

Sub-Saharan Africa: Cooperation and Capacity Building workshop

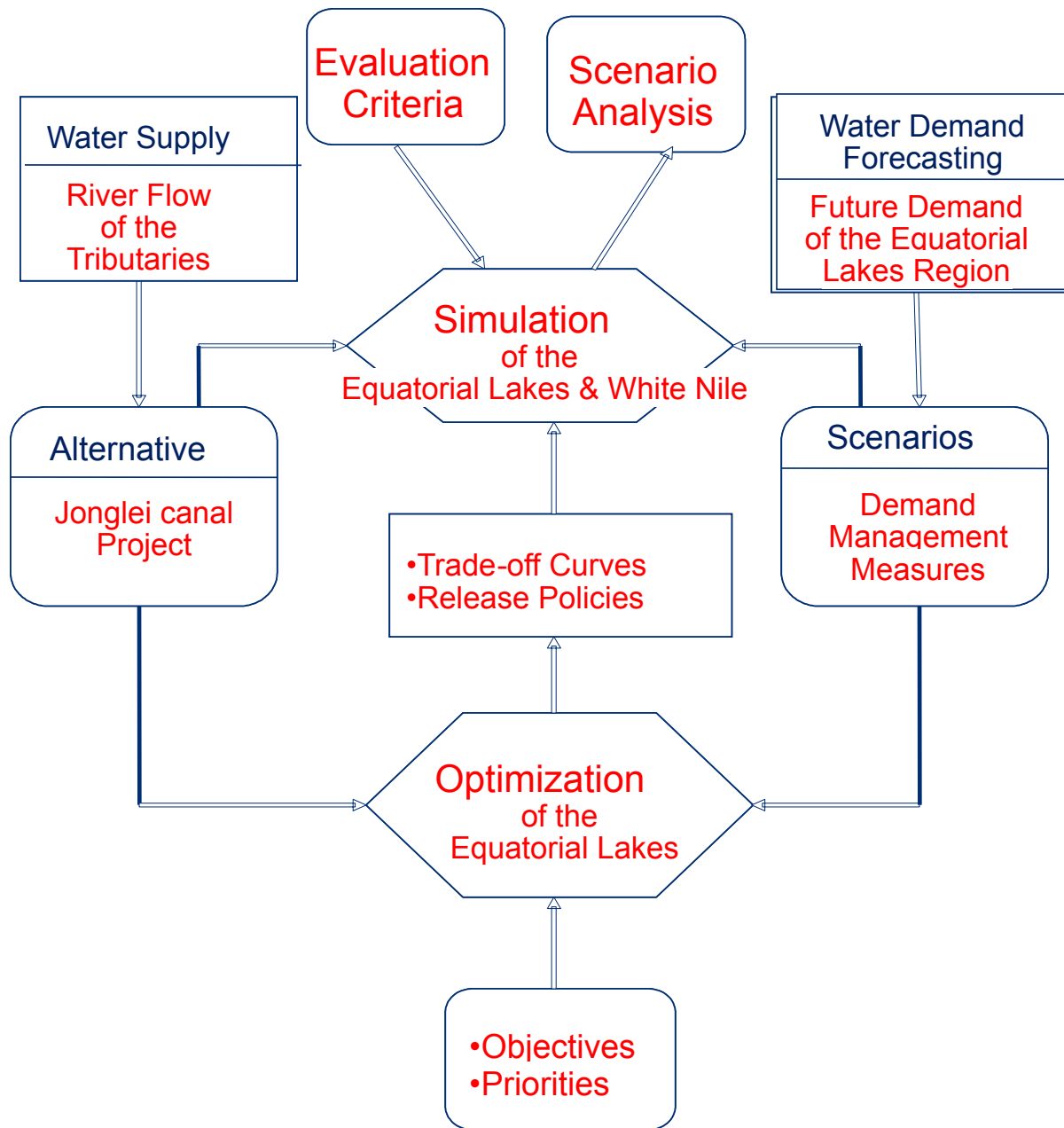
Applications of Decision Support Systems
On
Equatorial Lakes and the High Aswan Dam

By:
Dr. Mamdouh Hassan, Ph D

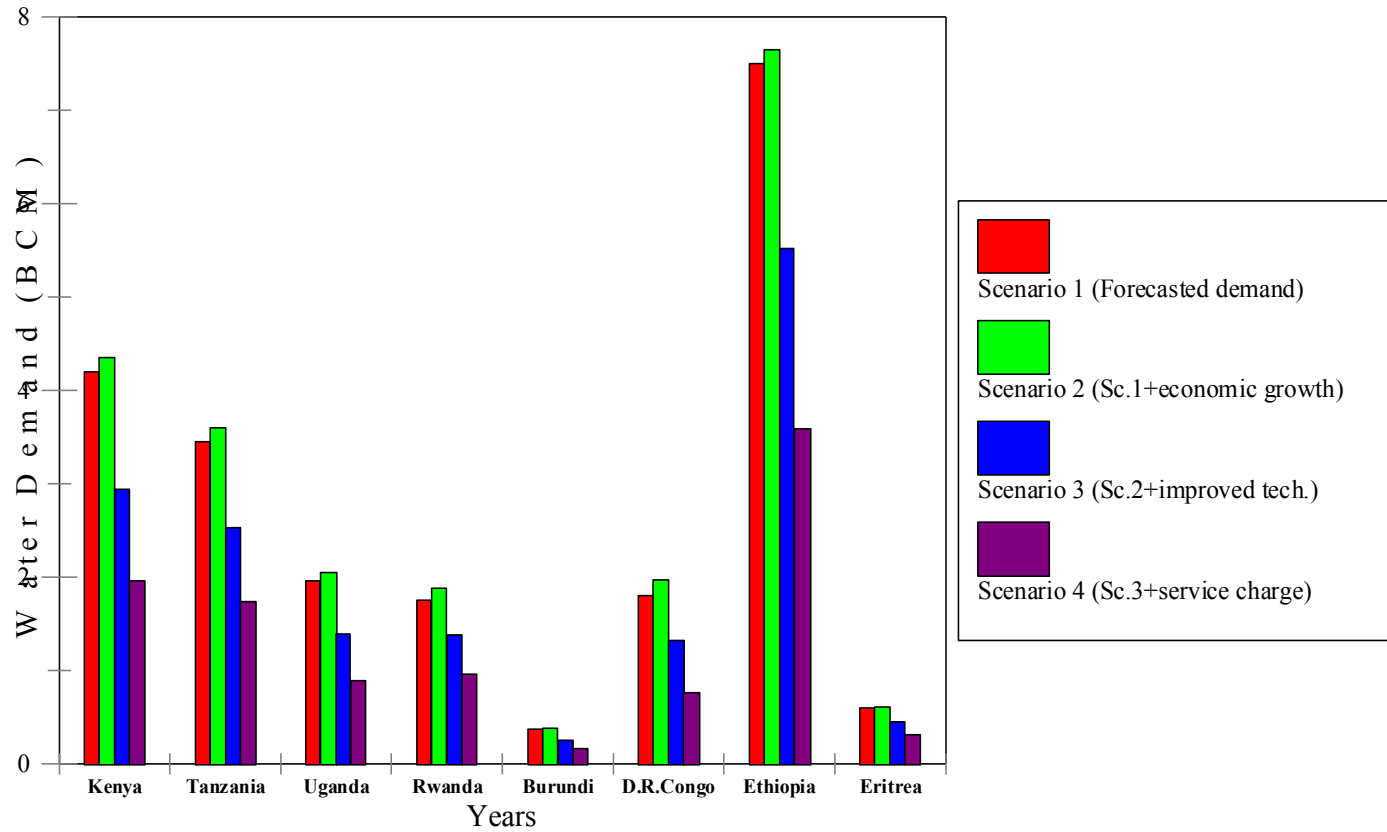
Addis Ababa, 23-24 May 2011

DSS Applications

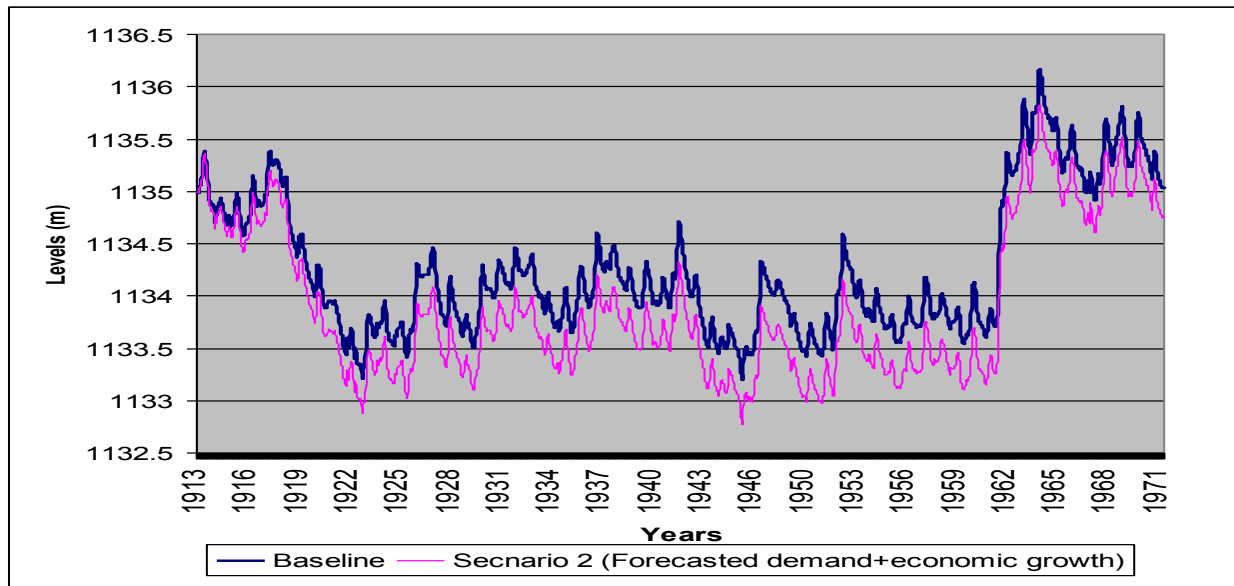
- **DSS Applications for Equatorial Lakes**
 - Equatorial Lakes simulation
 - Equatorial Lakes optimization
 - Policy and scenario analysis
- **DSS Applications for High Aswan Dam**
 - HAD long rang forecast
 - HAD simulation
 - Policy analysis



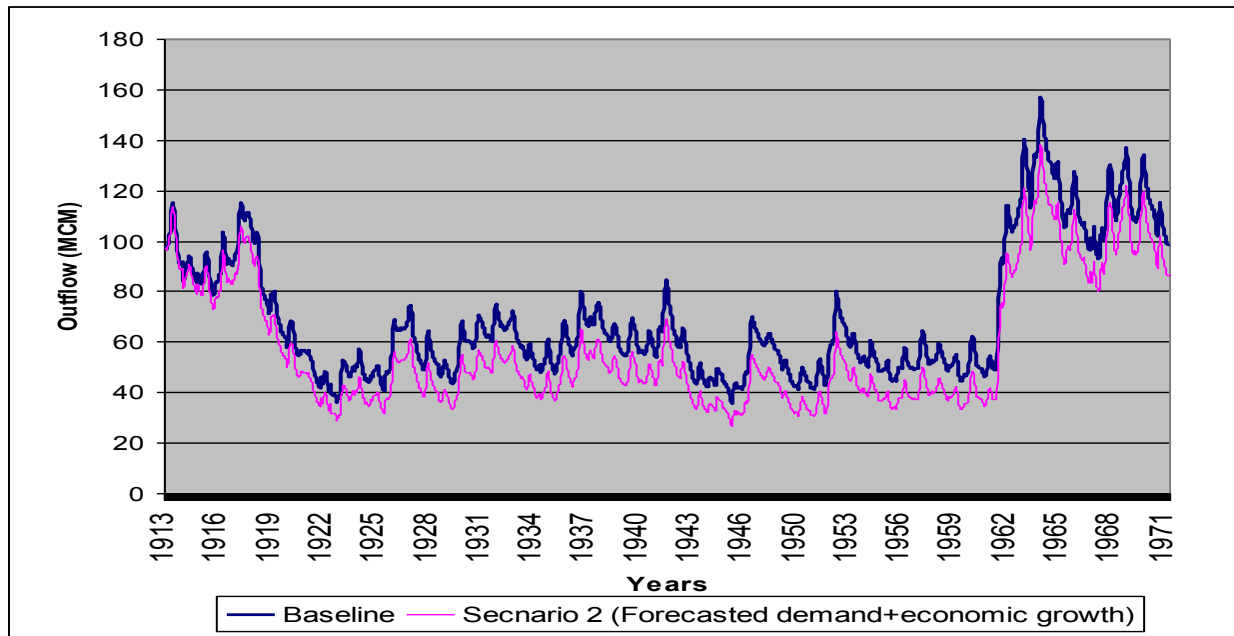
Schematic for the management of the Equatorial Lakes under different demand scenarios



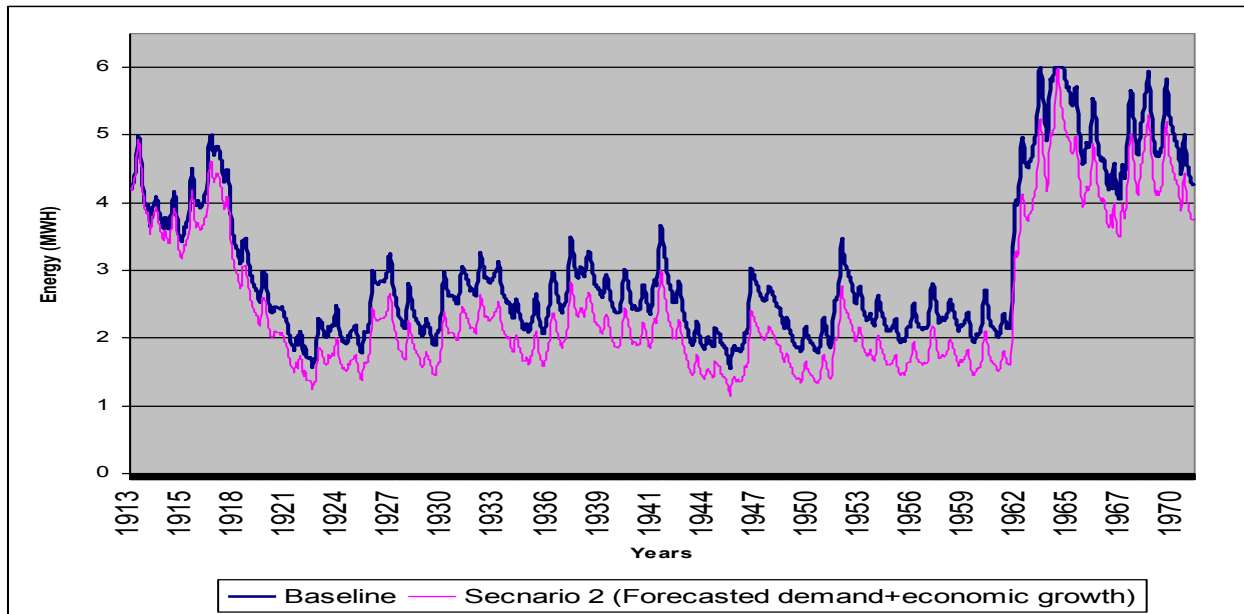
Water demand scenarios in the Nile basin countries for year 2050



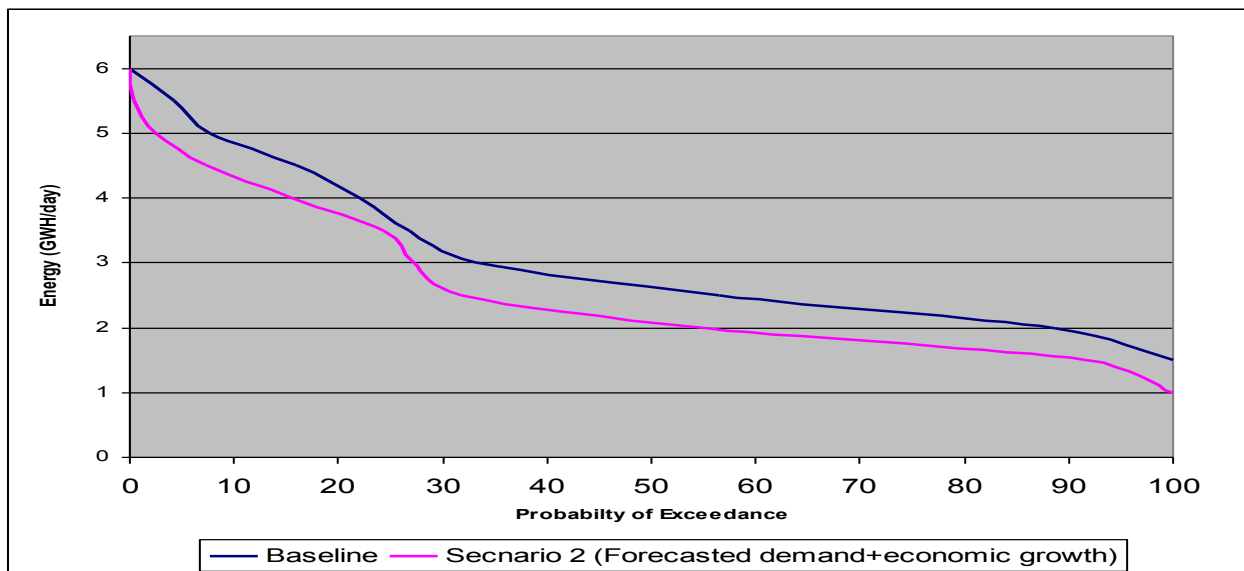
Lake Victoria levels for baseline and scenario 2



Lake Victoria releases for baseline and scenario 2



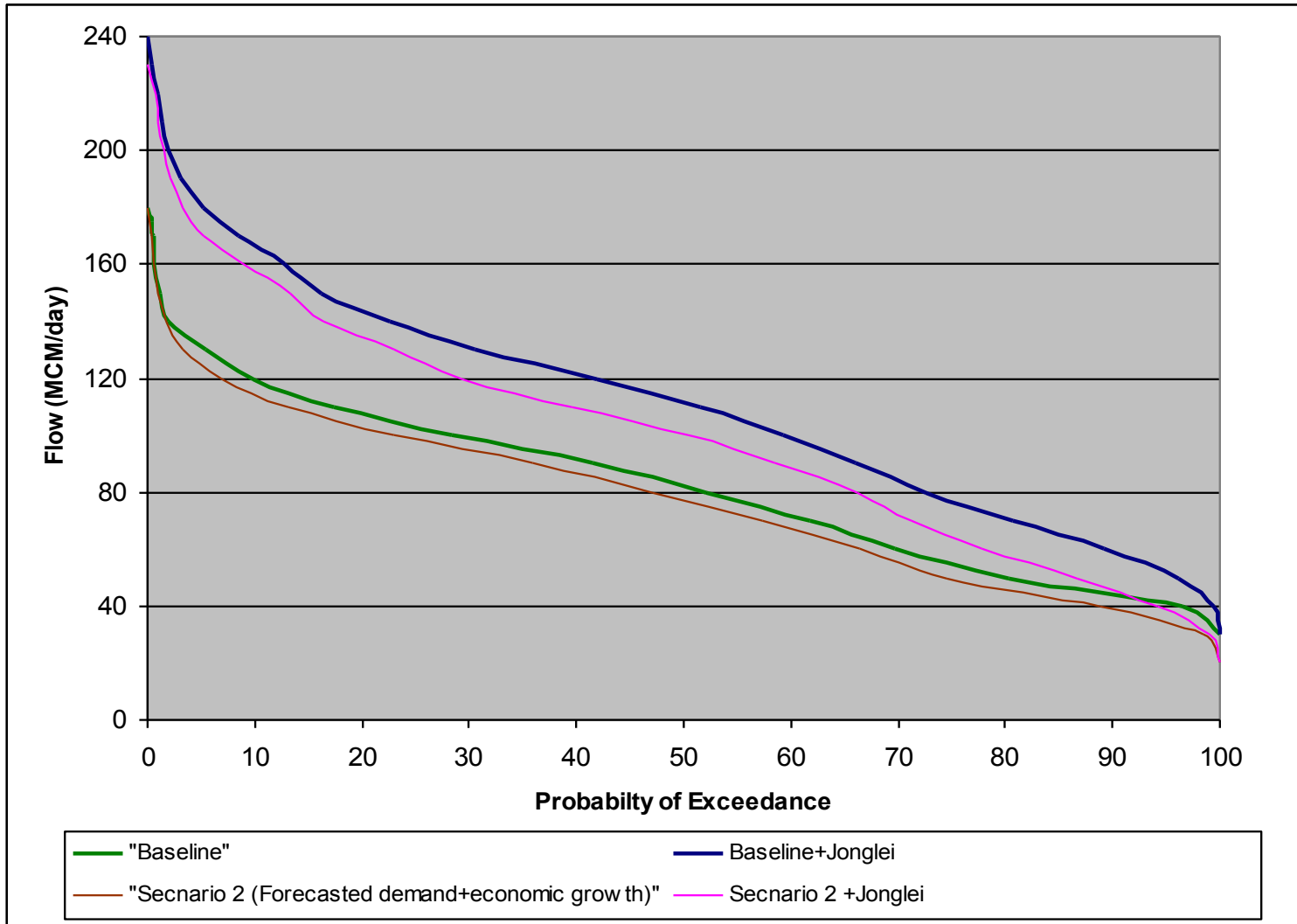
Energy production at Owen for baseline and scenario 2



Probability of exceedance for baseline and scenario 2

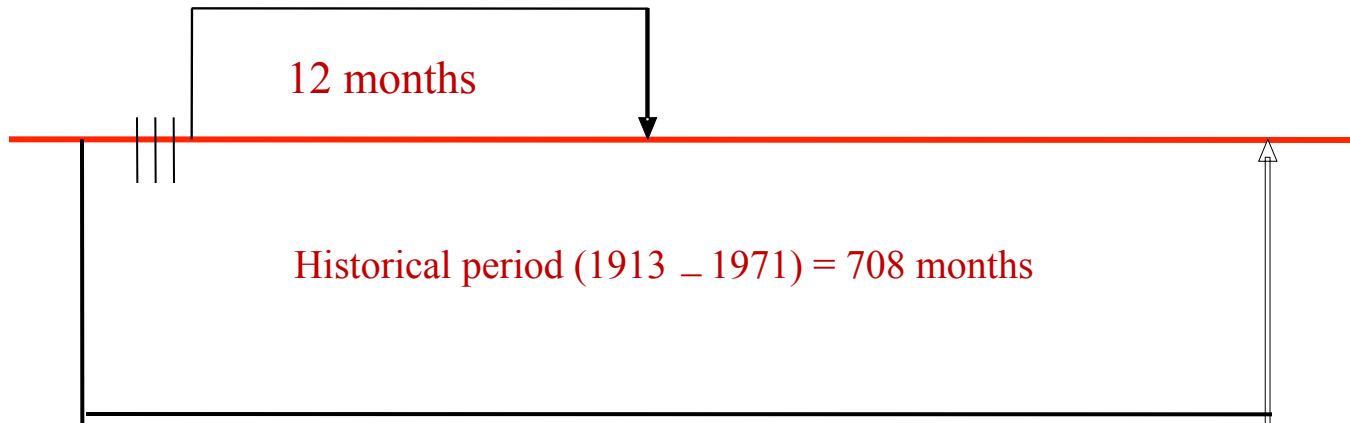
Indicators for the operation of Lake Victoria

Scenarios	h_{\min} meter	Prob [$h < H_{\min}$] %	q_{\min} MCM/day	Prob [$q < Q_{\min}$] %	E_r %	E_{\min} GWH/day
Baseline	1133.20	0.0 %	35.72	0.0 %	0.0 %	1.55
Scenario 1	1132.80	9.46 %	27.3	9.69 %	15.33 %	1.185
Scenario 2	1132.77	11.2 %	26.62	11.62 %	16.64 %	1.155
Scenario 3	1132.91	3.86 %	29.4	4.1 %	11.38 %	1.276
Scenario 4	1133.03	0.56 %	31.95	0.7 %	6.7 %	1.387



Probability of exceedance of flow at Malakal with and without Jonglei for baseline and scenario 2

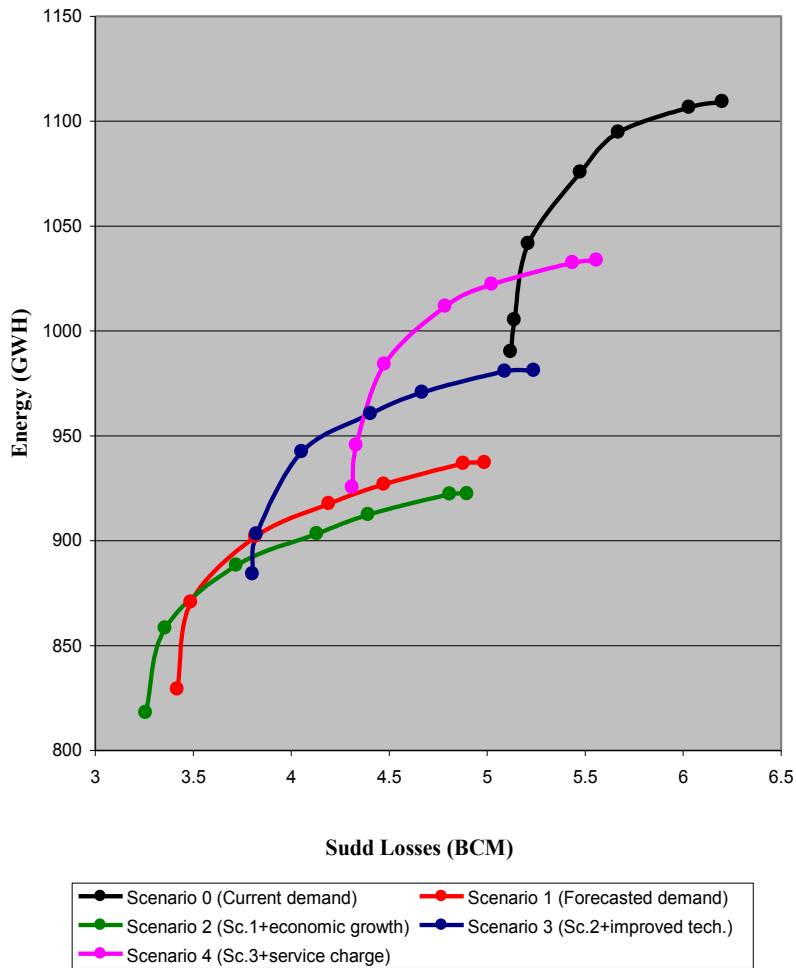
Forecast - Control Horizon (1 year)



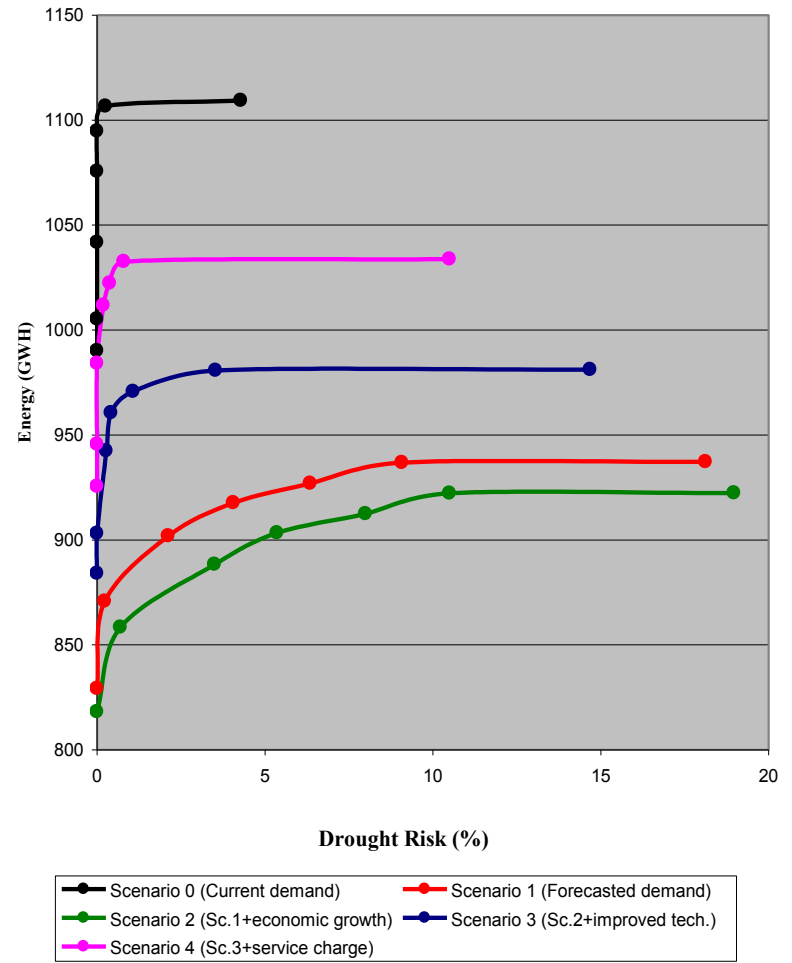
Simulation Horizon (59 years)

Schematic of the forecast-control-simulation process
for Equatorial Lakes

**Mean Annual Sudd Losses vs. Mean Annual Energy
(With Jonglei)**



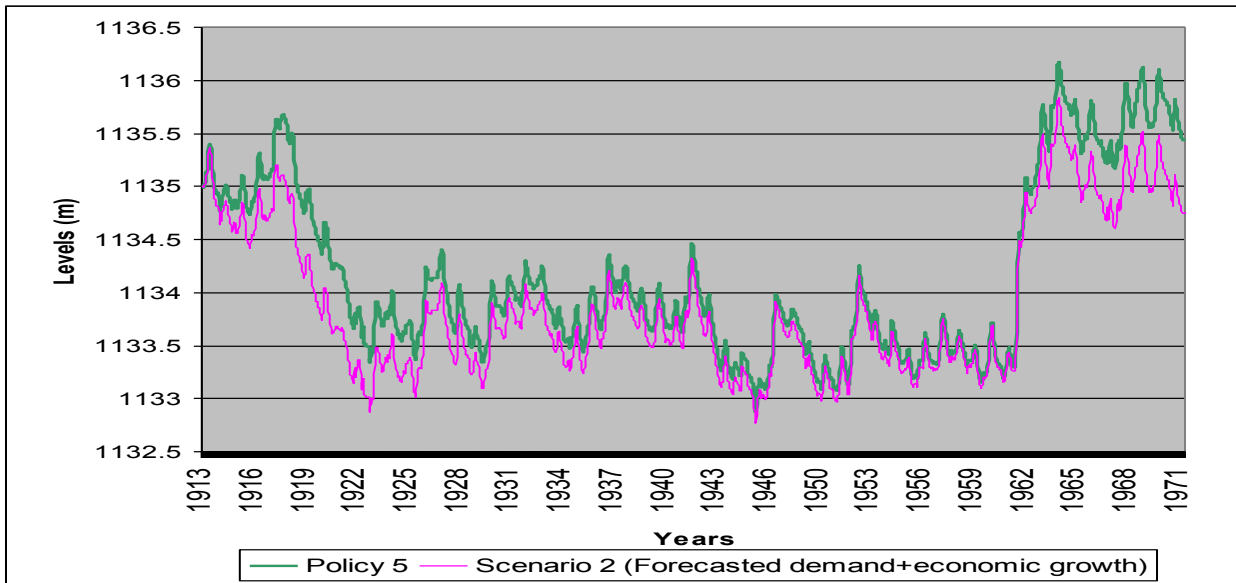
**Drought Risk vs. Mean Annual Energy
(With Jonglei)**



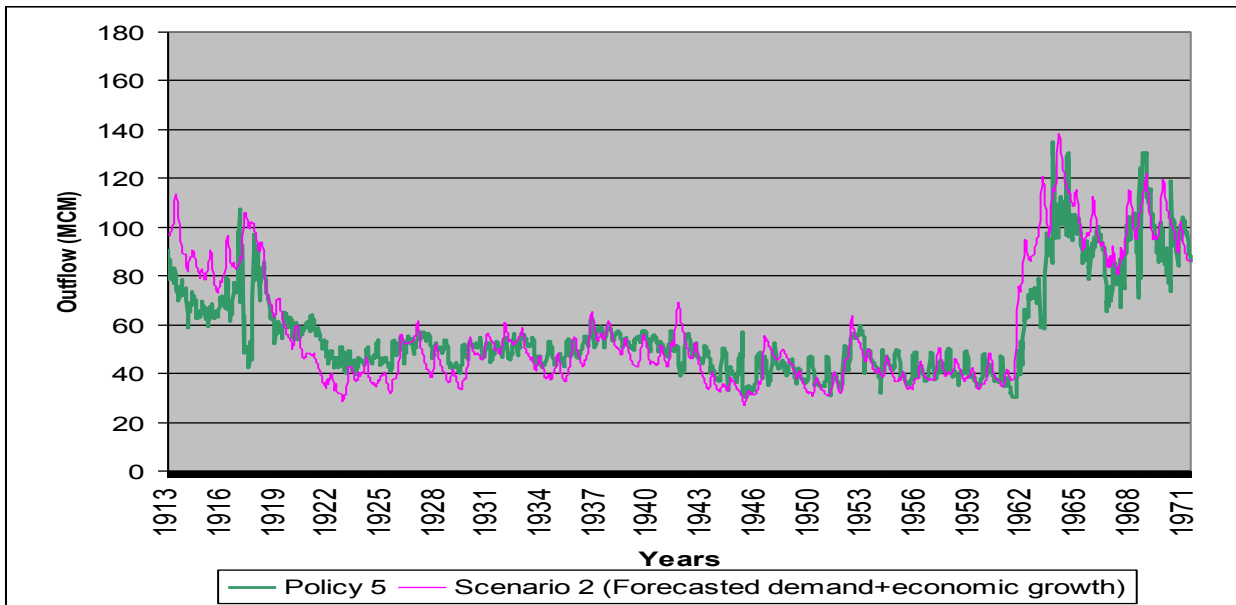
Tradeoff curves for energy generation versus Sudd losses and drought risk with Jonglei

Energy versus losses and drought risk for some selective policies

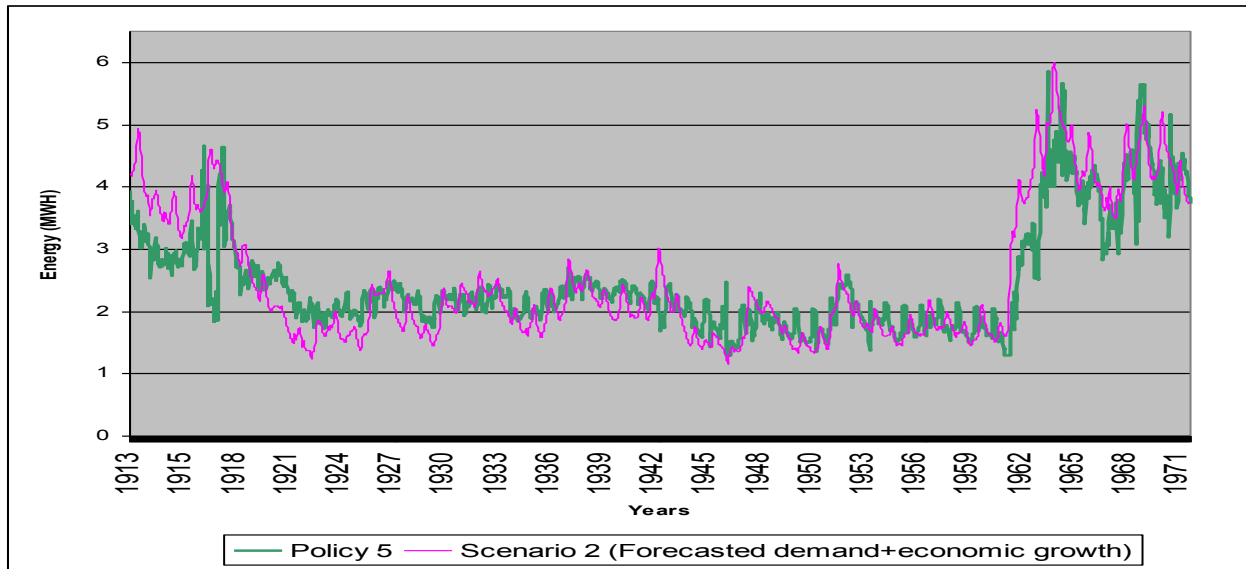
		Case 1: Without Jonglei			Case 2: With Jonglei		
		Energy (GWH)	Losses (BCM)	D r o u g h t risk (%)	Energy (GWH)	Losses (BCM)	D r o u g h t risk (%)
Scenario 0	Policy 1	1109.36	17.27	4.25	1109.34	6.2	4.28
	Policy 4	950.29	16.17	0.0	1075.64	5.45	0.0
	Difference(%)	14%	6%	-	3%	12%	-
Scenario 1	Policy 1	938.12	14.06	18.03	937.15	4.99	18.1
	Policy 4, 5	916.85	13.09	1.03	902.0	3.82	2.1
	Difference(%)	2%	7%	-	4%	23%	-
Scenario 2	Policy 1	923.46	13.79	18.78	922.33	4.9	18.97
	Policy 4, 5	902.02	12.74	2.4	888.35	3.72	3.5
	Difference(%)	2%	8%	-	4%	24%	-
Scenario 3	Policy 1	982.66	14.89	14.8	981.15	5.24	14.69
	Policy 4	961.73	13.99	0.19	960.49	4.4	0.42
	Difference(%)	2%	6%	-	2%	16%	-
Scenario 4	Policy 1	1035.2	15.83	10.68	1033.73	5.56	10.5
	Policy 2, 4	1033.14	15.56	0.61	1011.74	4.78	0.2
	Difference(%)	1%	2%	-	2%	14%	-



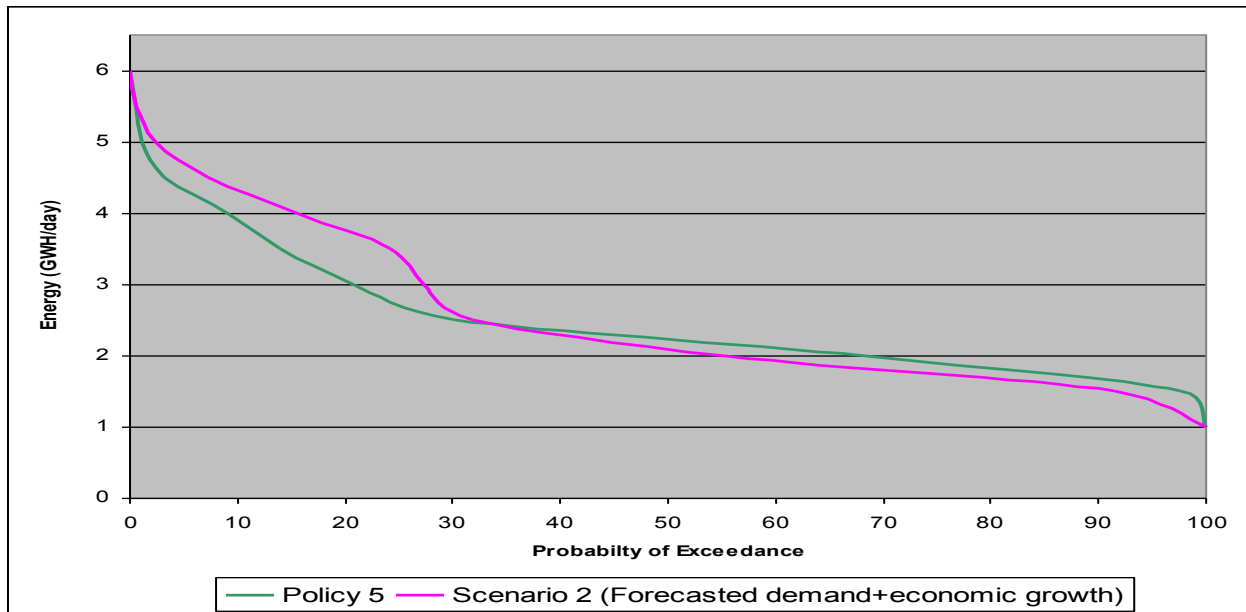
Lake Victoria levels for policy 5 and scenario 2



Lake Victoria releases for policy 5 and scenario 2



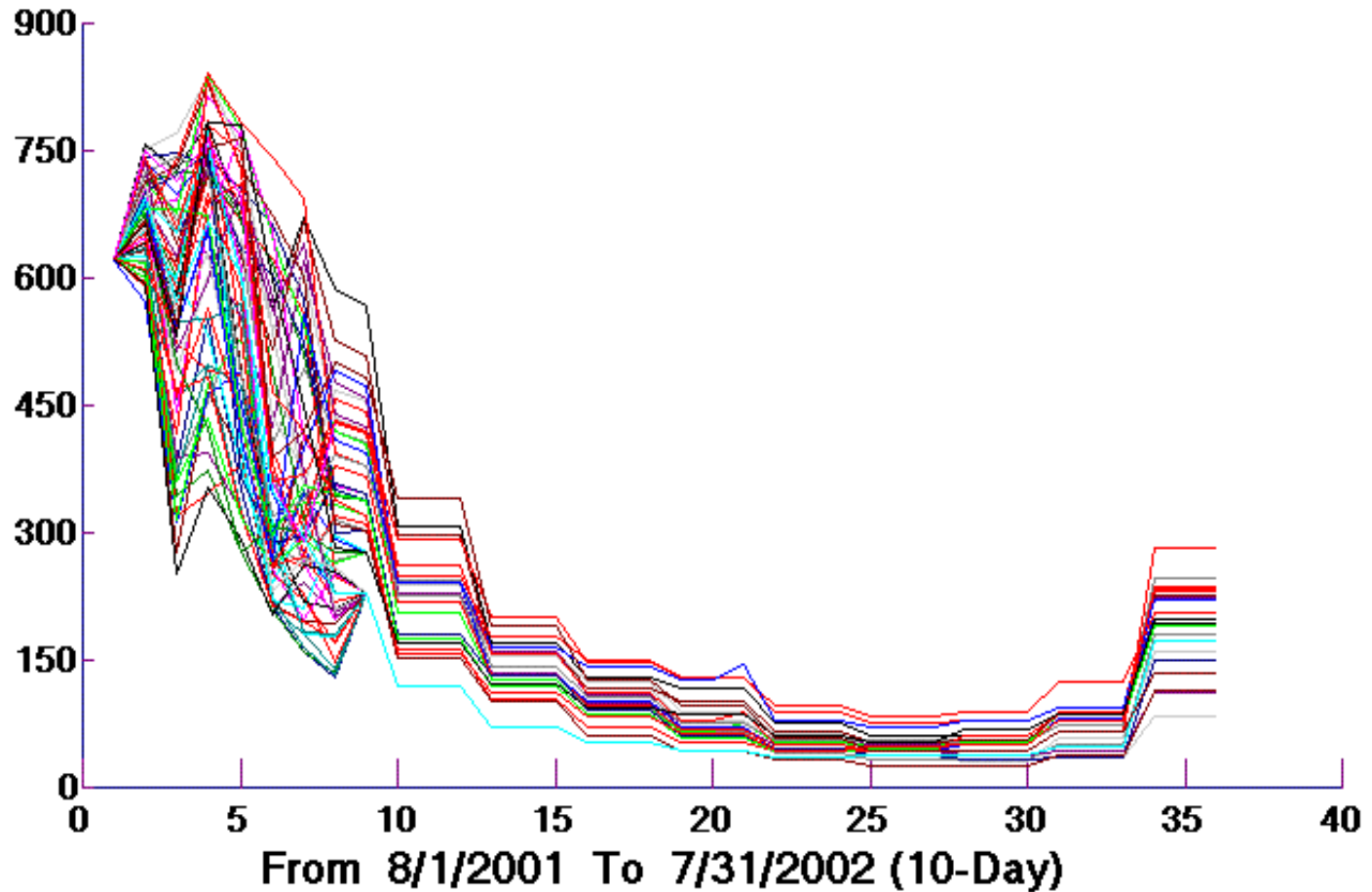
Energy production at Owen for policy 5 and scenario 2



Probability of exceedance for policy 5 and scenario 2

Select

HAD Inflow Traces (mcm/day)



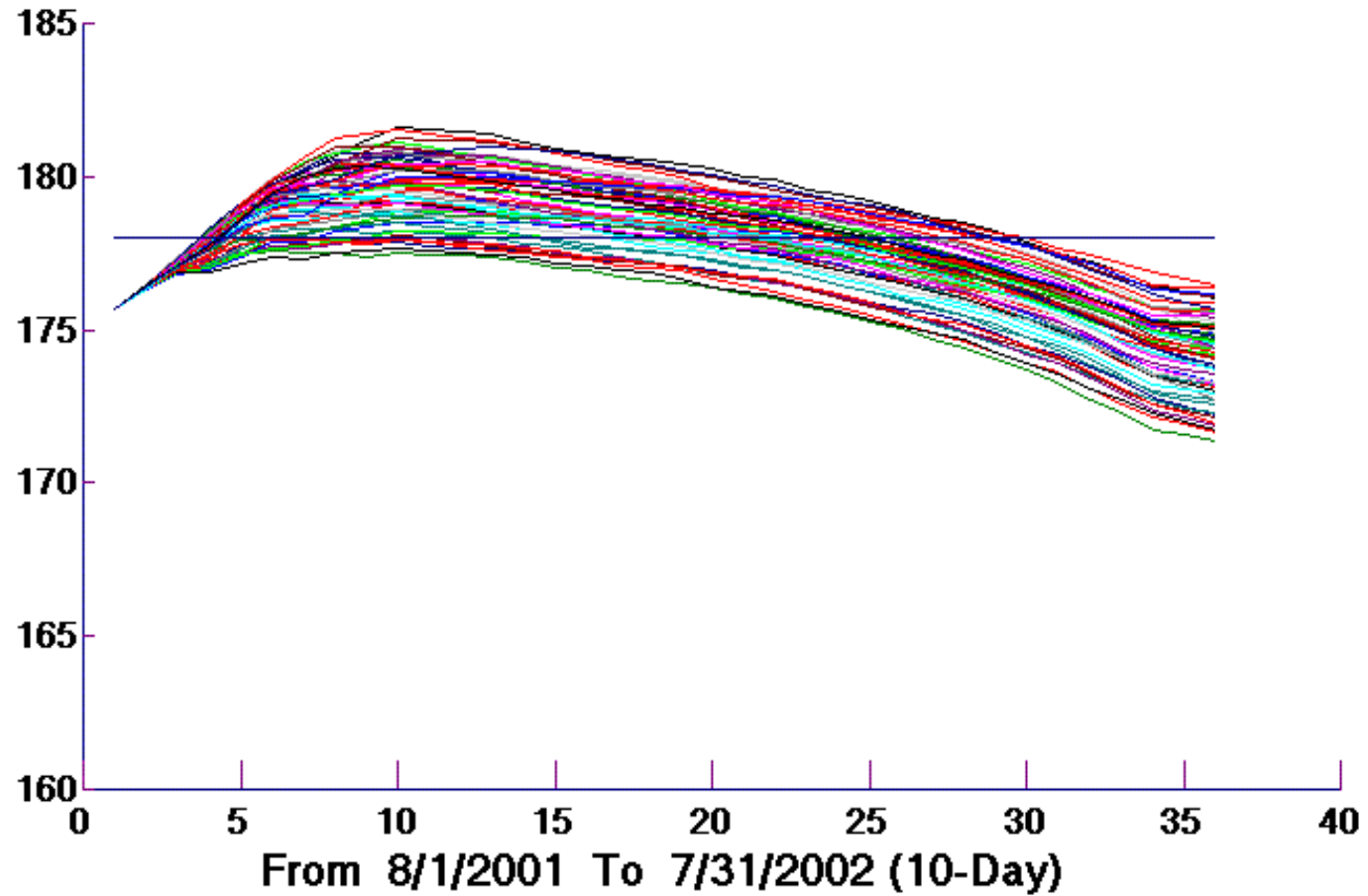
Case Study From the Flood Year 2001/2002

Select

25

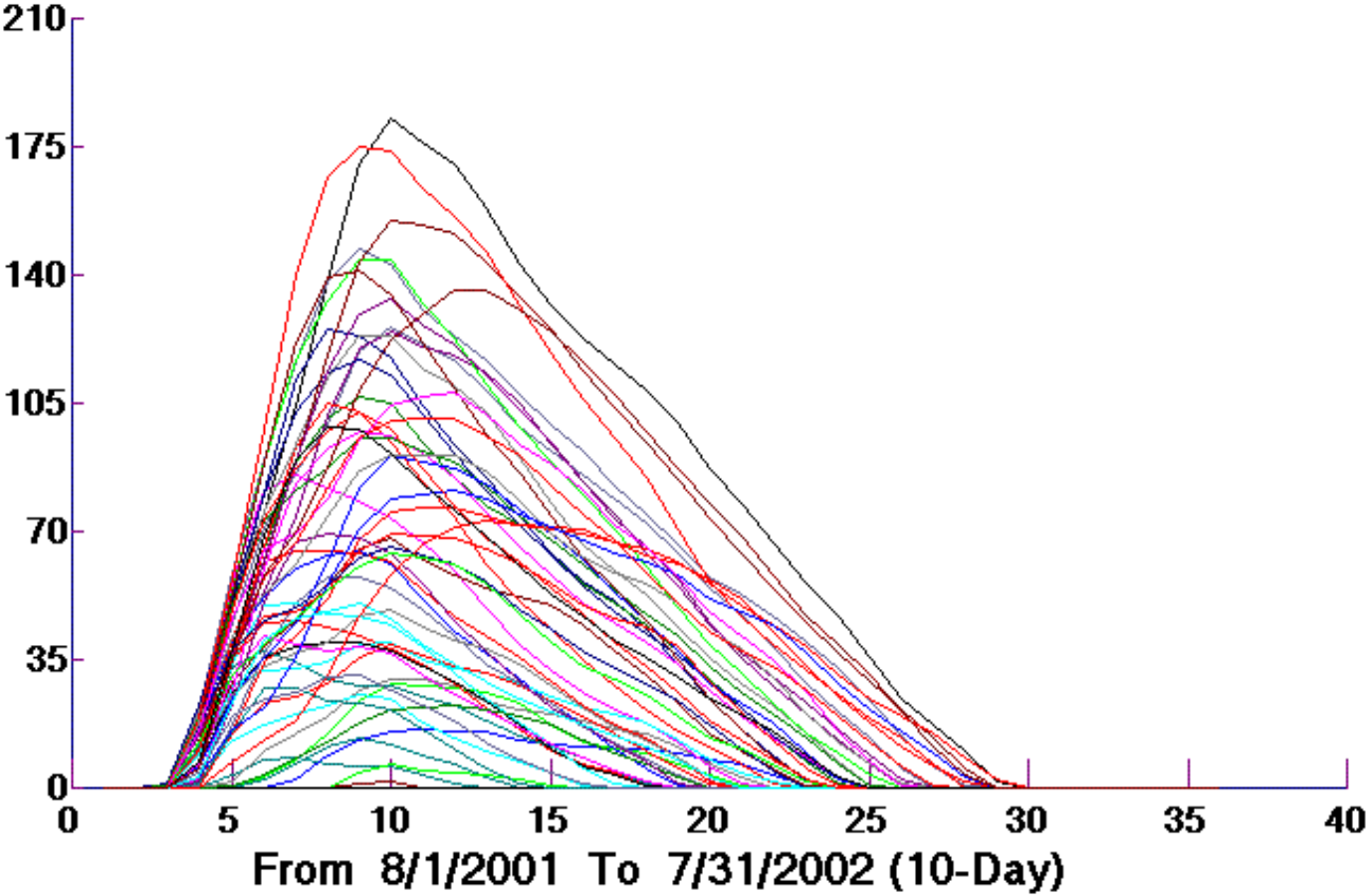
04/01/02-04/10/02

HAD Elevation Traces (m)



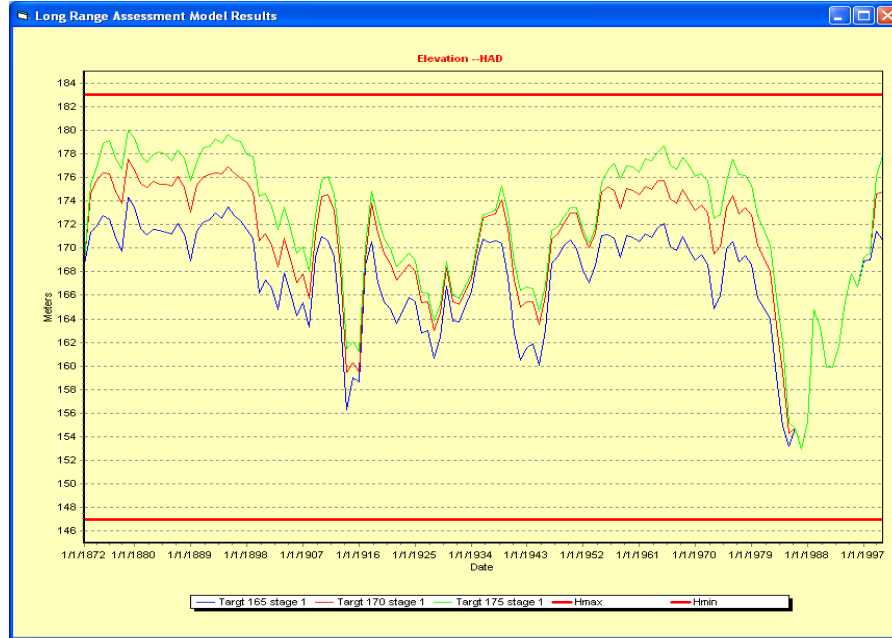
Case Study From the Flood Year 2001/2002

HAD Spillage Traces (mcm/day)

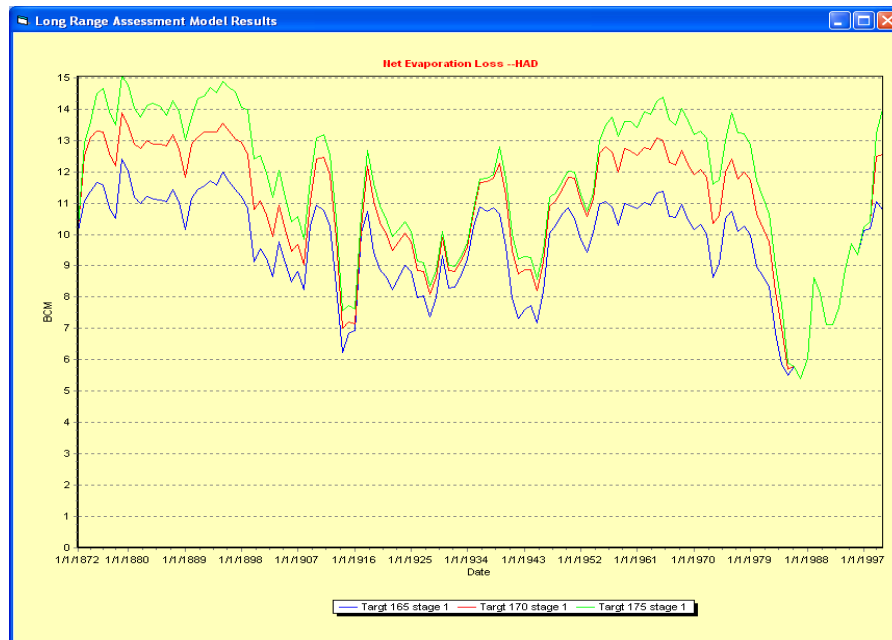


Case Study From the Flood Year 2001/2002

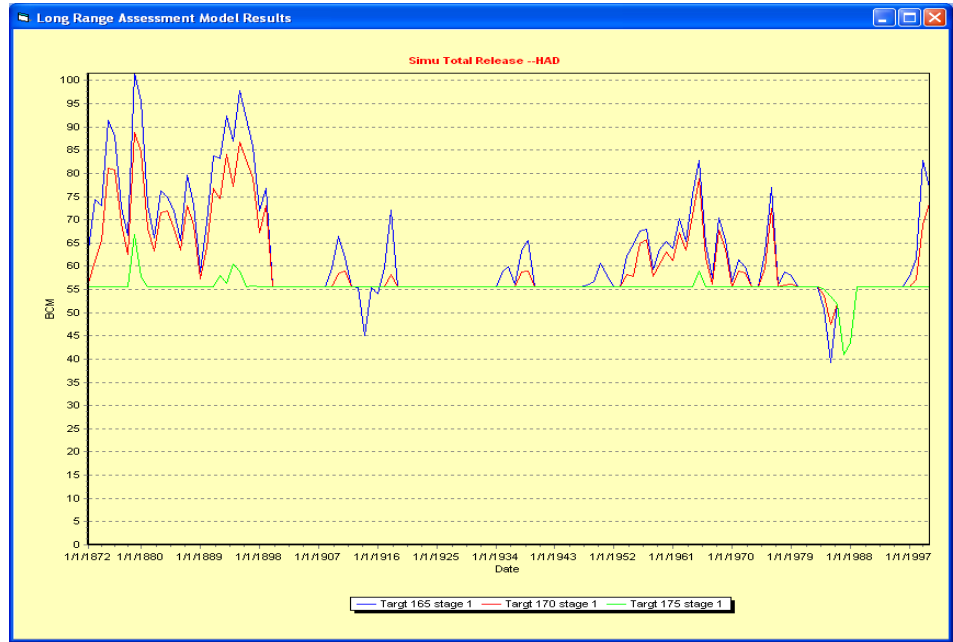
HAD Annual elevation
for the three policies



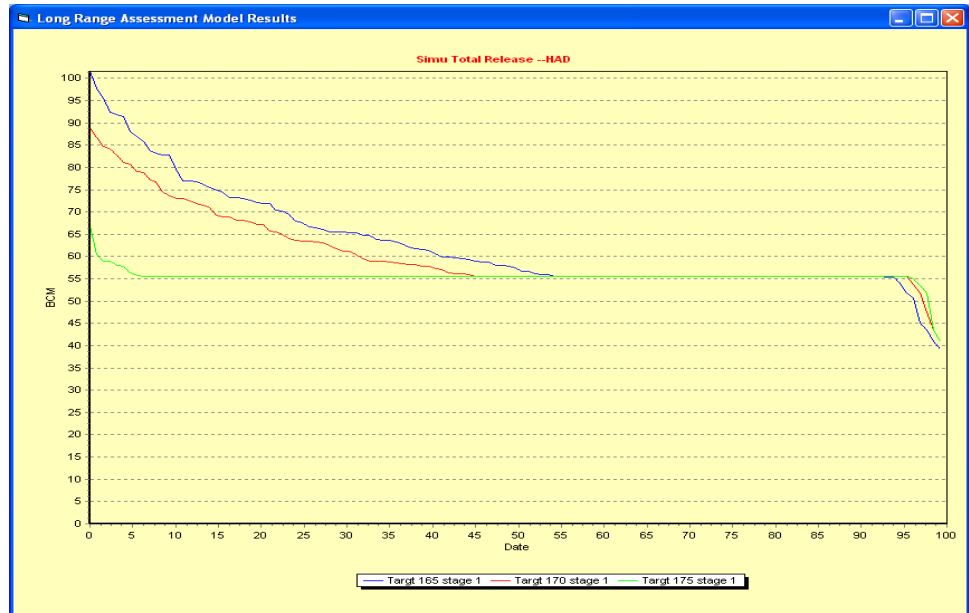
HAD Annual evaporation losses
for the three policies



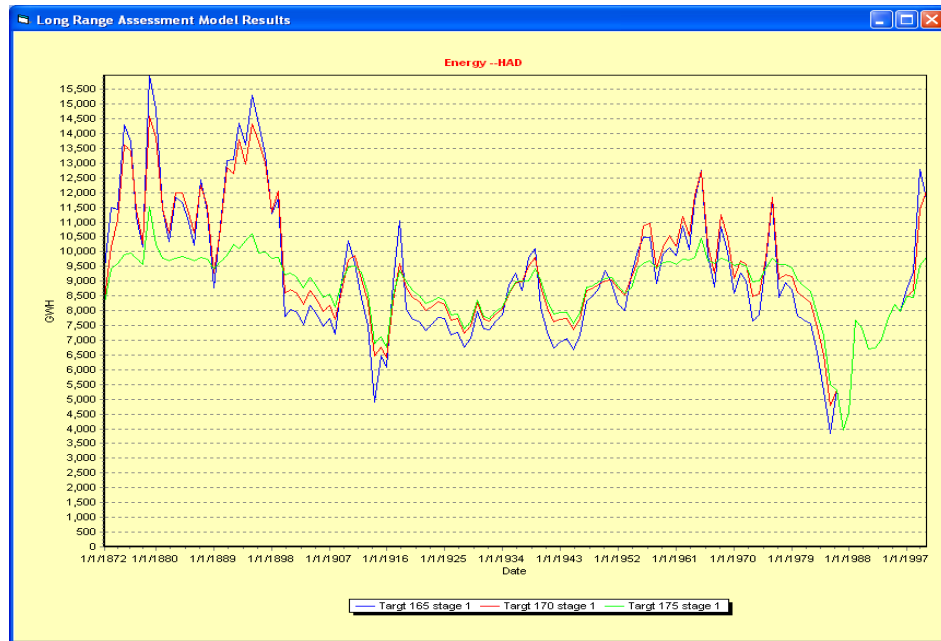
HAD Annual releases for the three policies



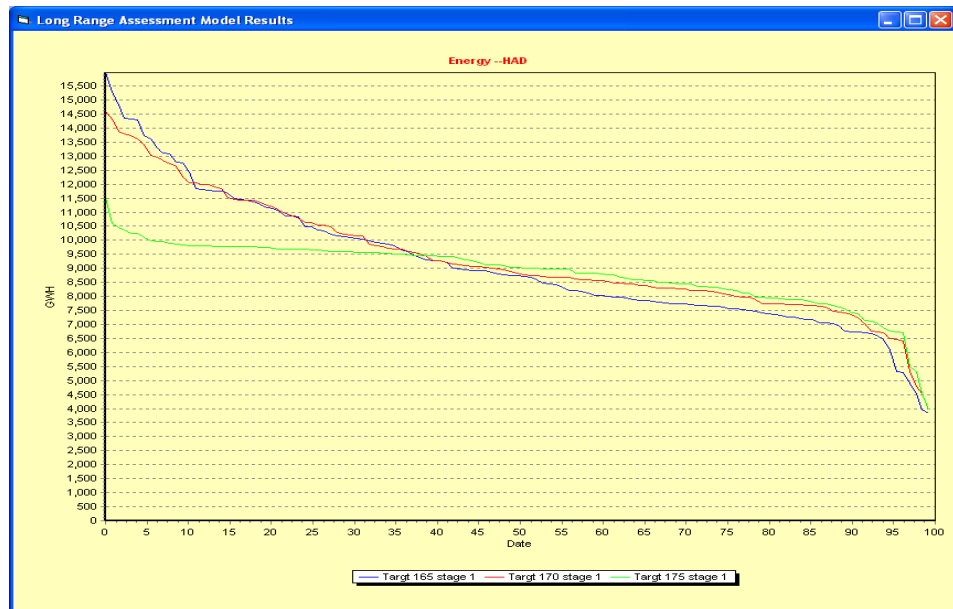
Prob. Of Exceed. For Annual releases for the three policies



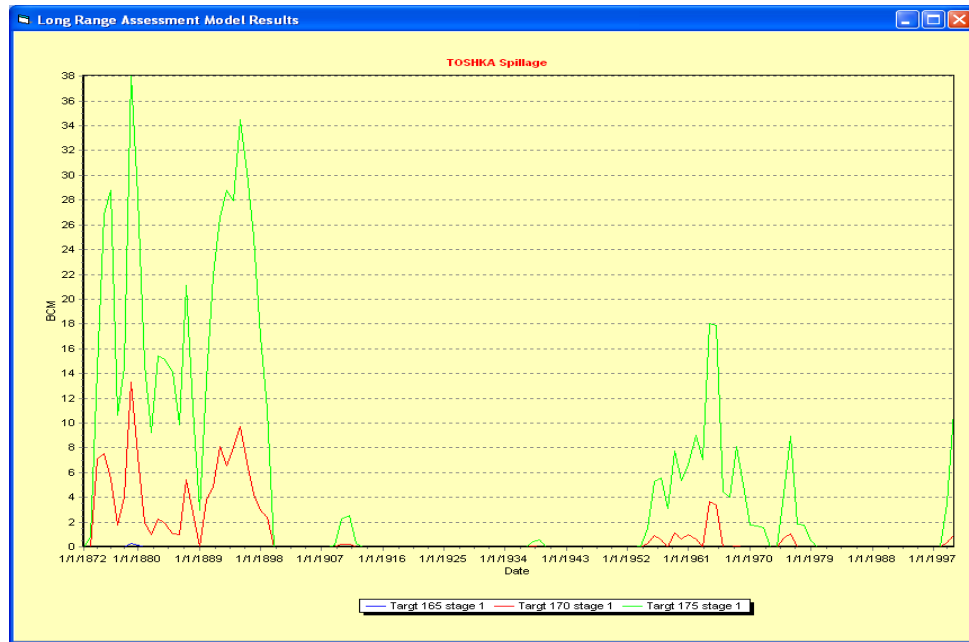
HAD Annual energy for the three policies



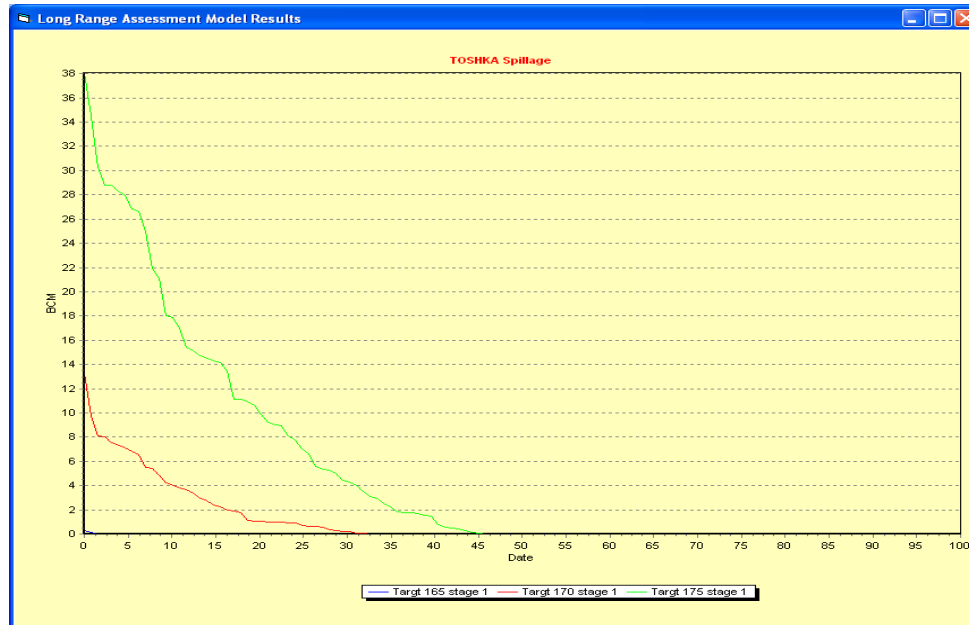
Prob. Of Exceed. for Annual energy for the three policies



HAD Annual spillages for the three policies



Prob. Of Exceed. for Annual spillages for the three policies



Conclusions

- DSS is essential tool to understand the underlying tradeoffs and formulate a shared vision management strategy.
- Capacity building is important for cooperation of the Nile basin countries.
- DSS tool development and capacity building are currently being pursued as part of NBI.