Mainstreaming Watershed Services In The South African Water Sector.

Christo Marais
Chief Director: Natural Resource Management Programmes
Department of Environmental Affairs, South Africa
Presentation Structure

• The socio-economic priorities of South Africa and how natural resource management can add value,

• A few case studies illustrating the impacts of improved land management practices on watershed services,

• Challenges experienced during the implementation and,

• The institutional arrangements needed to implement such projects and the stakeholders.
### Alignment of Aquafondo and Stakeholder Concerns and Goals

<table>
<thead>
<tr>
<th>Highly Aligned</th>
<th>Moderately Aligned</th>
<th>Narrowly Aligned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Working for Water</strong></td>
<td><strong>Working for Wetlands</strong></td>
<td><strong>Working for Land</strong></td>
</tr>
<tr>
<td><strong>Working on Fire</strong></td>
<td><strong>Working for Forests</strong></td>
<td></td>
</tr>
<tr>
<td>Reforestation</td>
<td>Industrial Effluent Treatment</td>
<td>Drinking Water</td>
</tr>
<tr>
<td>Aquifer Recharge</td>
<td>Mining Contamination Tailings</td>
<td>Distribution</td>
</tr>
<tr>
<td>Erosion Control</td>
<td>Strengthening Water Management</td>
<td>Agri-chemicals</td>
</tr>
<tr>
<td>Irrigation Technology</td>
<td>Increased Regulations</td>
<td></td>
</tr>
<tr>
<td>Infiltration Practices</td>
<td>Public Education</td>
<td></td>
</tr>
<tr>
<td>Bank Stabilization</td>
<td>Pesticides</td>
<td></td>
</tr>
<tr>
<td>Wetland Restoration</td>
<td>Farmland Preservation</td>
<td></td>
</tr>
<tr>
<td>Sustainable Livestock Systems</td>
<td>Dams</td>
<td></td>
</tr>
<tr>
<td>Ag Management</td>
<td>Stormwater Management</td>
<td></td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>Flood Protection</td>
<td></td>
</tr>
</tbody>
</table>
Mainstreaming Natural Resource Management into Socio-Political Priorities in South Africa

- Health
- Education
- Crime
- Employment
- Rural Development
By investing in biodiversity and ecosystem services restoration we can make very significant contributions to job creation and rural development.
“Over simplified” Spectrum of Degradation

Desertification

Bush Encroachments & Invasives
National Invasive Alien Plant Survey

Hectares Invaded = ± 20 million
Condensed Hectares = ± 1.9 million
65% of wetland types and 57% of river types are threatened. Wetlands cover only 2.4% of the country's surface area.
Degraded Areas of the Country
**Overview of Geographical and Socio Economic Scale of Working for Programmes to date**

<table>
<thead>
<tr>
<th>High Level Indicators</th>
<th>Outputs</th>
<th>Total Investment to Date ($ millions)</th>
<th>2012/13 Budgets ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WfW Hectares Treated</td>
<td>2 310 294</td>
<td>$864</td>
<td>$160</td>
</tr>
<tr>
<td>WfL Hectares Restored/Treated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WfW (incl. WfL) Person Years of Work</td>
<td>152 026</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WoF Burnt Hectares</td>
<td>2 453 223</td>
<td>$90.18</td>
<td>$51</td>
</tr>
<tr>
<td>Number of Fire</td>
<td>5 474</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WoF Person Years of Work</td>
<td>13 049</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$954</td>
<td>$211</td>
</tr>
</tbody>
</table>
Potential Loss of Biodiversity
Up to a 1/4 of RSA’s plant species.
### Impacts of desertification on the carbon balance

<table>
<thead>
<tr>
<th></th>
<th>Above ground</th>
<th>Litter</th>
<th>Roots</th>
<th>Soil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 ± 3</td>
<td>11 ± 1</td>
<td>25 ± 1.3</td>
<td>133 ± 27</td>
<td>209 ± 28</td>
</tr>
<tr>
<td>t C ha⁻¹</td>
<td>7 ± 1</td>
<td>1 ± 0.4</td>
<td>11 ± 0.7</td>
<td>95 ± 15</td>
<td>114 ± 14</td>
</tr>
<tr>
<td>Mills <em>et. al.</em> (2005)</td>
<td>Austral Ecology</td>
<td>and falling?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Impacts Of Land Degradation On Watershed Services

• Flows
  – Flood/high flows
  – Low Flows
  – Yield from water infrastructure
  – Ecological Reserve

• Sediments
  – Siltation of dams

• Water quality
  – Purification costs
  – Waterweed management costs
  – Health risks
Example 1: Reduction in Stream flow due to Invasive Alien Trees
Hydrological monitoring before and after clearing has shown that invasive alien plants have a significant impact on runoff. (Taken from Prinsloo & Scott 1999)
Some of the most recent work

EFFECTIVE MANAGEMENT OF THE RIPARIAN ZONE VEGETATION TO SIGNIFICANTLY REDUCE THE COST OF CATCHMENT MANAGEMENT AND ENABLE GREATER PRODUCTIVITY OF LAND RESOURCES

by

C Everson¹, M Guzhl, M Moodley¹, C Jarman², M Govender¹ and P Dye¹

The impact of the clearing of all the trees by January 2004 was a 44% increase in streamflow. This was equivalent to 75 000 cubic meters for the catchment. The relative contribution of the riparian zone compared to the upslope region during the period when both areas were cleared (January 2004 to May 2006) was 16 mm and 78 mm respectively (the riparian zone therefore contributing 21% to annual streamflow). Since the riparian zone represented only 11% of the total catchment area (7.5 ha versus 65 ha, Table 3.1), the significance of the riparian zone to streamflow generation was clearly demonstrated.
Preliminary Estimate of the Impact of Invasive Alien Trees in Rivers and Mountain Catchments on *Registered Water Use*

- **Current 4%**
- **If left unchecked it will increase to more than 16%**
The Unit Reference Values (URVs) = \{PV \text{ of all costs incurred over the economic lifespan of the project}\}/\{PV \text{ of the total water sales multiplied by the appropriate water tariff over the economic lifespan of the project}\}.

Aspects taken into account when calculating the URV, :

1. The economic life of water development projects (30 and 50).

2. Costs include capital cost, i.e. the upfront cost of initial clearing of invasive alien plants and the cost of the subsequent follow-ups plus the annual operations and maintenance costs that include labour, land, or resource management cost.
The Unit Reference Values (URVs) = Cont.

Aspects taken into account when calculating the URV,:

3. **Benefit** is the increased yield after initial clearing times the raw water tariff.

4. **Range of discount rates**, namely 4%, 6%, & 8%, is used.

5. A **URV** of greater than 1 indicates that the present value of the cost of the project exceeds the present value of the water sales and vice versa. A **URV** of 1 is break-even.
## The Results of the George Study

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Existing Garden Route Dam</th>
<th>Raise Garden Route Dam by 2.5m</th>
<th>Kaaimans Dam &amp; Pumpstation</th>
<th>Malgas Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Interference</td>
<td>N/A</td>
<td>0.37</td>
<td>1.51</td>
<td>0.51</td>
</tr>
<tr>
<td>Clearing 1999: New Scheme plus Clearing</td>
<td>N/A</td>
<td>0.36 (-3%)</td>
<td>1.26 (-17%)</td>
<td>0.50 (-2%)</td>
</tr>
<tr>
<td>Clear 1999: Clearing Only</td>
<td></td>
<td>0.36 (-3%)</td>
<td>0.67 (-56%)</td>
<td>0.45 (-12%)</td>
</tr>
</tbody>
</table>
Example 2: Sedimentation of Reservoirs In the Malotia Drakensberg
<table>
<thead>
<tr>
<th>Dam</th>
<th>% Sedimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welbedacht</td>
<td>91.1</td>
</tr>
<tr>
<td>Gilbert Eyles</td>
<td>76.5</td>
</tr>
<tr>
<td>Elandsdrifts</td>
<td>70.9</td>
</tr>
<tr>
<td>Bethulie</td>
<td>69.8</td>
</tr>
<tr>
<td>Seshego</td>
<td>62.6</td>
</tr>
</tbody>
</table>

$2.5/m^3$ of storage space

$1/m^3$ to dredge once

silted up

Legge 2010
Impacts of desertification on sedimentations and flows

- In the **Thukela**, good management practice can result in an additional **12.8 million m$^3$ in dry season flows**, the same action can **reduce sediment yields by 1.2 million m$^3$**

- In the **Umzimvubu**, it can result in an additional **3.9 million m$^3$ dry season flows**, and the **reduction in sediment is 4.9 million m$^3$ per annum**.
Restored Donga 50 m away

Mrs. Mavundla leader of the Okhombe Trust
Un-restored donga
1 Kilometer Downstream
10 Kilometer down at the inflow to Woodstock Dam
The dam surface 5 km down
The Dam Overflowing
Challenges

• Watershed services are not yet mainstreamed into the water value chain.

• Water users (represented by the water utilities) want to see a tangible net benefit (lower water tariffs) as a result of the implementation of watershed services projects.
Challenges cont.

• Still to much of an engineering approach to addressing water resource management challenges.

• Sellers (rural land users) of watershed services are not in a position to engage with the buyers (water utilities).

• There is still a lack of knowledge amongst land users about the impact of land management practices on watershed services.
Challenges cont.

• Watershed restoration has high upfront costs. Without support rural land users will not be able to do active restoration.

• There are good hydrological models available but very little monitoring and primary research is being done to validate the models.
Institutional Arrangements

• Watershed services must be mainstreamed in the water value chain.

• Because of high up front costs National, Provincial (state) and local government must buy into projects and actively support them.

• Appropriate legal entities need to represent the interests of land users (CBO’s/NGO’s)
Institutional Arrangements cont.

- Mechanisms to ensure accountability by sellers (land users), buyers (water utilities) and the regulator (government) are crucial.
- A strong working relationship between land users, the scientific community (M&E & research) and water utilities is needed to ensure proper measurement and valuation of services.
Thank You!!

Lesotho Highlands Scheme