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IWRM

HARTBEESPOORT DAM INTEGRATED BIOLOGICAL REMEDIATION PROJECT

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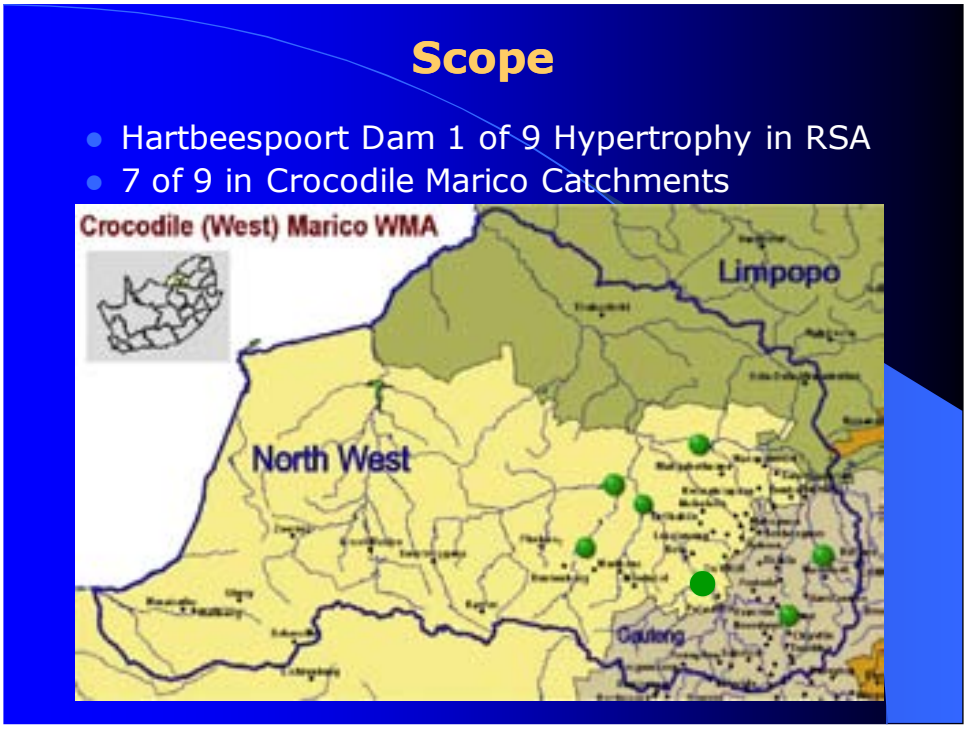
WATER MANAGEMENT AREAS


NORTH WEST WITH WMA
LIMPOPO
NORTHERN PROVINCE
CROCODILE WEST MARICO
NORTH WEST PROVINCE
GAUTENG PROVINCE
UPPER VAAL
LOWER VAAL
MIDDLE VAAL


Scope
Hartbeespoort Dam 1 of 9 Hypertrophy in RSA
7 of 9 in Crocodile Marico Catchments
Crocodile (West) Marico WMA
Limpopo
North West
Gauteng

What is a hypertrophic dam?

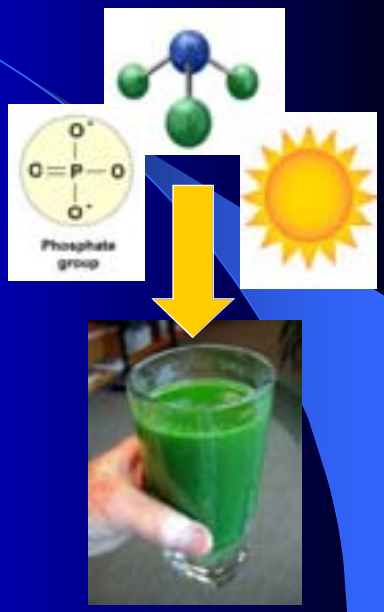
Dam water **excessively** enriched by

phosphate and **nitrogen** nutrients,

where algal growth is limited by

Solar **Radiation** and

Water **Temperature**



Hartbeespoort Dam 2016 hactares

Hartbeespoort Dam: Infrastructure

- Catchment Area: 4 112 km^2
- Mean Annual Rainfall: 670 mm
- Mean Annual Evaporation: 1 690 (S) / 1 246 (D)
- Surface Area: 2 034 ha
- Mean Annual Run-off: 163 million m^3
- Full Supply Capacity: 195 million m^3
- Firm Yield (1990): 158 million m^3
- Urban runoff/return flows: 103 million m^3
- Wall height: 59 m
- Crest length: 101 m

Hartbeespoort Dam: Infrastructure

- *Building of the Hartbeespoort Irrigation Scheme*
  - Construction started in 1916 after the First World War and completed early 1923
  - Canals – 5 years later
- Material used in dam wall: 68 000 m^3 concrete
- Spillway: 10 Crest gates
- Spillway capacity: 2 322 m^3/s
- Dam was raised in 1970 through the installation of the crest gates

Hartbeespoort Dam: Infrastructure

- History:
  - Planned as early as 1902
  - Formation of Union of South Africa in 1910 delayed work
  - First World War (1914) further delayed construction
  - Compensation for land took from 1914 to 1918
  - Great Flu epidemic (1918) and strikes in 1922
  - Work started in 1921, completed 1923
  - Served to provide employment and poverty relief to unemployed
  - Max of 1835 men employed on dam

Layout of the canal system and drainage canals

- Left Bank Main Canal (West) 56 km long
- Right Bank Canal (East) 48 km
  - North Canal – extension 24 km
- Drainage canals 52 km
- Branch canals in total 532 km
- Outlet Structures upgraded 2005R 10 mil +

What does Hartbeespoort Dam look like ?

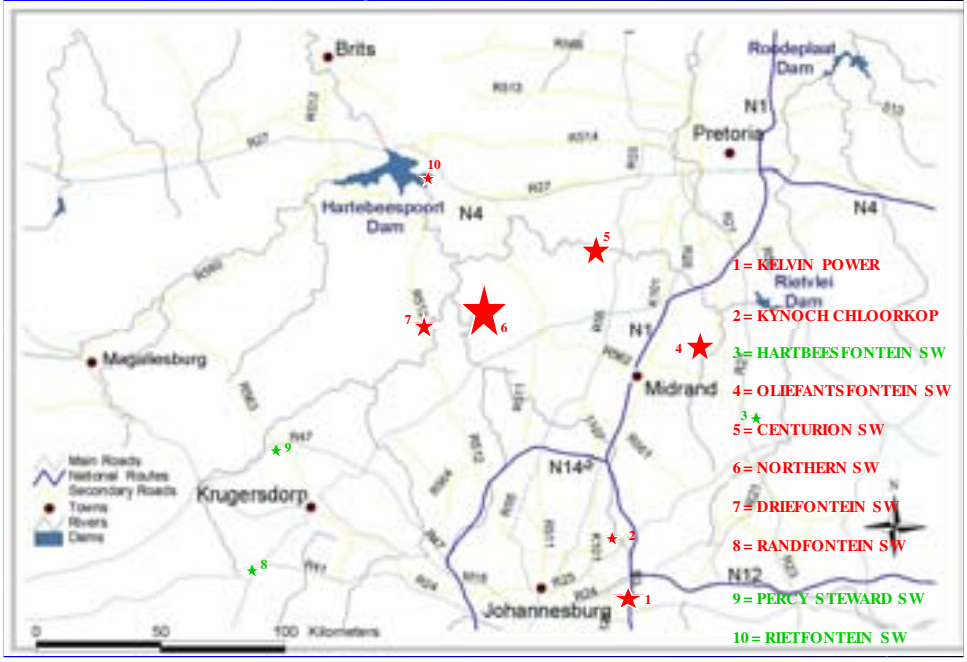
Impacts and Challenges

- Health Risk
- Environmental
- SMELL
- Recreational
- Water Purification
- Property Development
- Downstream water use - Water Loss

Problem Statement

- 600 Mega Liters of purified sewage p/d
- 166 tons of phosphate p/a.

Hartbeespoort dam: Significant PO4 point discharges

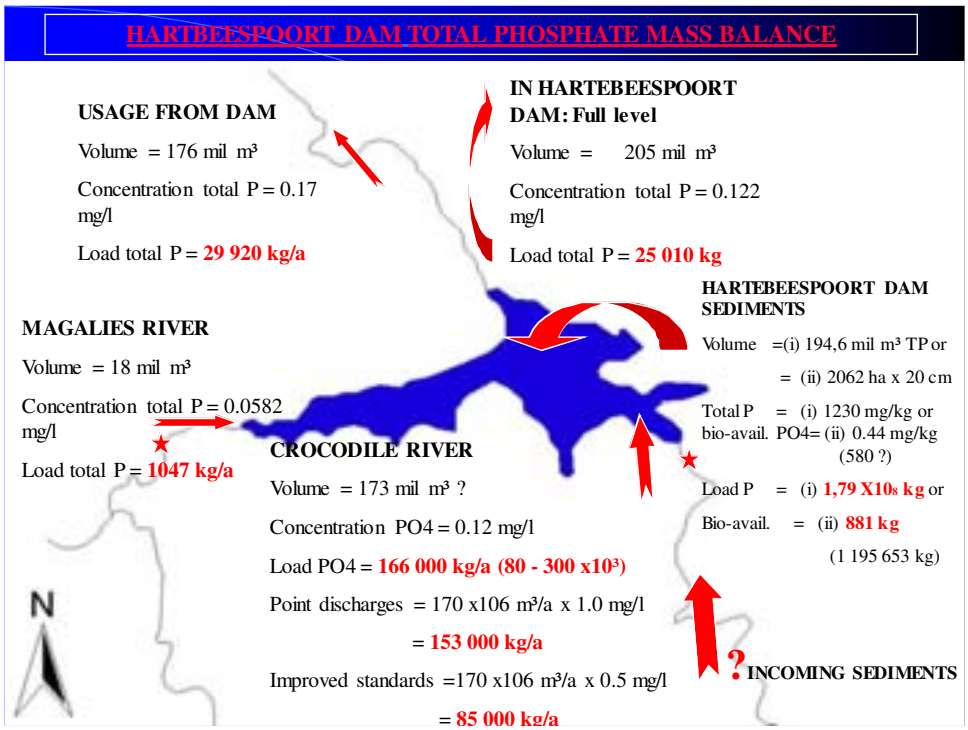


Sewage pipeline from urban metropolitan to Northern Sewage Works

Northern Sewage Works - waste water treatment plant

Impact - discharge continuous high flow into Jukskei River by Northern Sewage Works

Artificial Wetlands – aeration plays an important role



Problem Statement

- 600 Ml of purified sewage p/d
- 166 tons of phosphate p/a.
- Depleted riparian variation
- Shrinking wet lands
- Impacts from Desertification / Social Drought

Impacts - sewage works, urbanization, agriculture & industry - Clayville wetland

Natural Wetlands

Past & present impacts on rivers and natural wetlands due to:

Non-controlled activities e.g.

- Urbanization, Agriculture, Industrial & Mining
  - Hard surface e.g: Infrastructure & roads
  - Increased runoff
  - Reduction in recharge
  - Continuous high flow from return flows

Natural Wetlands

The result:

- Increased storm-water, waste-water discharge & surcharge flows – destruction e.g. Erosion.
- Riparian vegetation destruction.
- Loss of habitat - destruction of biodiversity.
- Sedimentation.
- Degradation of land

Impact - agricultural use – Clayville wetland

Impact - agricultural use – Clayville wetland

Impact - erosion & part of the gabions which have been washed away due to high flows – Clayville wetland

Prior impact - natural flood areas showing mostly natural riparian vegetation

Impact – riparian vegetation destruction - Dainfern Golf Estate

Impact - riparian vegetation destruction - Heronbridge College

Impact - Sand mining - Jukskei River

Impact - urban metropolitan

Problem Statement

- 600 Mega Liters of purified sewage p/d
- 166 tons of phosphate p/a.
- Depleted riparian variation
- Shrinking wet lands
- Impacts from Desertification / Social Drought
- Toxic microcystis algal blooms
- Exotic water plants (Hyacinths)
- Exotic fish (Carp)
- Distorted food web and fish population

HARTBEESPOORT DAM

APRIL 2003

Excessive algal blooms, hyacinth & toxicity

RESULTS & DISCUSSION

SPECIES COMPOSITION

Oreochromis mossambicus
(Mozambique Tilapia)

Chetia flaviventris
(Canary Kurper)

Tilapia sparrmanii
(Banded Tilapia)

Pseudocrenilabrus philander
(Southern Mouthbrooder)

Micropterus salmoides
(Largemouth Bass)

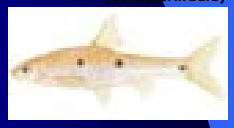
Cyprinus carpio (Carp)

Barbus unitaeniatus
(Longbeard Barb)

Barbus paludinosus
(Straightfin Barb)

Labeobarbus polylepis
(Smallscale Yellowfish)

Labeobarbus marequensis
(Largescale Yellowfish)

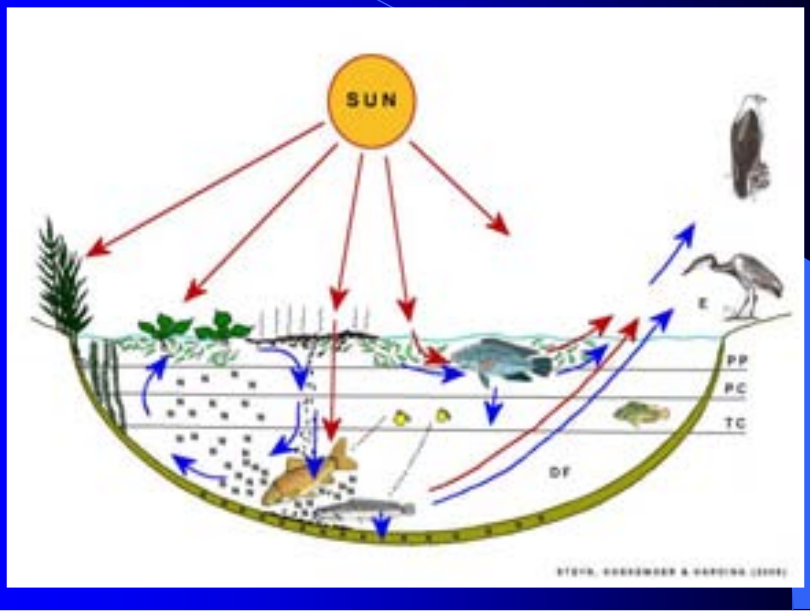


Barbus trimaculatus (Threespot Barb)

Barbus mattozi (Papermouth)

Clarias gariepinus (Sharptooth Catfish)

RESTRUCTURING THE FISH COMUNITY



THE PROGRAMME…

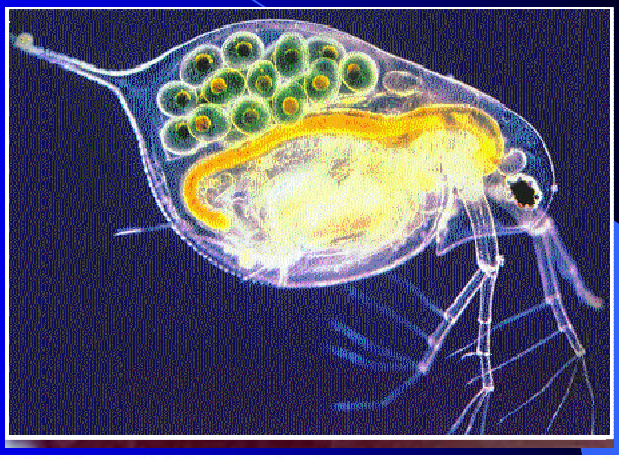
HARTBEESPOORT DAM INTEGRATED BIOLOGICAL REMEDIATION PROJECT

Who Lives / should live in Hartbeespoort Dam ?

Phytoplankton

Zooplankton

Fish



Overarching Projects

- Inter Governmental Steering Committee
- Project Coordinating Committee
  - Change control
  - Management
  - Monitoring and Auditing
- Research and Development
- Fund Raising
- Communication and Awareness
  - Communication Centre
  - Information Management

Dam Basin

- Manage Recreational Activities

Dam Basin

Biomass Management

- **Control and Remove Algal**

Dam Basin

- **Biomass Management**
  - **Control and Remove Algal**
  - **Control Floating wetlands**

Dam Basin

- Biomass Management
  - Control and Remove Algal
  - Control Floating wetlands
  - Shoreline vegetation

Dam Basin

- Biomass Management
  - Control and Remove Algal
  - Control Floating wetlands
  - Shoreline vegetation
  - Control Hyacinths

Dam Basin

- Sediment Removal

Crocodile River – sedimentation, urbanization, riparian vegetation destruction & toxic algae

Dam Basin

- **Fishery Management and Monitoring**
  - **Commercial Fishery**
  - **Food web (Zooplankton)**

Downstream

- Aqua Culture Hub
- Water Use Efficiency

Upstream

- Pre-Impoundment, Litter Trap, Dredging and river water treatment
- Upstream wetlands, Riparian vegetation and in stream habitat
- Phosphate reduction
- Silt and erosion Management
- Storm water management

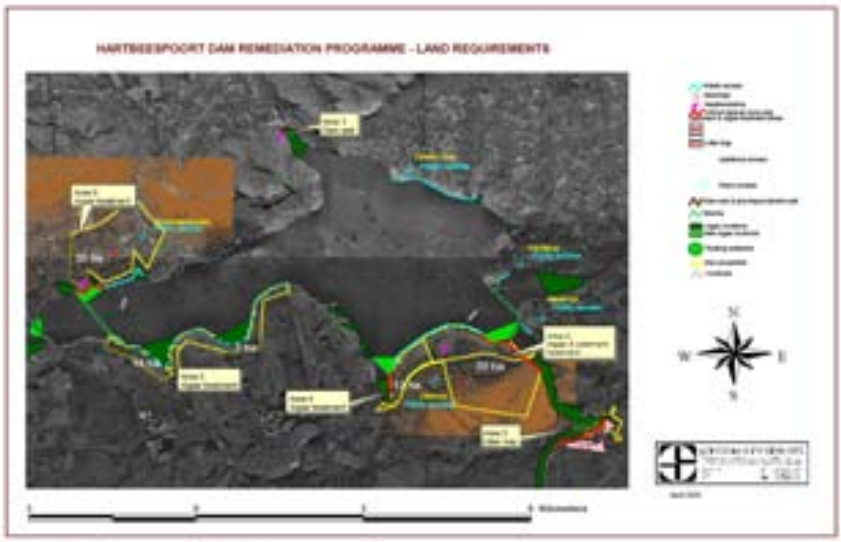
Implemented Activities - Feb 2008

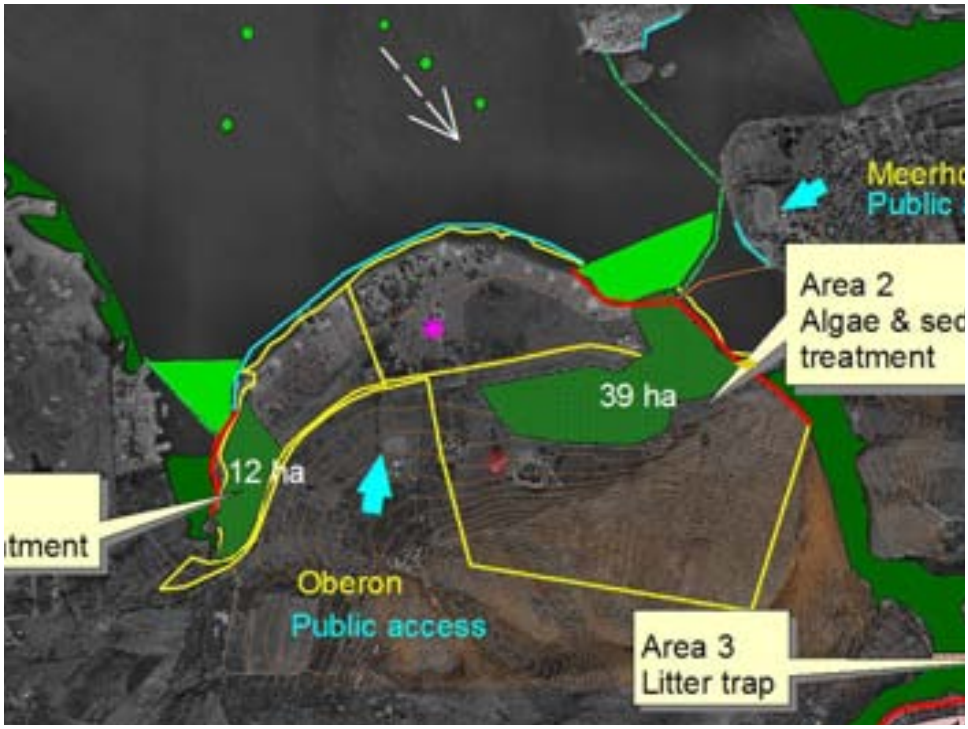
Business plan development

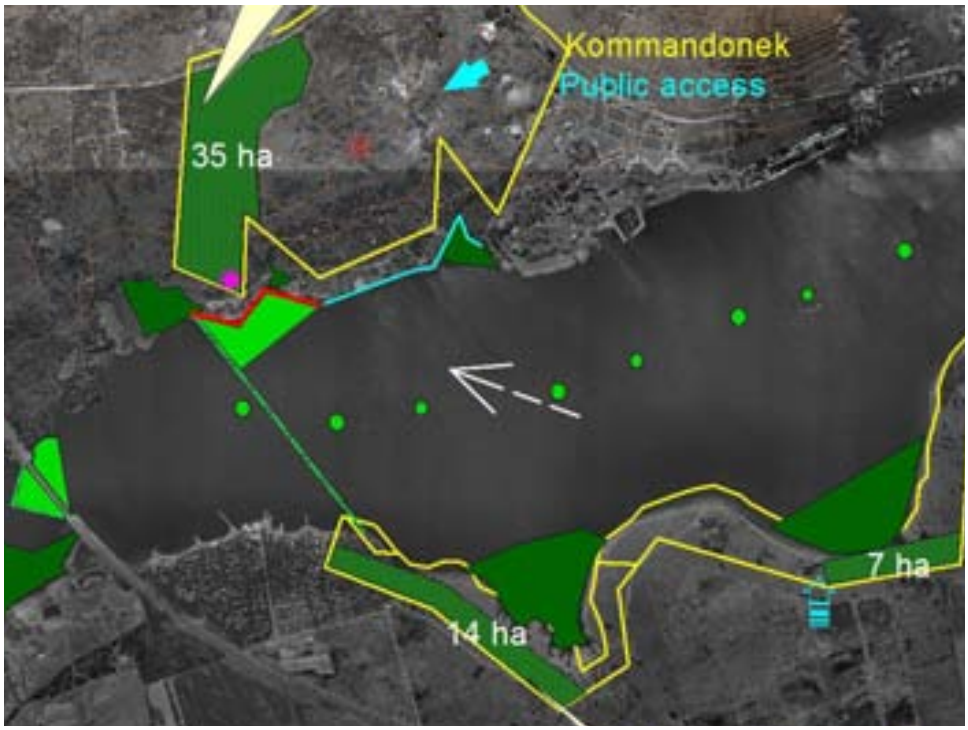
Algal Harvesting
- Floating booms
- Pump stations
- Raft
- Floating Islands

Hyacinths Harvesting

Dam Basin - access for The Plan







Thank You

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