

From science to management

The Okavango Basin
Transboundary Diagnostic
Analysis as an aid to basin
planning

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Water Matters
Cape Town

OKACOM meeting
Gaborone, Botswana 27 May 2010



The Transboundary Diagnostic Analysis

1. Background to the TDA
2. The State of the Okavango Basin
3. The TDA process
4. Drivers of change
5. Predictions of future change (scenarios)
6. Key findings and recommendations – Strategic Action Programme

Scenarios

- A way of exploring ideas and possibilities for the future
- They are hypothetical
- We place in them combinations of possible management options
- These help discussions and negotiations about an acceptable future
- They identify knowledge gaps - guide future research

Historically.....

	Scenarios of increasing development			
	1	2	3	4
Man-made benefits				
Regional economy	+	+	++	+++
Power generation	+	++	++	++++
Crop production	+	+	++	+++

Developing a comprehensive picture of development-driven change

	Scenarios of increasing development			
	1	2	3	4
Man-made benefits				
Regional economy	+	+	++	+++
Power generation	+	++	++	++++
Crop production	+	+	++	+++
Ecosystem health				
Fisheries	++++	+++	++	+
Wetland functions	+++	++	+	+
Subsistence use/ income	+++	+++	++	++

There is no magic number of how much water the river 'needs'. As the flow regime changes the river ecosystem will change.

Scenarios selected after several discussions with the Okavango governments during 2008

- **Low water use** National 5-7 year plans
present growth rates in Namibia and Botswana; accelerated in Angola
- **Medium water use** Possible 10-15 year plans
additional realistic major developments
- **High water use** Long-term possibly unrealistic plans
All possible/considered developments

Climate change (later)

Three-country multidisciplinary team



Angola

- Hydrology
- Hydraulics
- Geomorphology
- Chemistry
- Invertebrates



Namibia

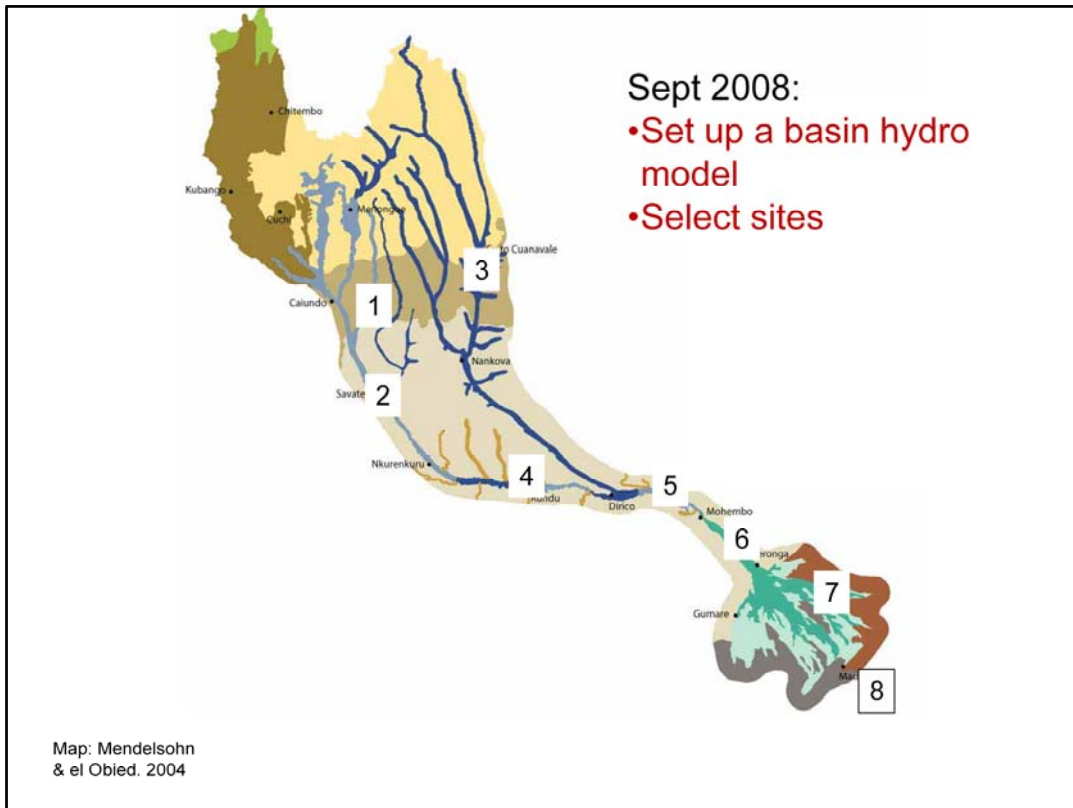
- Fish
- Birds
- Wildlife
- Socioeconomics
- DSS

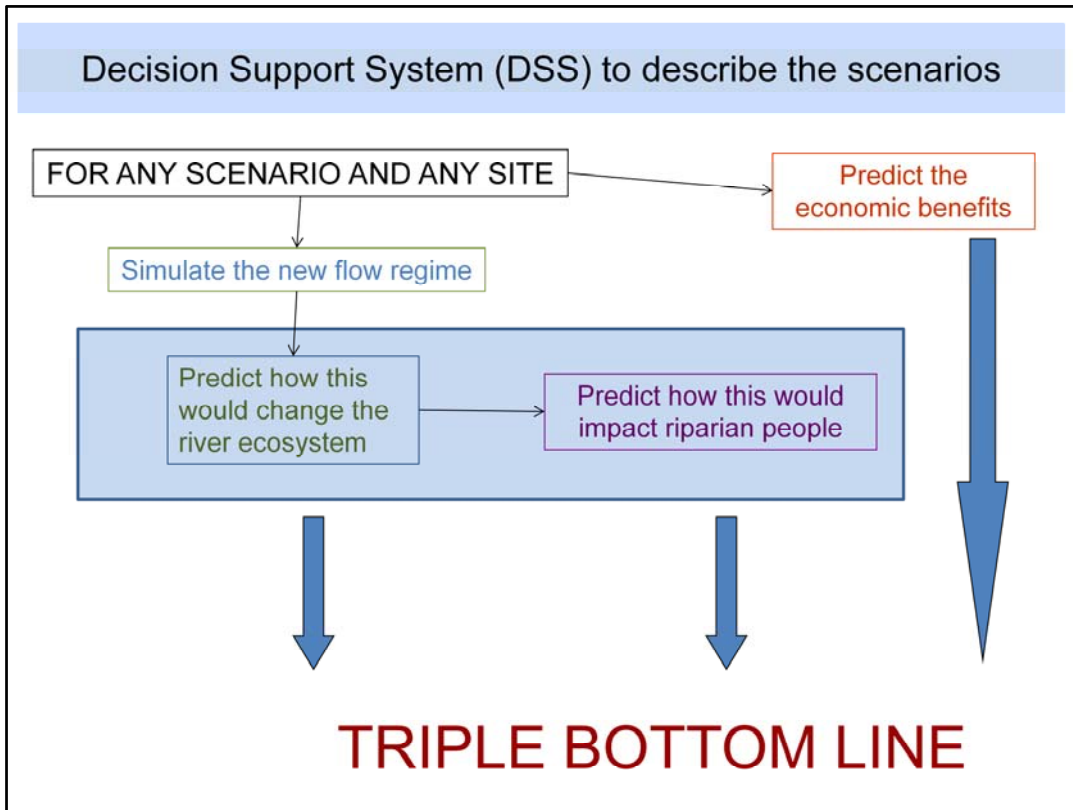


Botswana



Process team

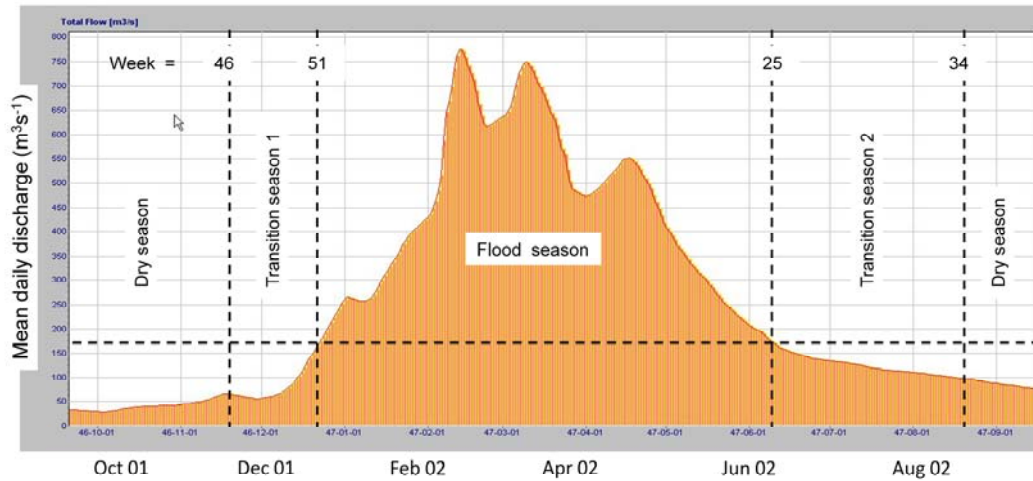




Why start with the flow regime?

We are addressing water-resource developments
It is the 'master variable'

Flow seasons at Site 4: Kapako in 2001/2



Ecologically relevant flow indicators at Sites 5 and 6
median condition

Flow indicators	Present Day
MAR (McM)	270
Dry season onset	Aug
Dry season minimum flow (m^3s^{-1})	114
Dry season duration (days)	115
Flood season onset	Jan
Flood season peak (m^3s^{-1})	620
Flood season volume (Mcm)	5269
Flood season duration (days)	150

Popa Falls/Panhandle – predicted change in all flow indicators under the three scenarios

Flow indicator	PD	Low	Medium	High	Comment
MAR (McM)	270	261	245	186	Progressive decline: 97%, 91%, 69% of PD
Dry season onset	Aug	July	July	June	Progressively earlier: 1, 3, and 7 weeks earlier than PD
Dry season duration (days)	115	130	145	193	Progressively longer dry season: 2, 4, 11 weeks more than PD
Dry season minimum flow (m ³ s ⁻¹)	114	101	93	21	Progressive decline : 89%, 82%, 18% of PD
Flood season onset	Jan	Jan	Jan	Feb	Slightly delayed by 1 wk (M) and 2 wks (H)
Flood season peak (m ³ s ⁻¹)	620	618	611	573	Progressive very slight decline: 99%, 98, 92% of PD
Flood season volume (Mcm)	5269	4980	4450	3294	Progressive decline: 96%, 84%, 63% of PD
Flood season duration (days)	150	143	129	103	Progressive shortening of flood season by 1, 3, 7 weeks

Biophysical indicators

70 used to describe the ecosystem

Lower floodplain grazers



Vegetation community:
river dry bank



Extent of inundated floodplain



Socioeconomic indicators

Nine used to describe how people use the river ecosystem

Fishing



Floodplain crops



Tourism

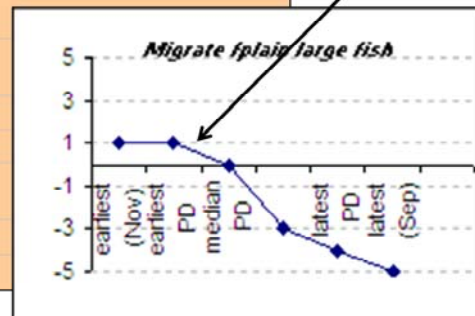


Entry in the DSS

uses data; international knowledge, local wisdom

4	Flood season onset		Community of large fish that migrate onto floodplains	
	<i>Site: Kapako, Namibia</i>			
	Description	week		Average
	1 earliest in future (Nov)	44		1
	2 earliest PD (Dec)	48		1
	3 median PD (Jan)	3		0
	4 latest PD (Apr)	9		-3
	5 latest in future (Sep)	16		-5
7				

Response Curve



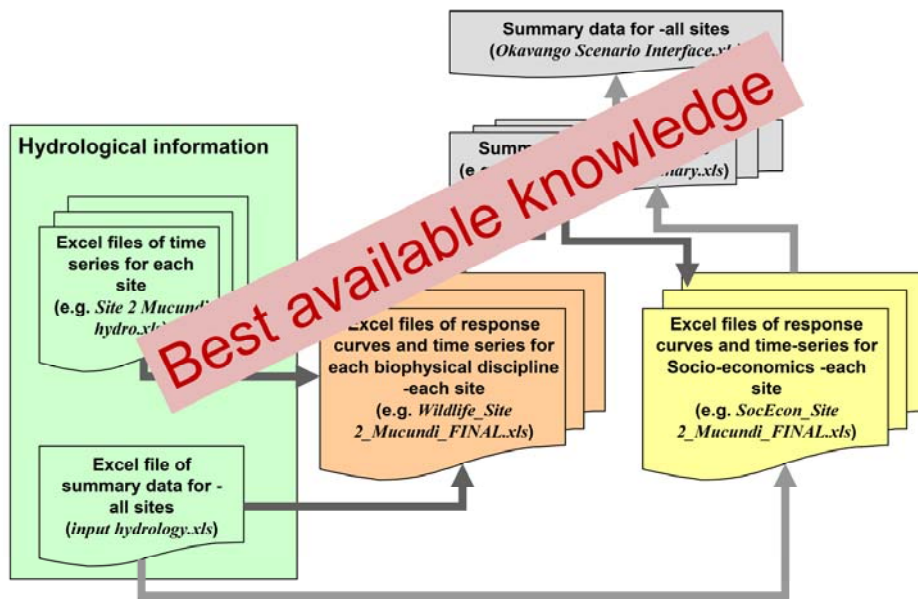
Knowledge Capture Workshop April 2009



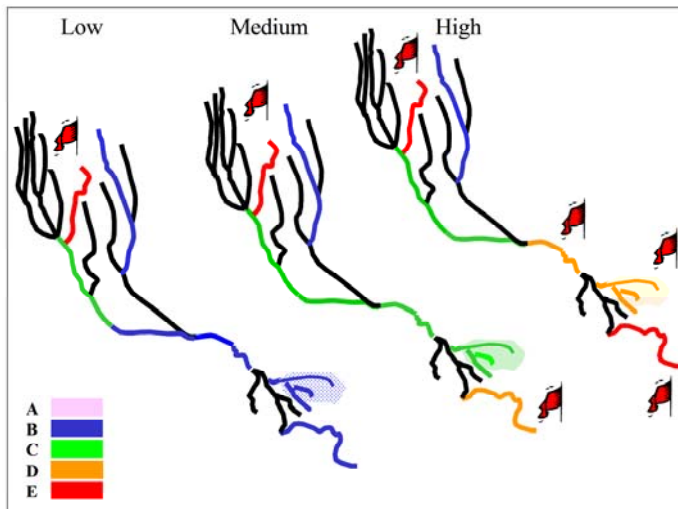
4000-5000
response curves
drawn and
captured in DSS



Flow of information through the DSS



TBL1: Summary of predicted changes in ecosystem condition for the hypothetical scenarios



Cuito River is very important

Progressive decline from Low to High scenarios

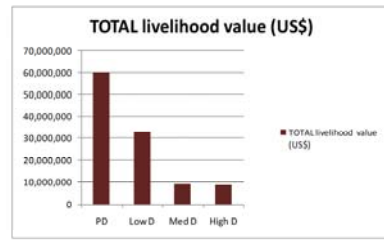
Impacts would become increasingly transboundary; felt most severely in lower basin

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

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

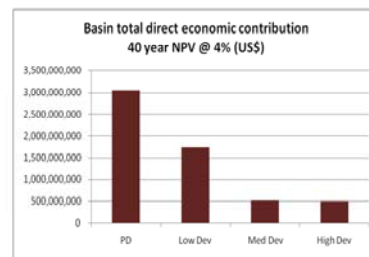
TBL2: Summary of socioeconomic changes

Livelihood implications of changing river resources



Small sustained reductions in tourism would severely impact livelihoods

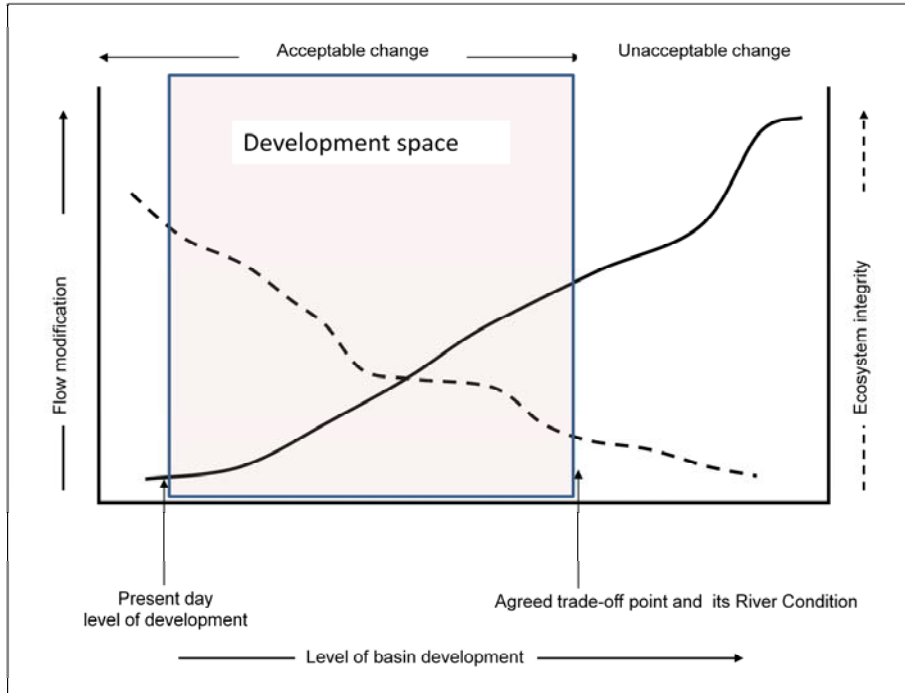
Direct economic contribution of all natural river resources



TBL3: Basin-wide macro-economic assessment

Ecosystem losses	US\$ 700 million for Low Scenario US\$ 1.4 billion for Medium and High water-use Scenarios
Medium and High Scenarios	Would generate such large economic losses that they would overwhelm all the benefits even under an optimistic economic projection. NOT ALL ECOSYSTEM SERVICES COSTED
Urban supply and sanitation	Requires small amounts of water
Hydropower	Run-of-river: manage impacts through design
Irrigation	Vast majority of economic losses

The concept of Development Space

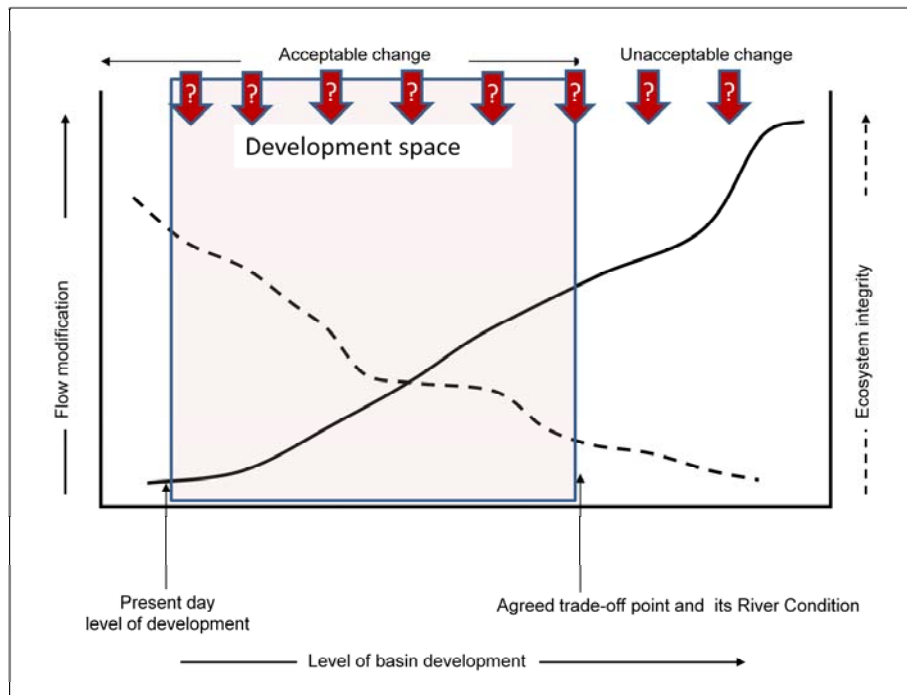


What is unacceptable:
what might be the ecosystem 'mark in the
sand' for the Okavango people?

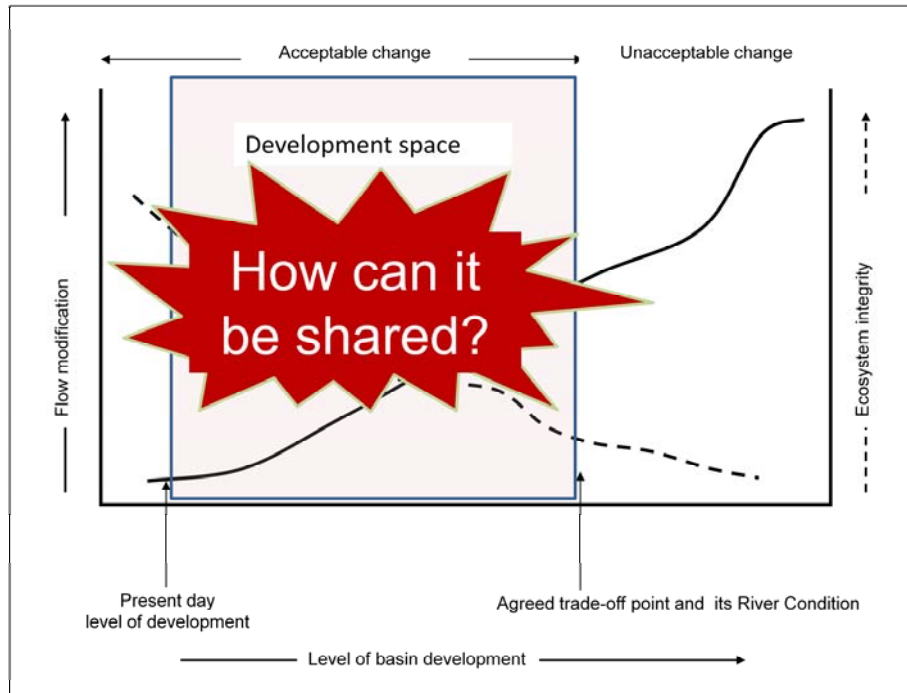
Are the following a step too far?

- Parts of the main channel drying out for part of year?
- Floodplains not flooding?
- Water too polluted to drink or wash in?
- 30% loss of biodiversity?
- 60% decline in fisheries?
- Loss of areas of religious or cultural significance?
- 80% reduction in subsistence livelihoods?
- ?

How scenarios help define the Development Space



Sharing the Development Space



Priority needs for sustainability

- Political approval and commitment
- Decision-making/negotiation process
- Procedure for decisions on new projects

Priority needs for basin management

- Set up/refine models: hydrological; hydraulic; sediment/geomorphology; water quality
- Refine predictions in DSS
- Basin-wide monitoring and adaptive management
- Capacity building

Acknowledgements



- OKACOM for initiating and supporting the project
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