The evolution of environmental flow assessments in South Africa and the move toward IWRM

Jackie King
Water Matters
Cape Town

WRC 40th anniversary celebration conference, Pretoria,
31 August – 1 September 2011

Background

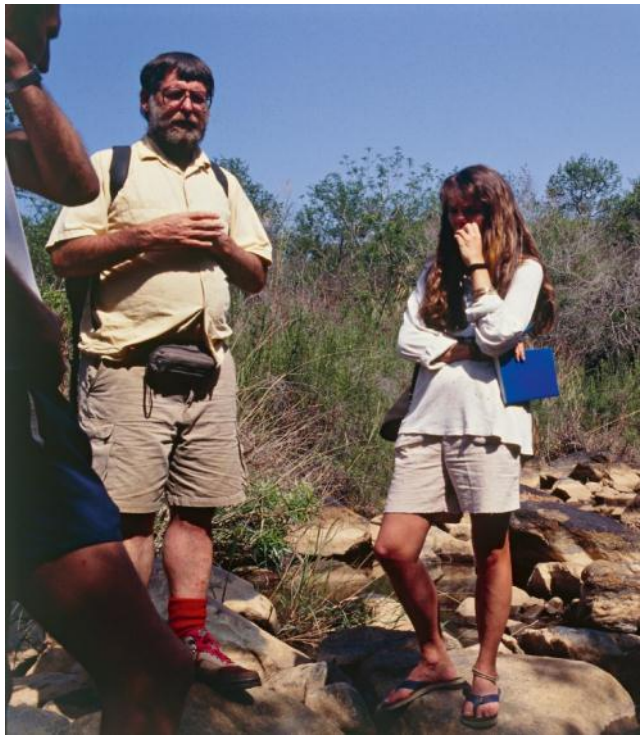
1980s: Global concern growing over the negative impacts of water resource developments

1990: WRC funded its first three full-scale ecological projects

One of these was an investigation of ‘instream flow requirements’ (now called ecological water requirements (EWRs) or Environmental Flows)

Early research on Environmental Flows

1990-94 Investigation of the Instream Flow Incremental Methodology (IFIM), which focussed mainly on fish habitat



1991 - water managers makes contact

1991 The Lephalala River – “We are going to build a dam – how much water do you want for the river?”

Answer: There is no magic number. It depends on what you would like the river to be like in the future.

It is a societal choice

DWA asked the scientists to make that decision and provide recommended flows: *magnitude, frequency, timing, duration* for ten or more rivers with dams in the planning stages

Move to holistic methods

IFIM not suited to RSA

Needed to address:

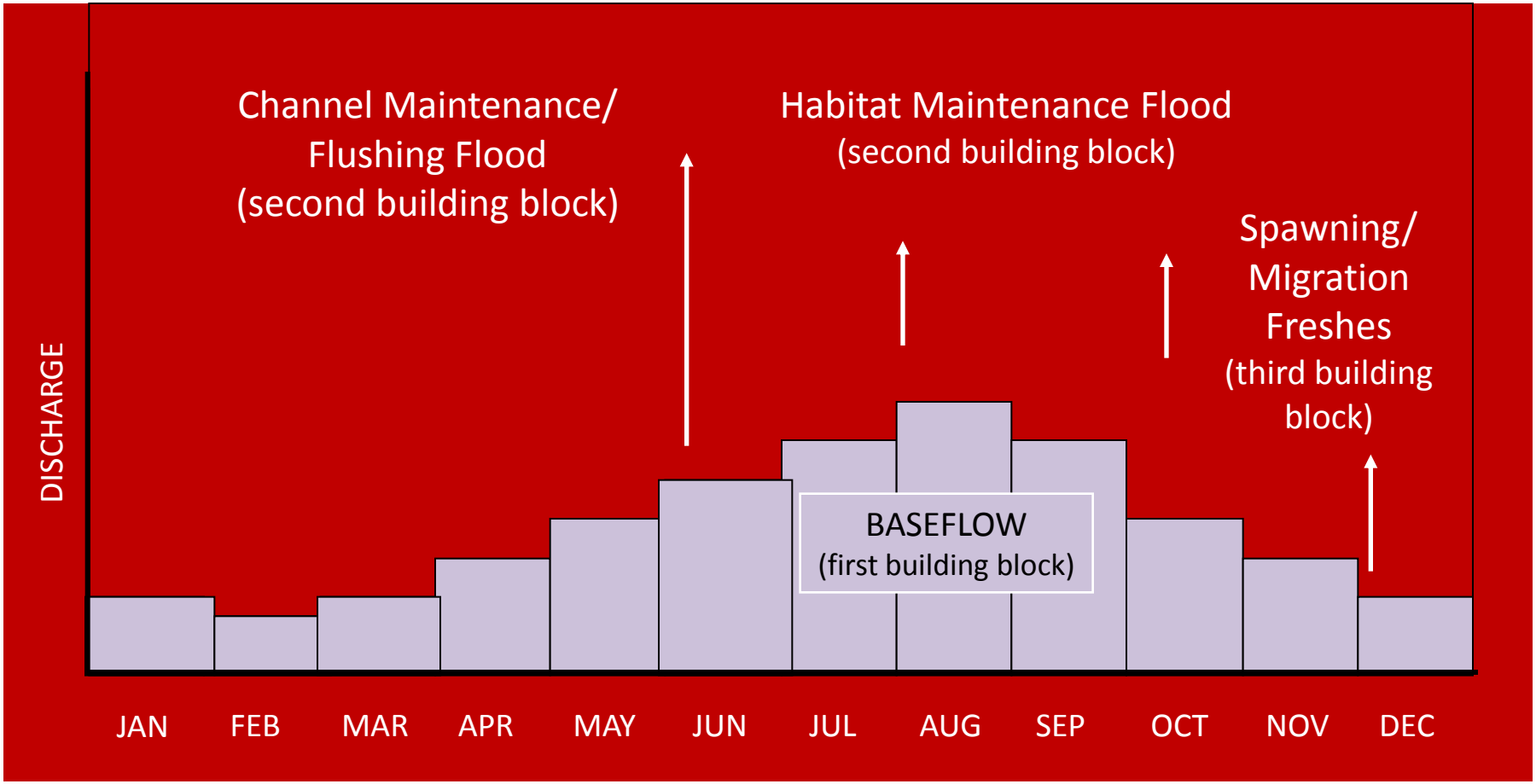
- the whole flow regime
- the whole ecosystem
- subsistence use

The holistic approaches require multi-disciplinary teams

Biophysical: hydrology, hydraulics, geomorphology, sedimentology, water quality, vegetation, fish, invertebrates, plankton, water birds, reptiles and amphibians, micro-organisms, mammals

Socio-economic: sociology, resource economics, regional economics, public and livestock health, culture and religion

Building Block Methodology – Development began in 1992



Prescriptive and therefore ultimately seen as flawed, but the BBM influenced the 1998 National Water Act

South Africa's National Water Act 1998

Status of aquatic ecosystems

1980s No legal standing regarding water

1990s Competing user

1998 One of two sectors with a right to water
- *Basic Human Needs Reserve*
- *Ecological Reserve*

2000 Stockholm Water Prize

Now Water allocation will be set for every significant water resource in the country

The National Water Act requires three measures to be implemented to protect water resources – the Resource Directed Measures

1. Classification of water resources - Management Classes (minimally, moderately or heavily used)

2. The Reserve of water (quantity and quality)

3. Resource Quality Objectives (RQOs)

By the late 1990s:
Catchment-wide approaches to setting Reserves, and beyond

Methods for rivers

1. Habitat Flow Stressor Response (HFSR)
2. Downstream Response to Imposed Flow Transformation (DRIFT)

Method for estuaries

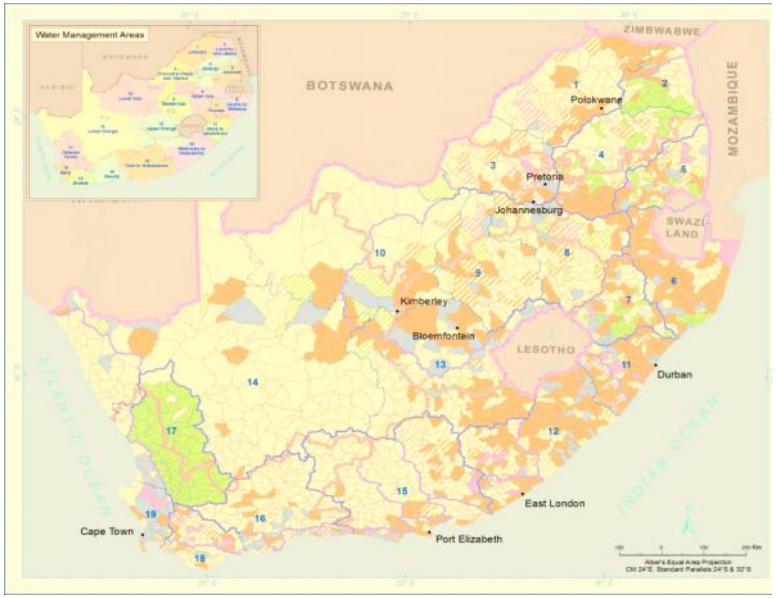
Estuarine Reserve determination methods (version 3)

Methods for wetlands, ephemeral rivers, groundwater, water quality, socio-economics, software and DSSs, monitoring, strategic adaptive management, RQOs

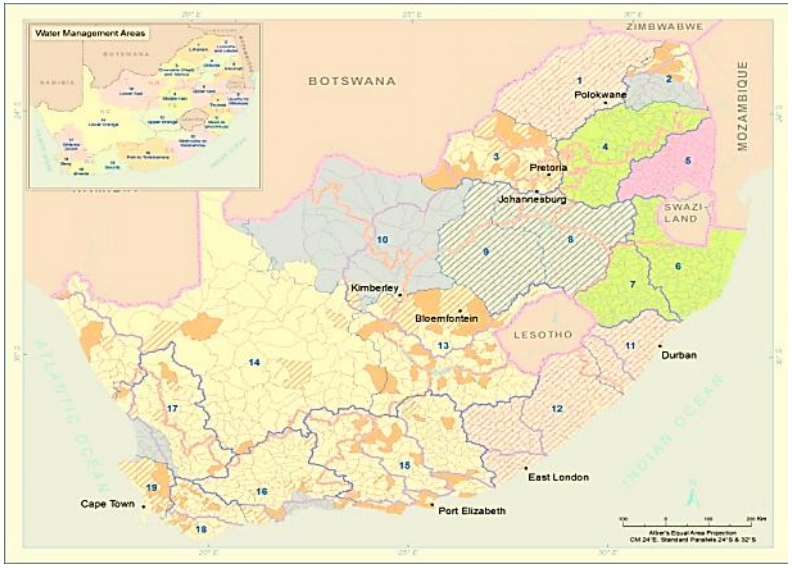
Under development

Geographical coverage of Reserve assessments

Surface waters: 43% of country



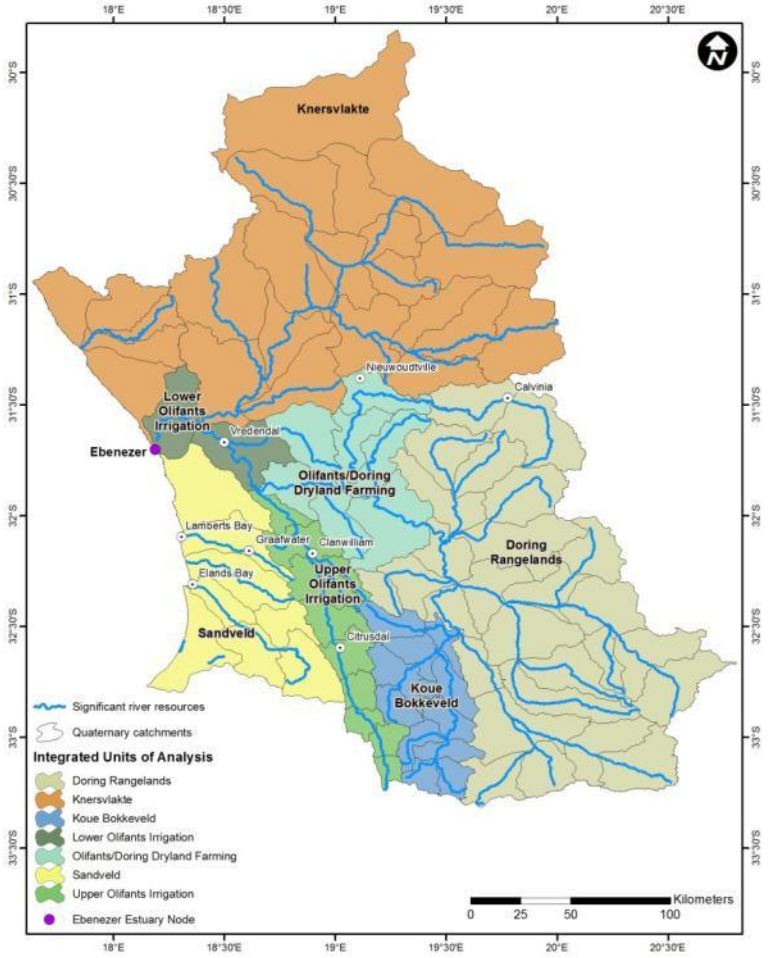
Groundwater: 59% of country



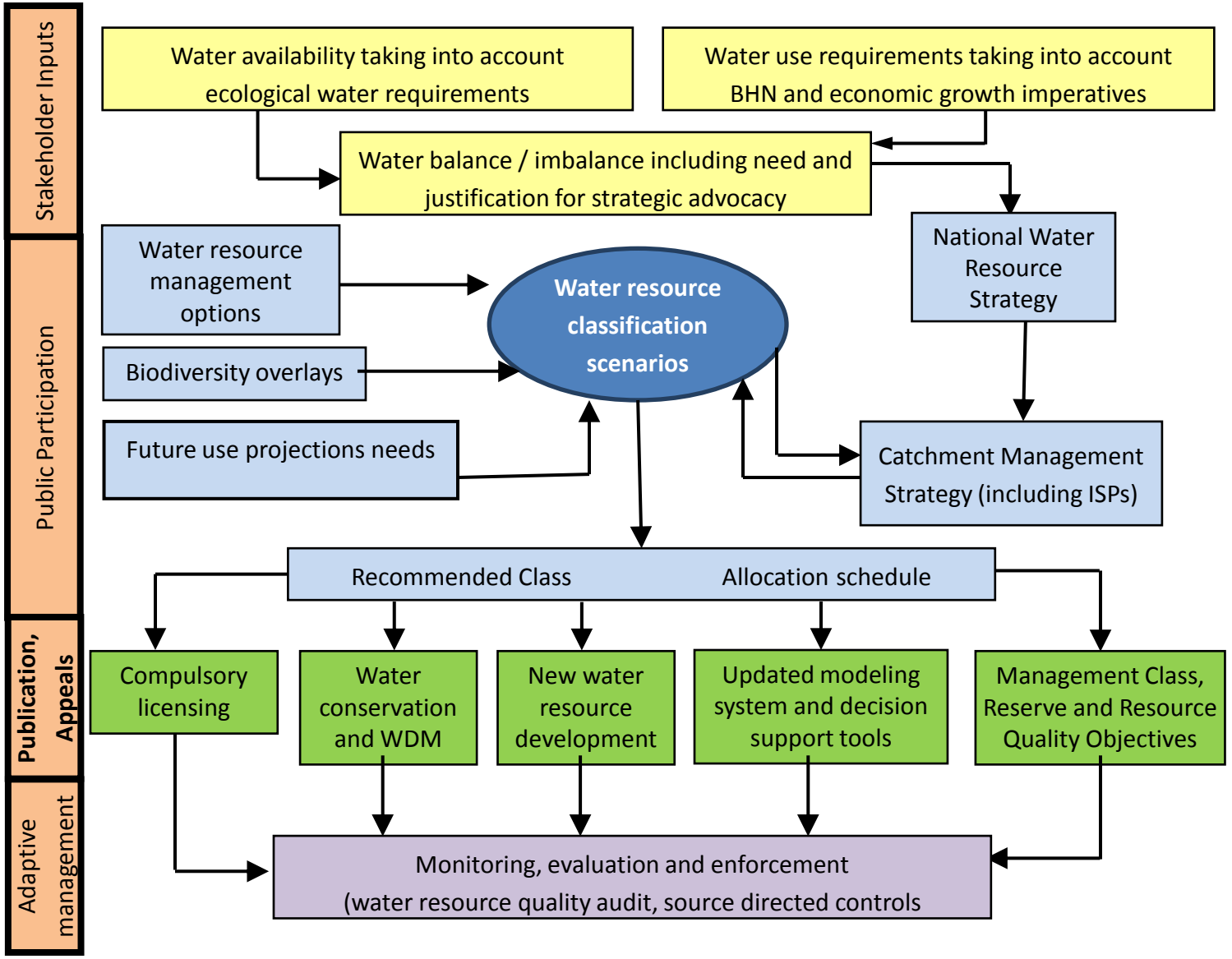
Water Resource Classification

1. Identify Integrated Units of Analysis
2. Describe a range of scenarios for each and workshop with stakeholders
3. DWA makes the decision – catchment management plan
4. Reserve and RQOs set

Olifants Doorn Water Management Area



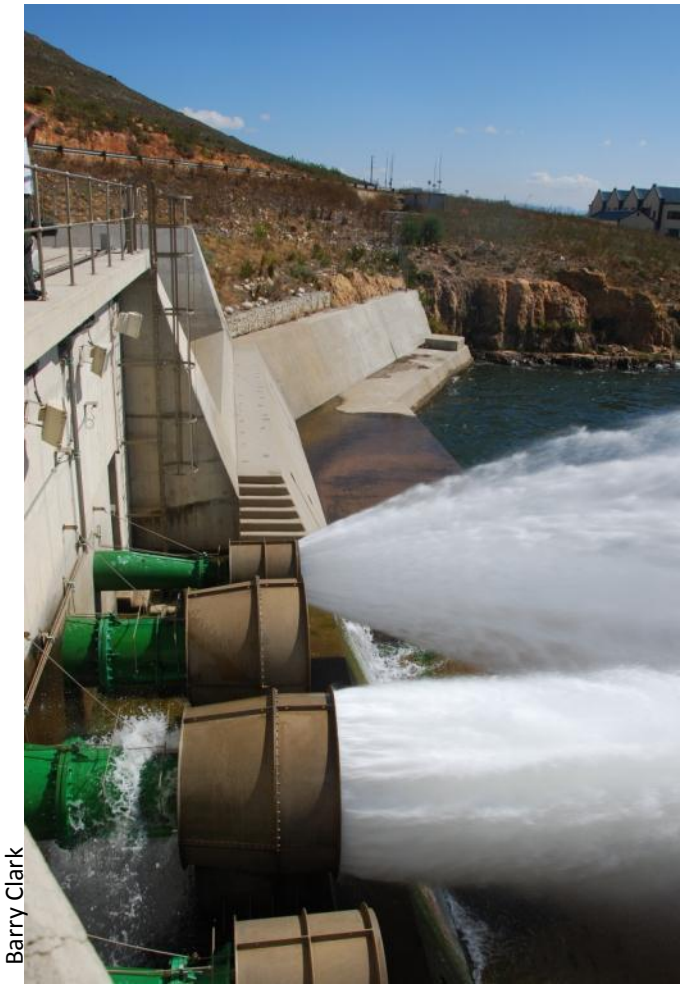
Integrated water resource management – DWA's vision



Knowledge and skills development

172	peer reviewed scientific articles
32	chapters in books
1	complete book
131	technical refereed research reports
196	other publications
59	invited/keynote presentations at international conferences
126	other contributions to international conferences
170	contributions at national conferences, meetings
54	postgraduate theses
22	national training courses

The Berg River: first dam designed and operated in SA within the framework of the NWA to specifically release Reserve flows, and according to World Commission on Dams guidelines



Barry Clark

TCTA

First designed to release floods for ecosystem maintenance

WATER RESEARCH COMMISSION

In 1994 South Africa emerged from political isolation and installed its first democratic government. The country's river scientists emerged from scientific isolation to make a major global contribution to a new science aimed at helping resuscitate the world's dying rivers and bring a more caring balance into the management of those still in good condition. As the incoming government prepared its new water law, the water scientists were ready with their knowledge and vision for sustainability, and so the two strands of history intertwined again and again in ways not imaginable even a few years earlier. This is an account of those times and what came next from some of those who took part.

ENSURING some, for all, for ever, TOGETHER.

Sustainable use of South Africa's inland waters

Jackie King and Harrison Pienaar (editors)

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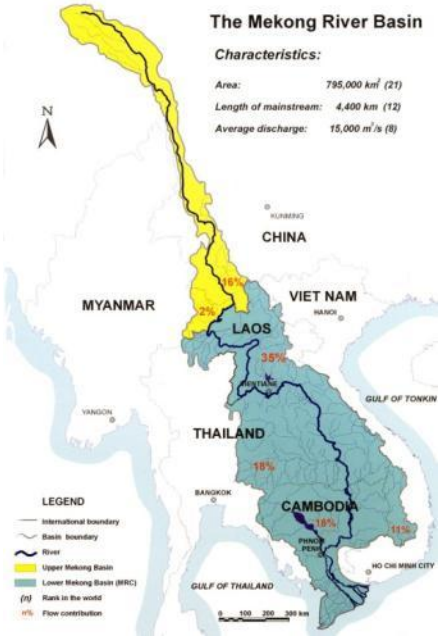
The Lesotho Highlands Water Project - 1997

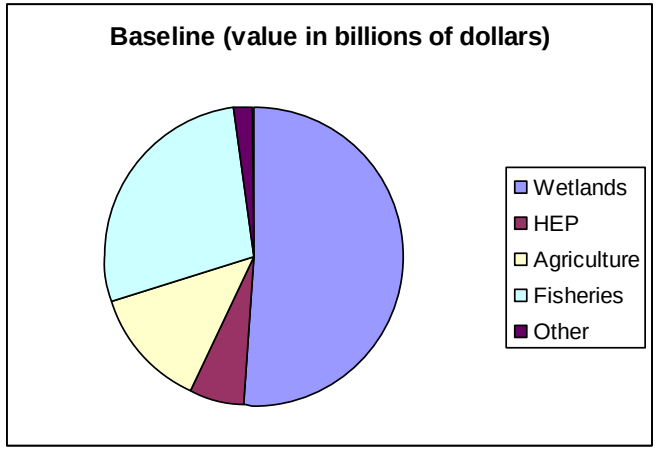
Scenario	Change in river condition	Impact on subsistence users	Costs of compensation	Yield of water
1	Low	Negligible	Low	Very low
2	Moderate	Moderate	Moderate	Low
3	Severe	Moderately severe	High	Medium
4	Critically severe	Severe	Very high	High

Data: Metsi Consultants

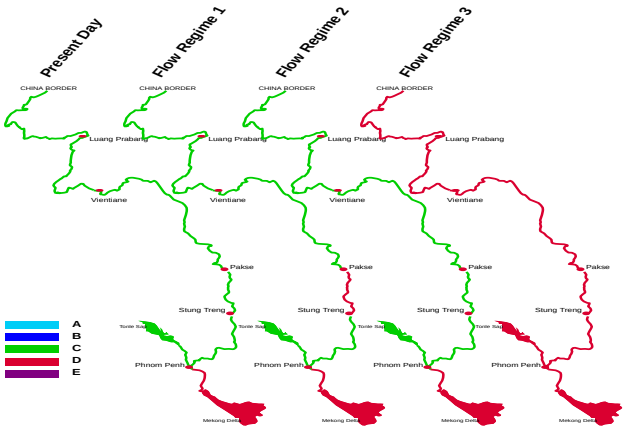
2003-2007: The Lower Mekong beneficial uses now and with development



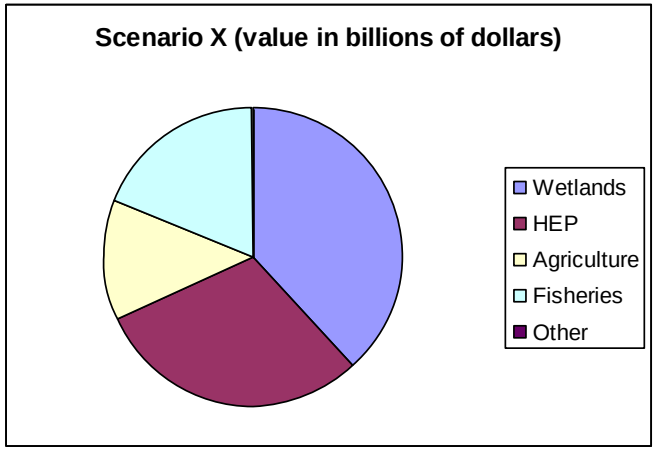
Assets by country – present day



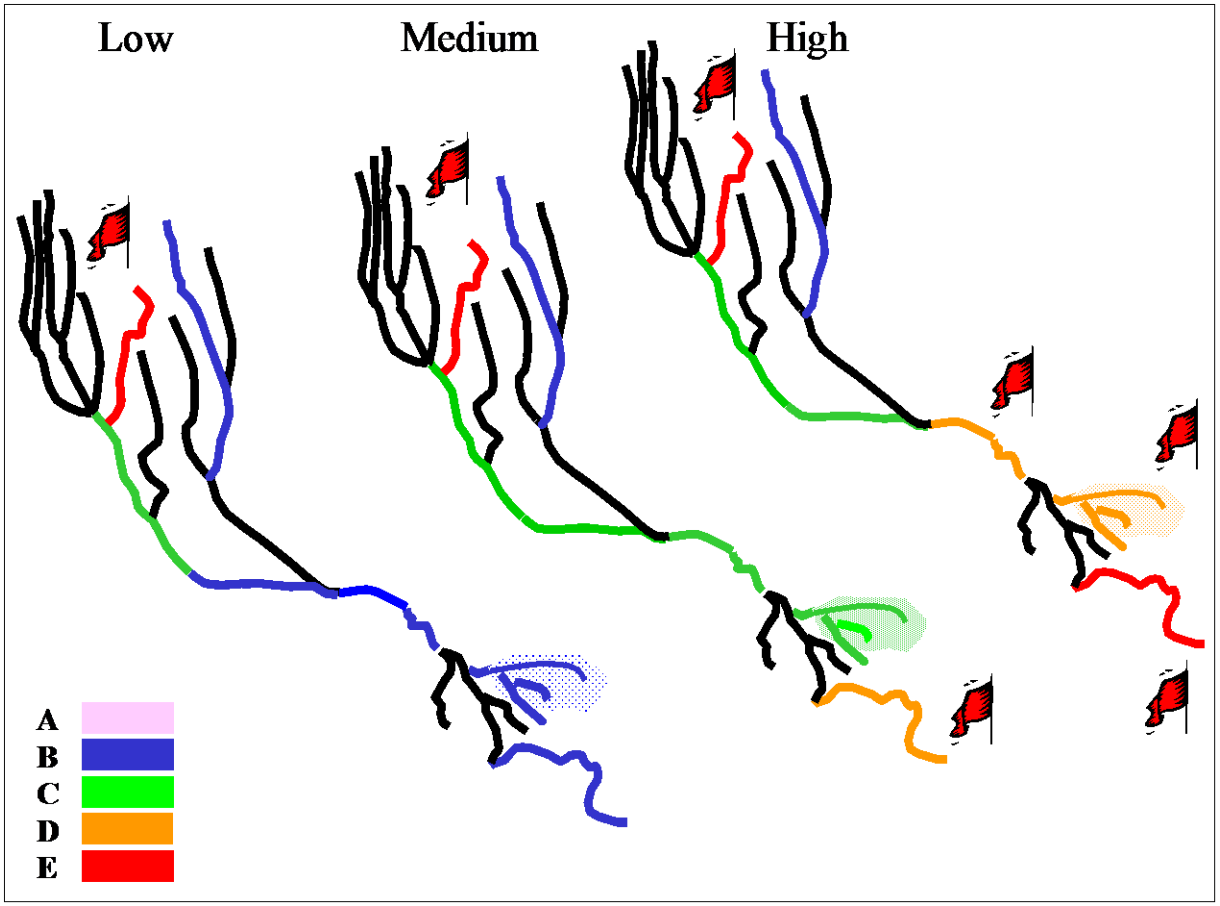
Predictions for fish



Assets by country – future



2008-2010: The Okavango Basin: summary of predicted changes in ecosystem condition for the hypothetical scenarios



A Natural
B Largely natural
C Moderately modified
D Largely modified
E Critically modified

Impacts would become increasingly transboundary; felt most severely in lower basin

High scenario: large parts of the system would be unable to sustain present beneficial uses; significant terrestrialisation

Recommended a high development low water use future – sharing benefits not water

Agriculture is the big determinant

2009-2011: Pakistan v India : Court of Arbitration
The Neelum River, headwaters of the Indus in Kashmir

The Water Research Commission : a force for good

Prof Ridge's keynote address:

"working together to produce interdisciplinary insights from firm single-discipline bases ……applying minds, intellectual curiosity and imagination to make sense of our world"

WRC: Good, kind, steadfast, professional support, and believed in us

Serendipitous: researchers funders water managers

International reach of the work; and envy of other countries

Future: move past method development to operationalisation of Resource Directed Measures

It's not broken, please don't fixit!

Acknowledgements

South Africa's national body of knowledgeable and hardworking water professionals