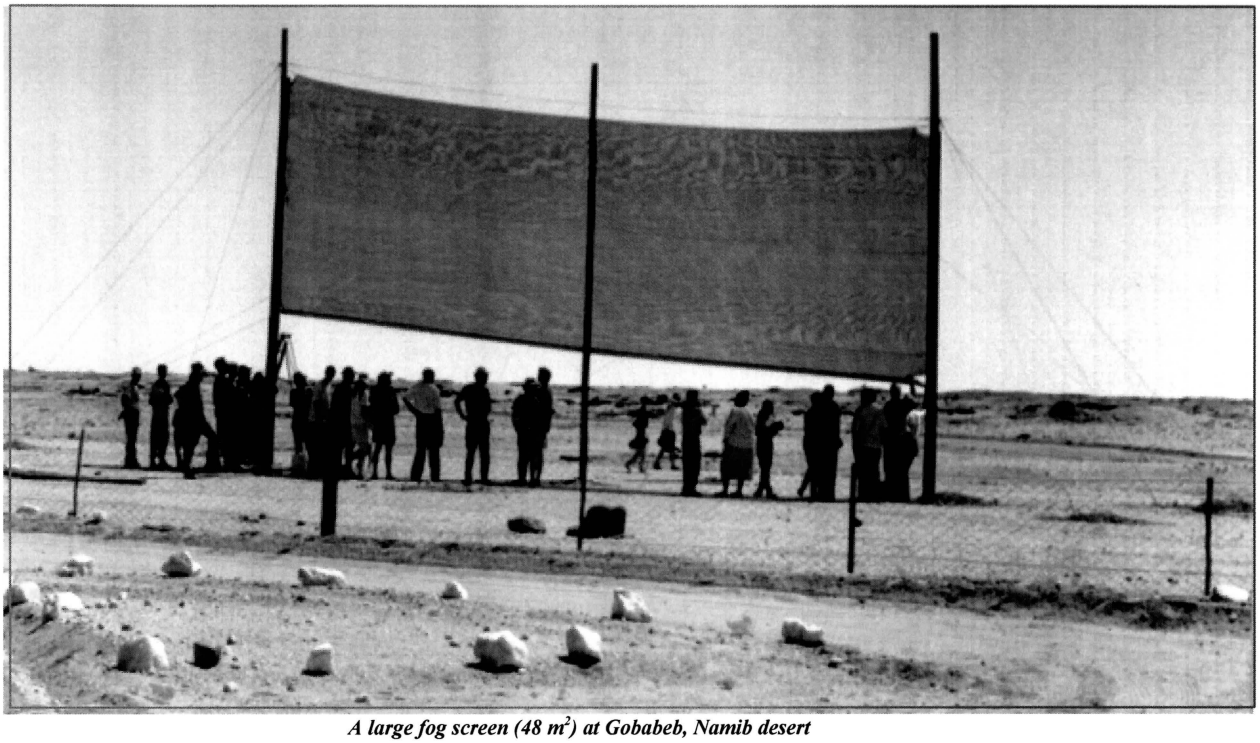
Some of the solar distillation experiments at the University of Stellenbosch

2) Fog harvesting

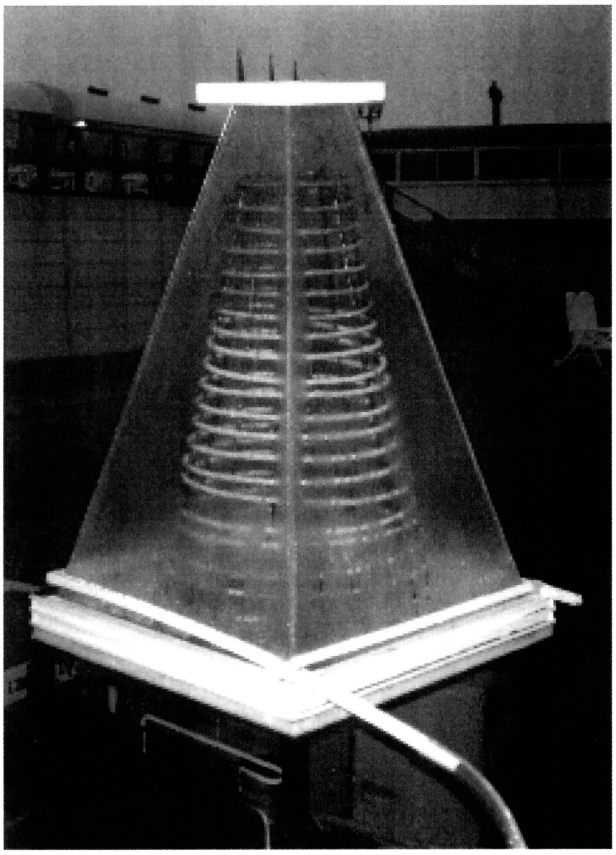
- Determine fog harvesting efficiency of different material-
  natural fog harvesters- beetles (live & dead) and plants
  single fibres of various material e.g., polyethylene and aluminium
- Conduct fog harvesting experiments with Standard Fog Collectors- using different material e.g., polyethylene and Al mesh [new, old and sand-papered (increased contact angles)]
- Fog harvesting experiments with the newly developed alternative-fog harvester-
  With; a) glass covering (normal + sand-papered)
  b) metal covering (normal + sand-papered)
- Collect fog samples for chemical analysis- from the coast – Gobabeb
- Finally, a) derive a fog-harvesting/condensation index/coefficient that could be used in the selection of fog-harvesting material
  b) develop/propose a theoretical model for estimation of fog harvesting potential at the coast of Namibia



fog harvesting experiments at the coast



A large fog screen (48 m^2) at Gobabeb, Namib desert



The new fog harvester during the first trials at the coast