

Sedimentation and Operation Study of Upper Atbara and Setit Dams Complex

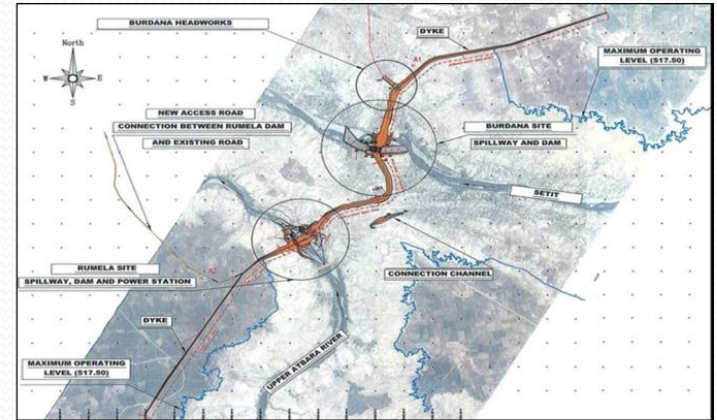
Deltares



The Hydraulics Research Station
محطة البحوث الهيدروليكية



UNESCO-IHE
Institute for Water Education



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The study area



Objectives of the Study

To develop an adequate sediment management strategy and an optimal set of reservoir operation rules for the Upper Atbara and Setit dams Complex.

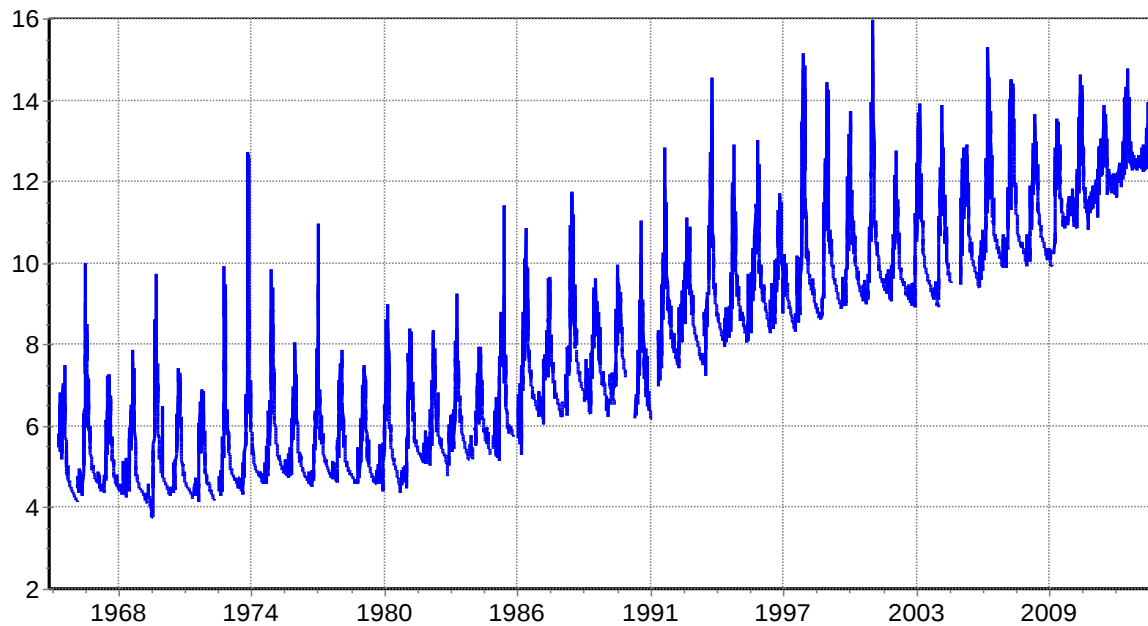




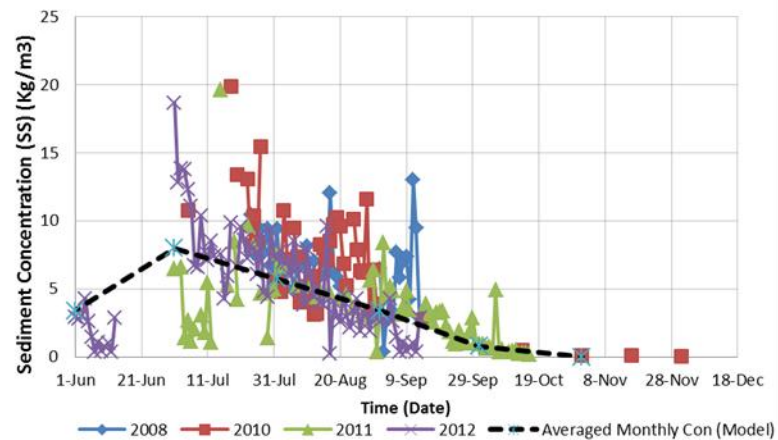
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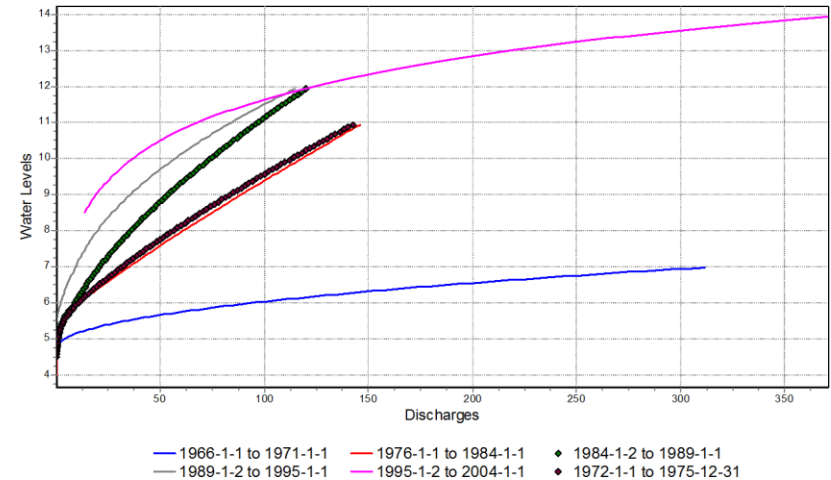
Data processing



Sediment Concentration of Setit River (Burdana Station)



Kubor: 1966 to 2002



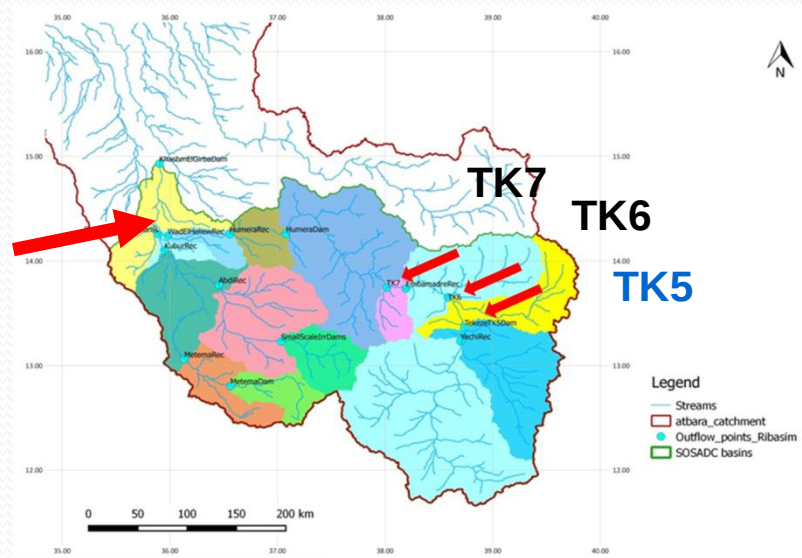


Results and Discussion

Impacts from TK dams

- Total area at KashmElGirba = 100000 Km²
- The area Upstream TK5: 31% of the total area / 30% of soil loss
- Annual total sediment inflow DCUA: - 11%
- Upstream TK7: 47% of area / 54% of soil loss
- Annual total sediment inflow DCUA: - 25%

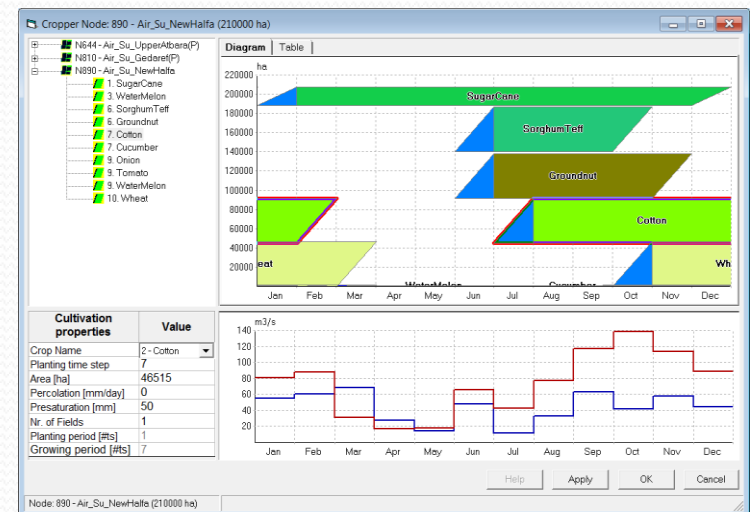
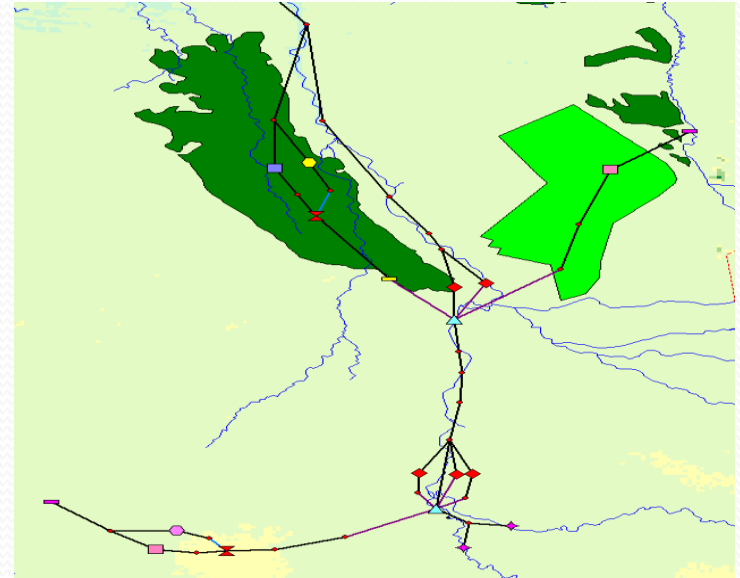
Atbara Dam Complex



Irrigation supply Reliability: New halfa Scheme

- Current around 70%
- With DCUA reservoir operation: goes up to 100% (No UAIP)
- Implementation of UAIP reduces irrigation reliabilities to:

- 95% (400,000 fd)
- 85% (800,000 fd)



impacts of irrigation on: firm energy reliability at KEG

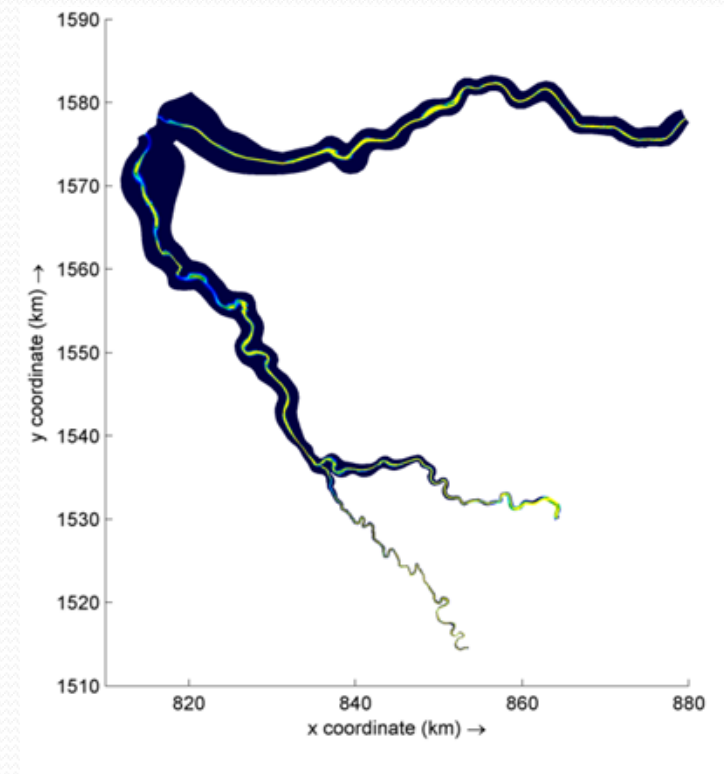
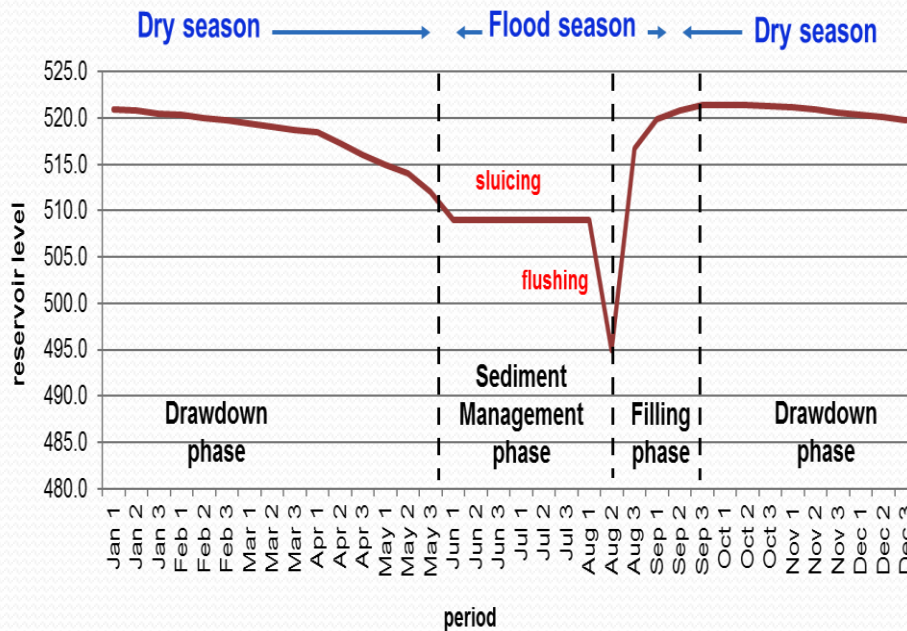
Firm energy	Irrigated area (fd)	
	500000	1300000
18 hr/day	100 %	90 %

Impacts of irrigation on: firm energy reliability at DCUA

Firm energy	Irrigated area (fd)		
	500000	900000	1300000
2 hr/day	100%	> 80%	60%
4 hr/day	80%	> 70%	55%
6 hr/day	60%	> 50%	50%
8 hr/day	50%	> 45%	45%

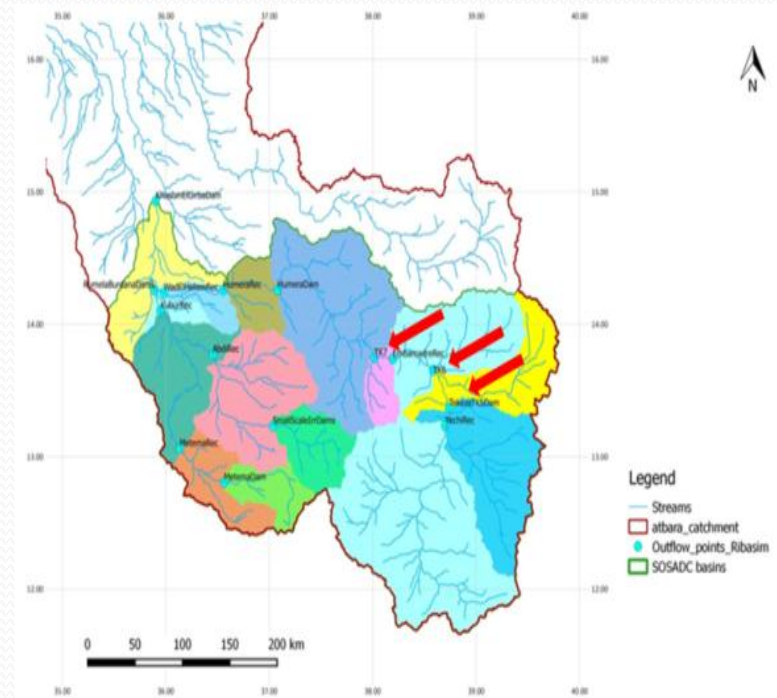
Sediment management

- limited impact on irrigation and firm energy reliability;
- 6-10 days after flushing: no energy generation at Rumela hydropower.



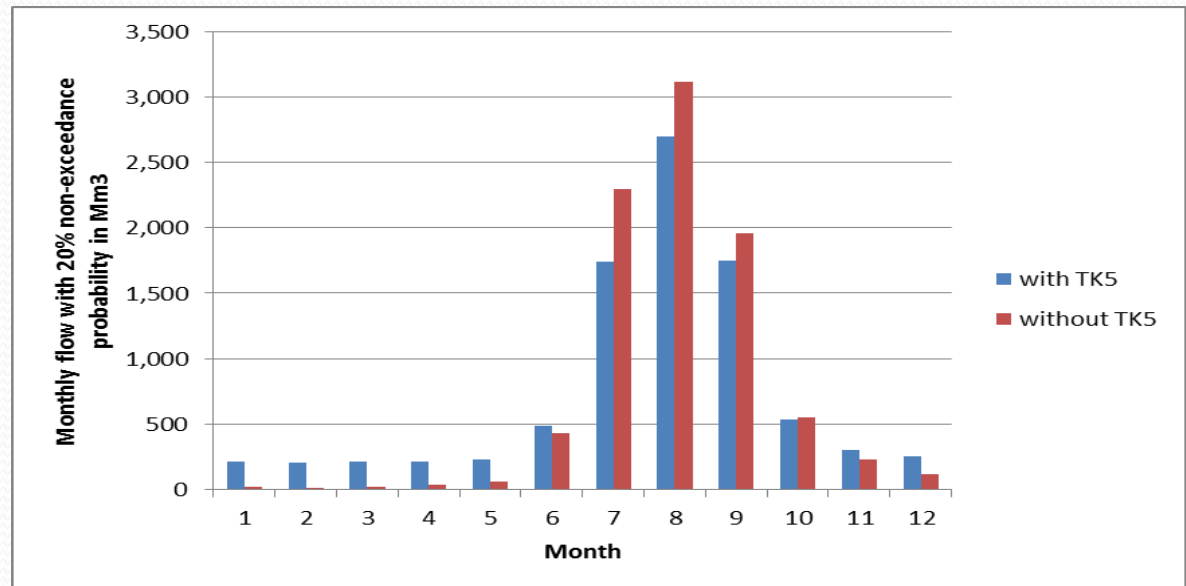
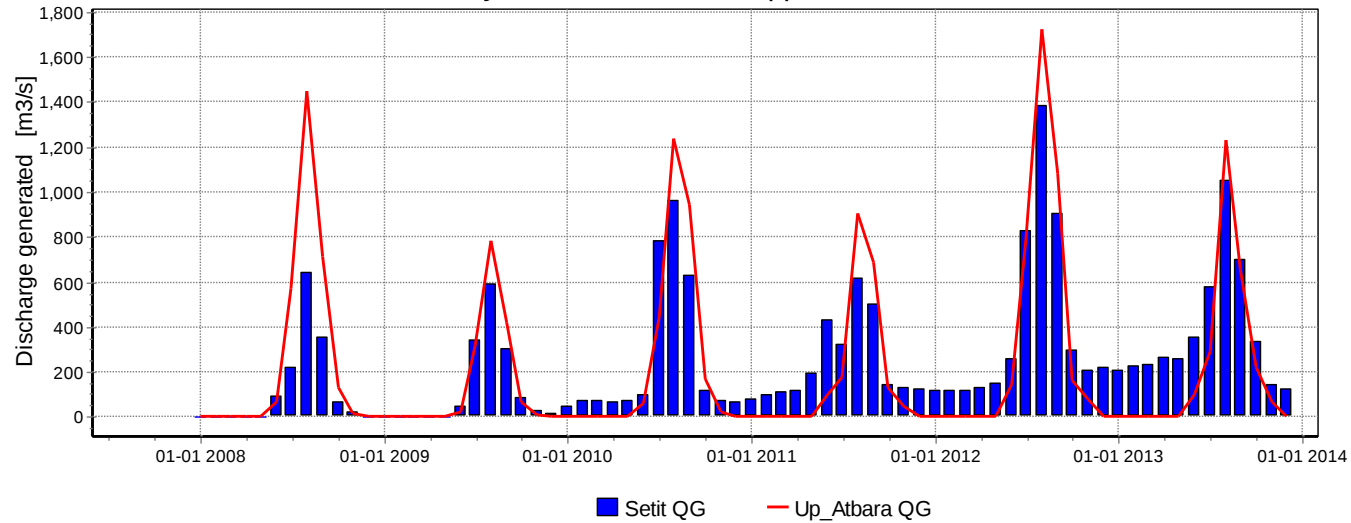
Impacts of upstream development: Build TK5 dam

- After the operation of TK5 dam:
 - Irrigation supply reliability:
increased by about 25%
 - Firm energy reliability:
increased by about 5-25%



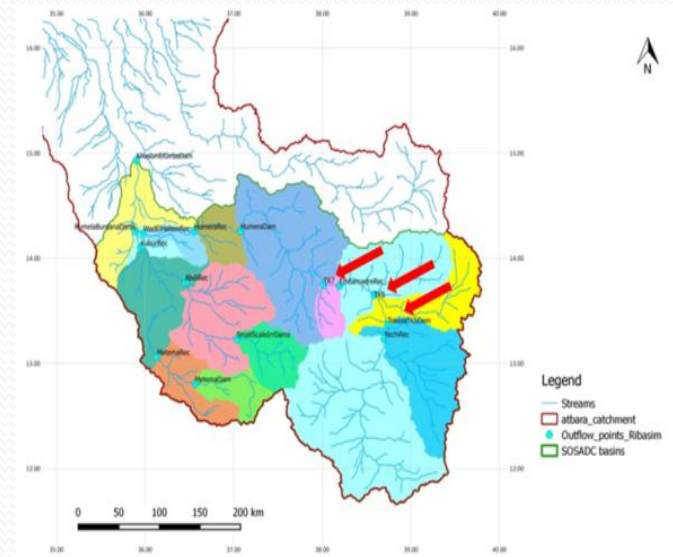
Impacts of TK5

Monthly flows of Setit and Upper Atbara



Increases in upstream water use by: 10-20%

- irrigation reliability falls from 95% to 80%
- firm energy generation reliability falls from 65% to 40% for ADC; and from 96% to 84% for KEG



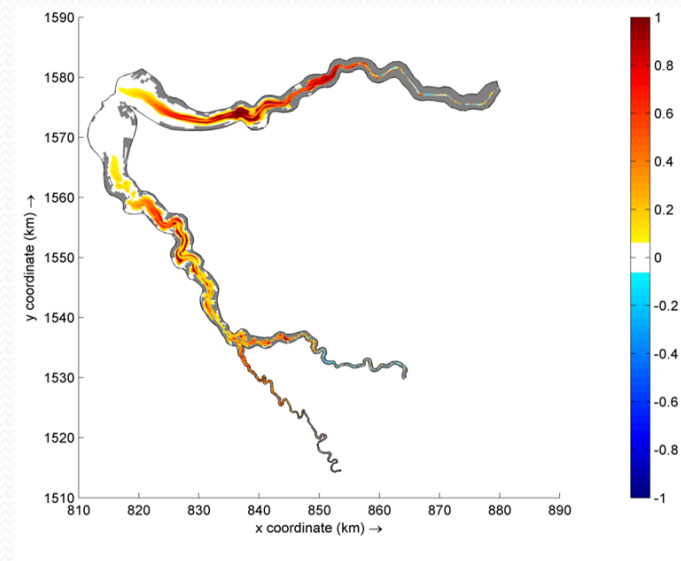
Loss of reservoir storage capacity

➤ Impact on irrigation reliability

- Storage reduction of DCUA to 85%, no UAIP: no impact
- Storage reduction of DCUA to 70% with UAIP: reduction to less than 70%
- Additional reduction of active storage of KED reservoir: no impact.

➤ Impact on firm power reliability

- Storage reduction of DCUA to 85%, no UAIP: 7% reduction to 75% (4 hr/day)
- Storage reduction of DCUA to 70%, with UAIP: 10% reduction to 50% (2 hr/day)



Conclusions

➤ Irrigation reliability

- Increase to **100**% for New Halfa Irrigation Scheme with DCUA
- Decrease again to **85**% with UAIP is developed (800,000 fd)

➤ Firm power generation reliability

- no UAIP and firm power requirement is 2-4 hr/day: > 80%
- With UAIP: << 80%

➤ **Impact of sediment management** on irrigation and hydropower generation reliability: very limited (1-2%)

Conclusions cont...

- Reduction in active storage of DCUA reservoir will result in **serious reductions** in irrigation and firm energy generation reliabilities;
- **Assuming active storage reduction of 30%;**
 - The irrigation supply reliability may reduce from 100 to 70% (with UAIP)
 - Firm energy reliability fall by 10-25% to very low values <<50%.
- **Given an annual storage reduction of 1-2.5%, a 30% reduction in active storage may occur within a period of 12-30 years (even with maximum sediment management).**



10/13/2014



THANK YOU