

Environmental Flow Policy Development and Implementation: Lessons from the Lesotho Highlands Water Project

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What are EFs?

"An allocation of water with a prescribed distribution in space and time, and of a specific quality, that is deliberately left in a river, or released into it, to manage river health and the integrity of ecosystems and communities sustained by river flows"

The Challenge

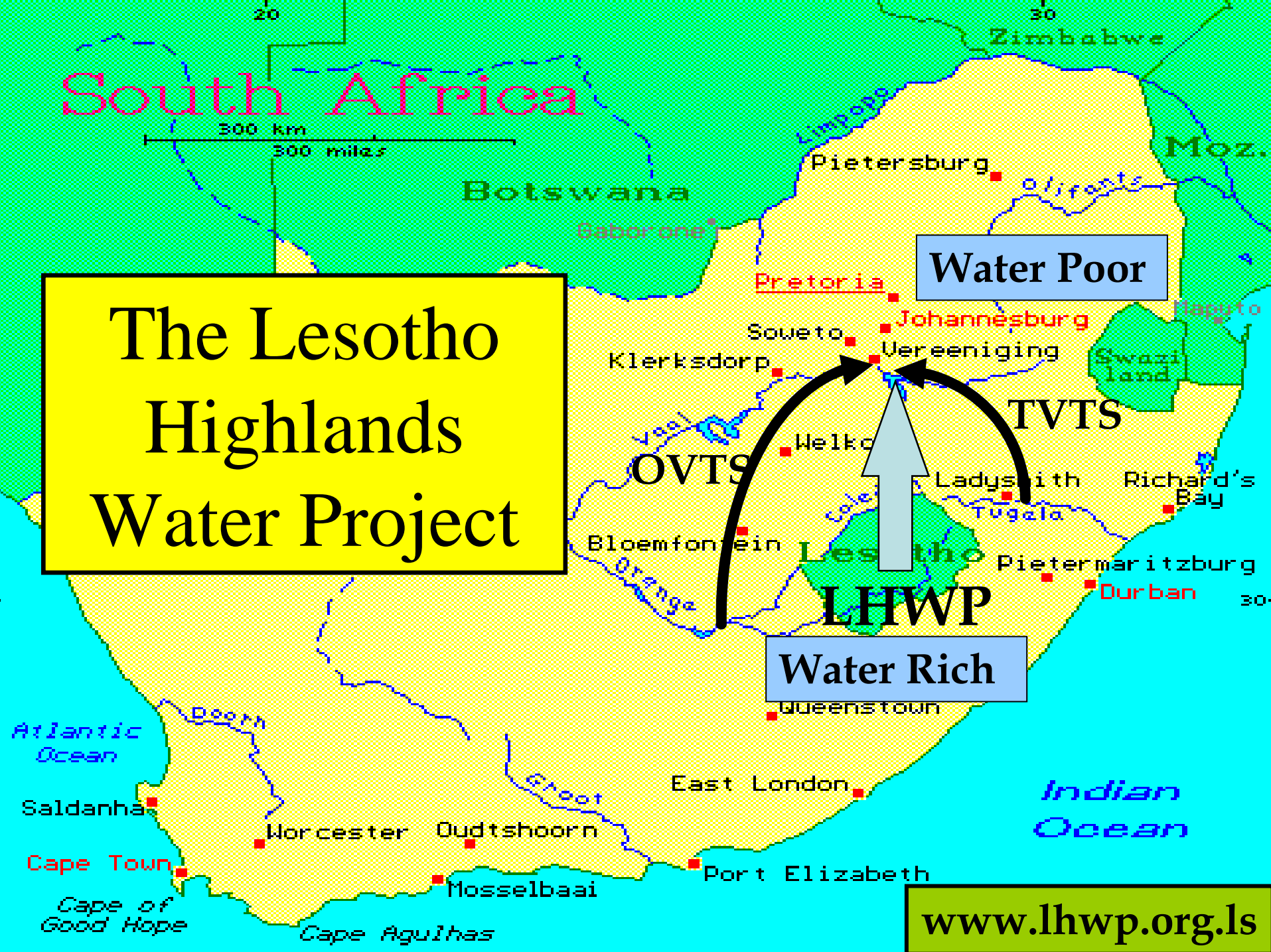
- The decision-makers' task is to allocate water between all users of water in multi-purpose projects
 - Water supply, Irrigation, Energy, Industry, etcetera

And the Environmental and Social uses that are typically "voiceless constituencies"

South Africa

300 km
300 miles

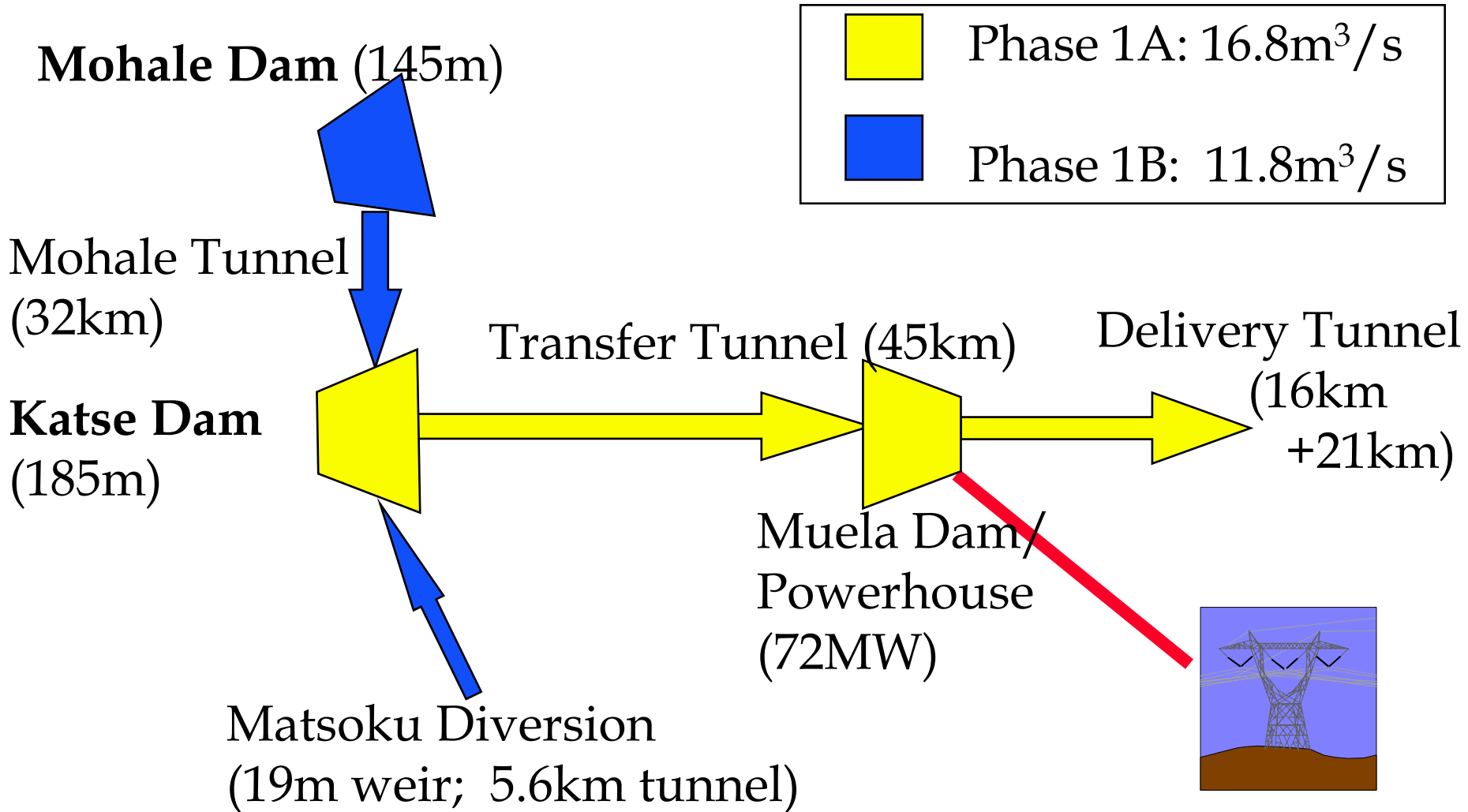
The Lesotho Highlands Water Project



Water Poor

Water Rich

Lesotho Highlands Water Project Schematic Project Layout



LHWP Phase 1A

- ❑ **Katse Dam:** 185 m high; Storage = 1,950m m³
- ❑ To deliver 18 m³/s
- ❑ Transfer Tunnel: 45 km
- ❑ Delivery Tunnel: 15 km in Lesotho; 22 km in RSA
- ❑ Hydropower Plant: 72 MW installed capacity
- ❑ Muela Dam: 55m high concrete arch type

Phase 1A Water Transfer

Katse Dam - First Overflow



LHWP Phase 1B

- ❑ **Mohale Dam - 145 m high ;**
Storage= 958m m³
- ❑ To deliver 11.7 m³/s
- ❑ Transfer Tunnel- 32 km
- ❑ Matsoku Diversion weir & tunnel

Phase 1B

Mohale Dam



**What can we learn from
the Lesotho Highlands
Water Project?**

Engineering

- Katse and Mohale are world class dams which have received many accolades
- But nowadays dams are not judged merely on engineering excellence
- Dam projects must also deal with environmental and social issues
- Multidisciplinary teams are essential to ensure that EFs are taken into account at all stages of dam planning and design
- This does not always happen in agencies that lack non-engineering competencies

Timing of EF Work

- EF work should be undertaken very early in project preparation as part of the EIA
- So that EFs can be built into project design and feasibility studies and
- Agreement on EF Policy and Procedures reached--and problems resolved--well before any legal agreements need to be signed

Undoing mistakes by re-engineering and retrofitting can be very expensive

Start With Legal Framework

- No legal framework for EFs in Lesotho
 - No national legal obligation to protect downstream environment and communities
 - No "river classification system" or river health targets at outset
- no way of judging what level of environmental degradation might be considered unacceptable by Lesotho society or their South African partners
 - or how trade-offs between water users should be made

Without a policy or legal framework, Environmental Flow initiatives are burdened not only with determining environmental flows, but also with giving them legitimacy.

- ❑ EF discussions take place in a policy and legal vacuum
- ❑ Putting scientists and decision-makers in an impossible position
- ❑ Leading to confusion and *ad hoc* decision making

The EF Science

- How reliable is the science?
- Can we really predict environmental and social impacts?
- Lesotho EF science was state-of-the art
- First comprehensive impact evaluation of downstream environmental and social impacts under a World Bank dam project
- But it was complicated

Is it too complicated for decision-makers?

Environmental C

	Re			
	Matso			
	T	4th	D	
% MAR	40	36		
Geomorphology	S+	S		
Water quality	M+	S		
Vegetation	M+	M	M-	L
Macroinvertebrates	M+	M	M-	L
Fish	S+	CS	S-	M
Amphibia	L	L	L	N
Mammals & birds	L	L	L	N

-with greater variation--pluse

Is this really understandable?

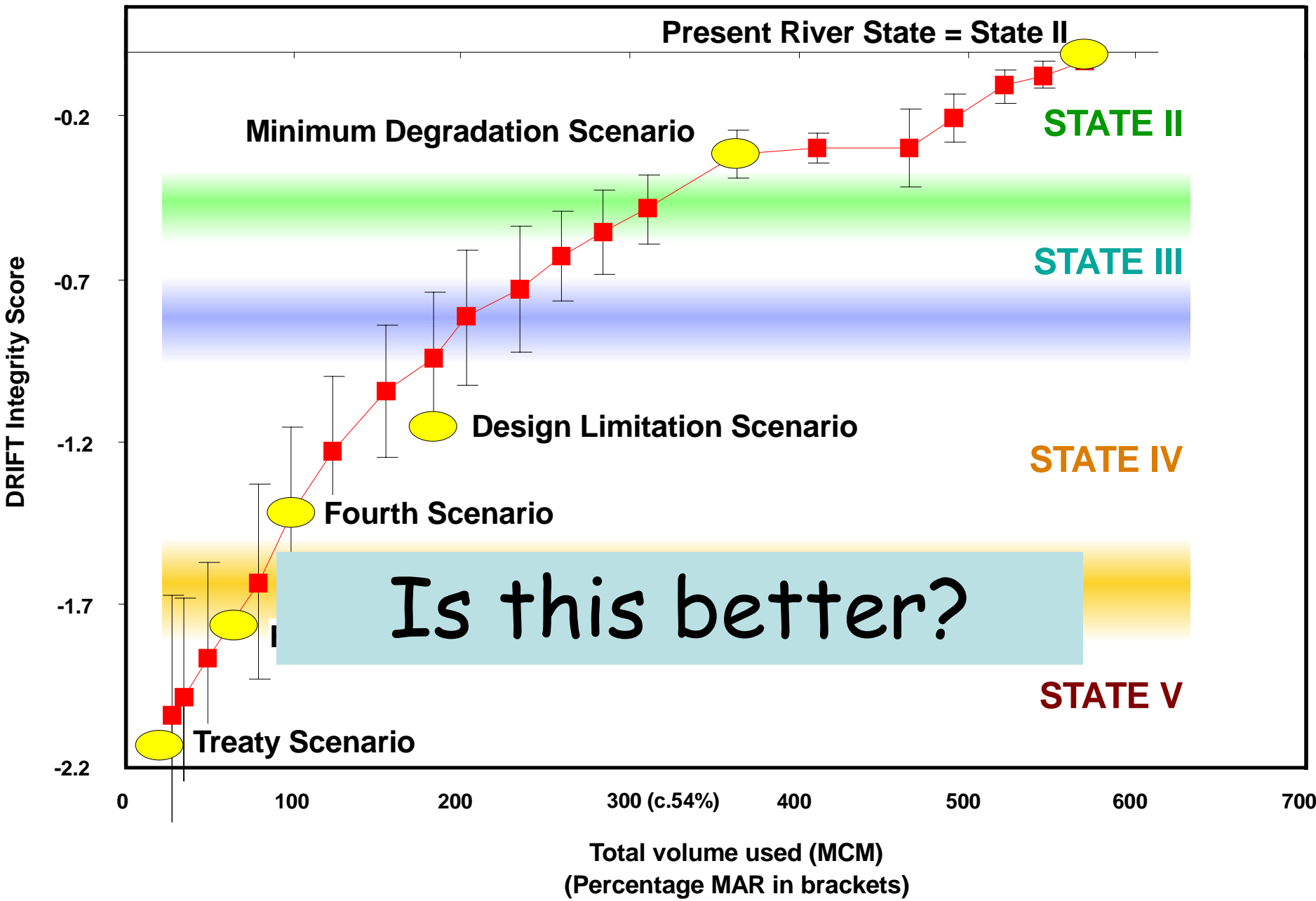
2 and 3

ch 3: Malibamats'o

9	7	5	2
8	6	5	5
9	7	6	2
9	9	7	1
7	1	5	1
7	2	2	1
58	40	35	17

	4 th	DL	MD
	29	41	56
	7	6	1
	7	5	3
	7	5	3
	9	5	3
	9	7	1
	5	4	3
	7	2	2
	52	35	21

- Unweighted numerical scale
- CS=9; S+=8; S=7; S-=6; M+=5.....N=1



A Decision Framework is Needed

- So decision-makers can debate the consequences of EF options at an early stage
- Articulating values of stakeholders up-front
- Ensuring that understandable EF data is available to non-specialist decision-makers
- With explicit data reliability limitations
- And weights for each factor consistent with societal values
- That permits decision-makers to see the implications of their decisions in a safe space

LHWP Decision Framework

	Treaty Minimum	Fourth	Design Limitation	Minimum Degradation
Annual Economic Value of Losses (1999 Maluti million)	8.0	6.4	5.7	2.9
Lost Variable Royalty (Maluti million)	0	41	218	463
% of Total Royalties		1.5%	8.0%	17.0%
Rate of Return	7.6%	7.4%	7.3%	7.1%
Reach2 Environmental Indicators	58	40	35	17
Reach 3 Environmental Indicators	52	35	21	10
Reasonableness Flag		MEAN	REASONABLE	GENEROUS

A Last Word On Environmental Impacts

- MONITOR
- MONITOR
- MONITOR
- MONITOR
- MONITOR
- Establishing baseline data before construction begins is a good investment

Marginalised Impacts, Marginalised People

- Downstream is different from upstream
 - Less certainty regarding impact
 - Uncertainty increases with distance
 - Smaller impacts--larger numbers of people
 - Hard to determine the cut-off point
 - Compensation *in situ*, not resettlement
 - Likely to involve compensating communities not individuals
- Ensure capacity to communicate, negotiate and deliver compensation

Marginalised Impacts, Marginalised People

- Imbalance in political influence and negotiating strength of:
 - Urban dwellers, commercial farmers, textile factory owners
 - usually well organized, vocal pressure groups which have the means to participate in and influence decision-making
 - impacted people
 - often poor, less well-educated, under-represented in the decision making process and politically marginalized

The Precautionary Principle

“Where there are threats of serious or irreversible damage*, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation”

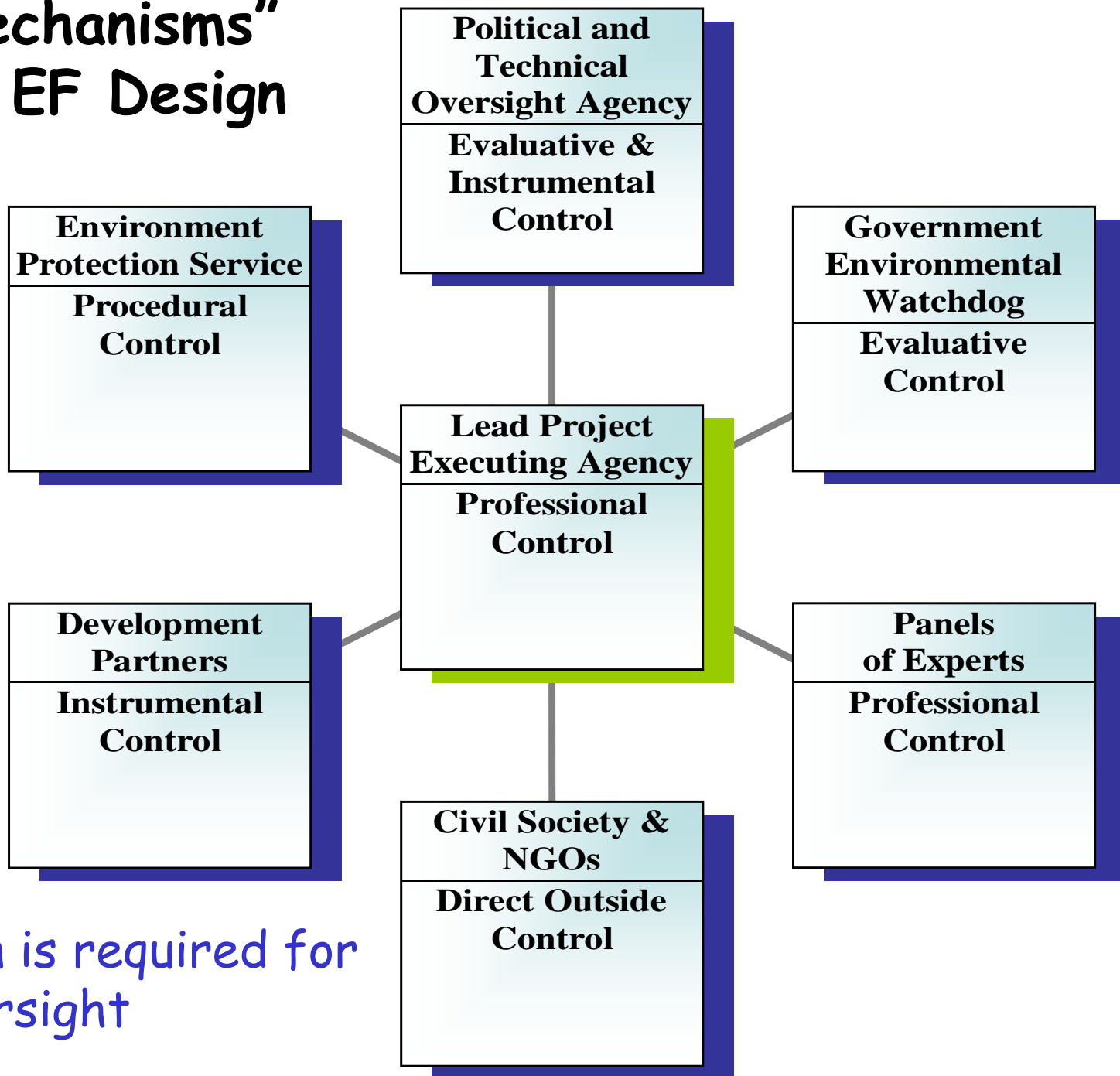
(Principle 15 of the UN Conference on Environment and Development)

*One might add “or social impacts”

The Economics

- Did EFs significantly affect ERR? No
 - Treaty Minimum Scenario: 7.6%
 - Selected Scenario: 7.35%
- Dam costs are often underestimated because they fail to account for ALL the economic costs of the project, e.g.
 - Design features to permit EF releases (valves, etc)
 - Additional operational & monitoring costs--staff, consultants, equipment, EF audits
 - Mitigating environmental and social impacts
 - Compensation payments
 - Consultations and communications—Website, PR, Meetings

"Control Mechanisms" Influencing EF Design



A combination is required for effective oversight

10 KEY LESSONS FROM LESOTHO

1. Dams are multi-purpose projects involving trade-offs between water uses—including "voiceless" users
2. Establish a policy/legal framework
3. Ensure decision-makers understand the environmental science
4. Use a DSS to move from predicting impacts to quantifying trade-offs
5. Let decision-makers explore EF options without compromising their positions or values

10 KEY LESSONS FROM LESOTHO

6. Monitor

7. Establish control mechanisms for EF success

8. Start early, VERY EARLY

9. Do not underestimate resistance to EFs

10. Be patient—it will take time!

Lesotho EF Work Achievements

1. EF methodology that systematically links biophysical and social impacts
2. EF Policy developed in legal vacuum
3. More effective EF release mechanisms
4. EF Releases 300-400% more than planned
5. EF Policy river health targets largely met or exceeded
6. Substantial downstream compensation programme