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Failure of the Mtera-Kidatu Reservoir System in the Early 1990s

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Outline of Presentation

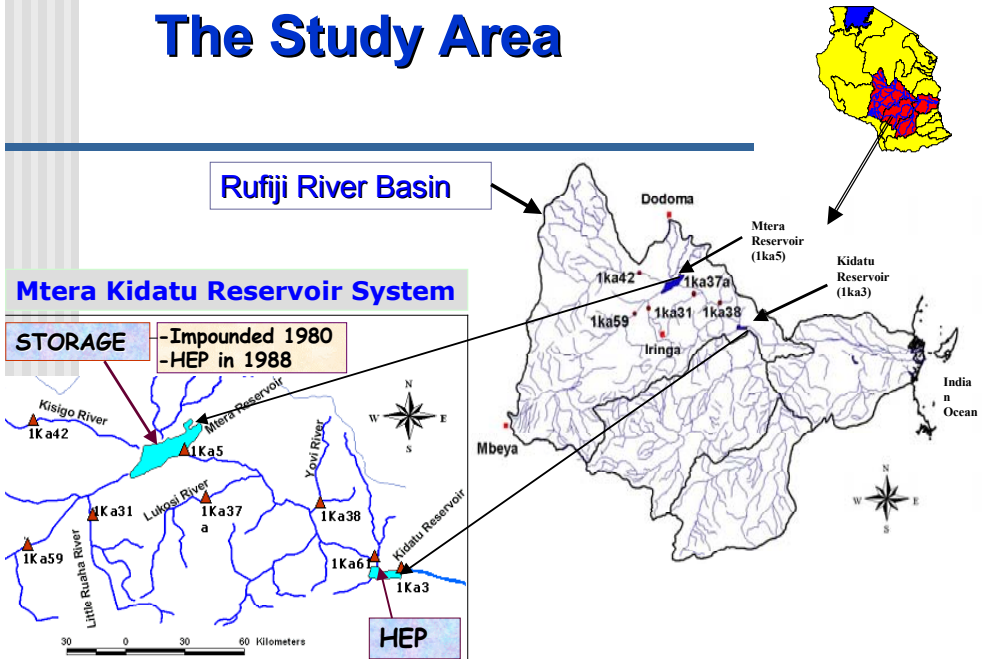
- Introduction
- The study area
- The Investigated Problem
- Results
- Conclusions

Introduction

- Hydro Electric Power (HEP) production is required for the national development & income, and requires proper reservoir regulations/operations management
- Improper management and followup of the operational rule of the reservoir releases leads to failure of the system, reduced generation and possible power cuts.
- There is a popular belief by major institutions that the failure of the Mtera-Kidatu reservoir system in the early 1990s was due to increased upstream water abstractions that caused water not to reach the Mtera Reservoir

→→ This has been proved wrong by this study..← ←

The Study Area



The Investigated Problem

The possible cause for the failure of the Mtera-Kidatu Reservoir System in early 1990s:

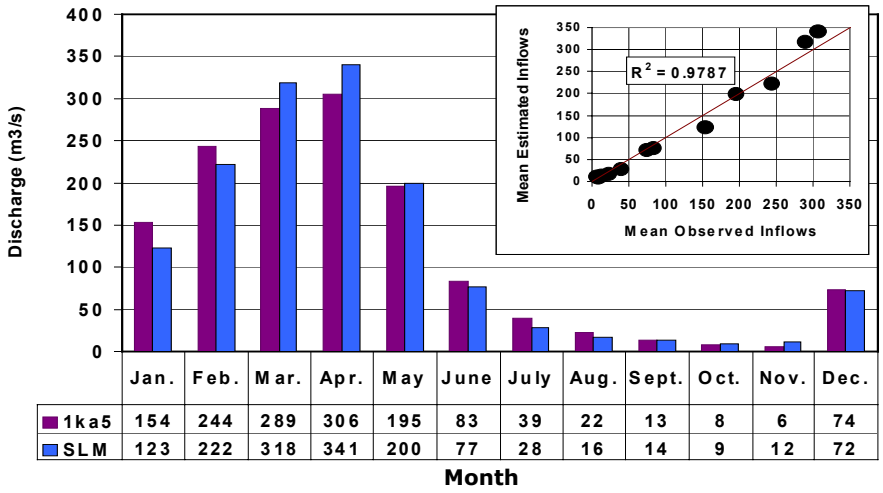
- Sudden decrease in inflows
- Sudden increase in losses
- Sudden increase in hydropower generation
- Unnecessary spill
- Combination of the above among others

Results of investigation

Causal effect studied	Results (the fact)
Decrease in inflows	▸ Not significant decrease (no statistical ↑ or ↓ in trend in the amount of annual rainfall within the catchment)
Increase in losses	▸ No significant increase in losses, Evaporation in agreement with design value, seepage & deep percolation not realised, no direct pumping withdrawals
Increase in hydropower generation	▸ No increase in HEP generation (Except the opposite - power rationing) ▸ No direct link btn. the 2 turbines installed at Mtera in 1988 and the failure…
Unnecessary spill for Mtera	▸ Singled out causal factor (Subjected to further investigation)

Results *(cont.)*

Comparison of Observed Mean Monthly Flows and Estimated Mean Monthly Flows by SLM at Mtera (1957-1979)

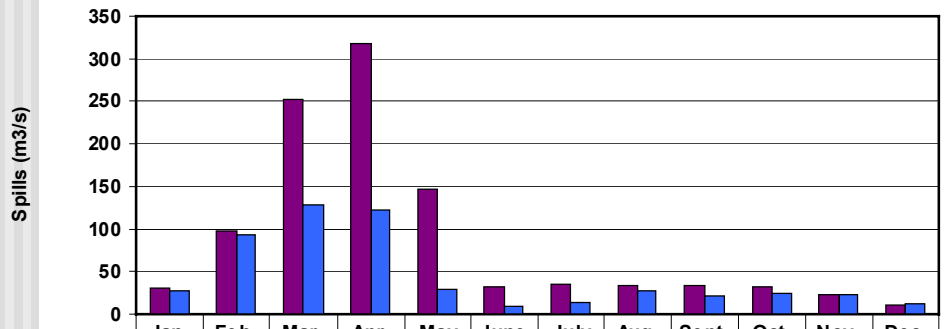


	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1ka5	154	244	289	306	195	83	39	22	13	8	6	74
SLM	123	222	318	341	200	77	28	16	14	9	12	72

Month

Simulation Model Results

Mean Monthly Simulated versus Historical Spills from the **Mtera Reservoir** (1983-1992)



	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Est.	29.9	97.1	251.6	317.7	147.4	32.5	34.4	33.8	33.7	32.3	23.6	10.6
Mean Obs.	27.9	93.6	128.9	122.5	29.8	8.9	14.1	27.0	21.7	24.0	22.7	12.0

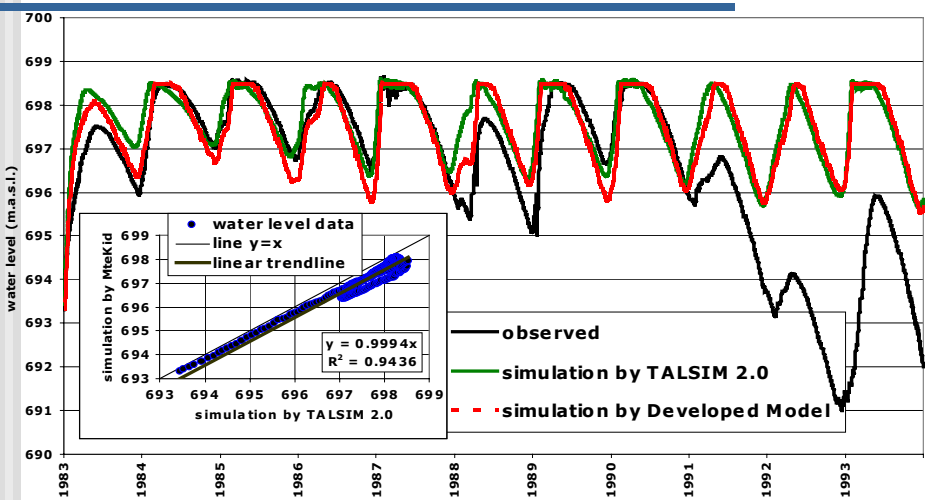
Month

Discharges and Spillage

	Mtera	Kidatu	Interv. Catch.
Expected flows at design (m^3/s)	126	166	41
Simulated flows (m^3/s)	122	171	48
Average releases (m^3/s)	61	93	*(Contribute about 15-40% of inflow to Kidatu)*
Average recorded outflow (Mm^3)	65	101	
Spillage			
Recorded spill in 1991 &1992 (Mm^3) at Kidatu	621 (1991)	353 (1992)	Account about 30% of the volume from Mtera

Simulation Model Results

Verification of the investigation using TASLIM 2.0 model



Conclusion

The study revealed that:

- Unaccounted/unnecessary spillage was identified to cause the failure of the system
- Mtera-Kidatu Reservoir System would not have failed if the flows that are generated in the intervening catchment (12,000k m^2) between Mtera and Kidatu were considered in the operational management of the Mtera-Kidatu Reservoir system

Acknowledgement

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