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A Stated Preference Modelling Approach for Eastern Nile Water Resources Management in Case of Conflicting Interests using RiverWare

Yilma Seleshi
Associate Professor of Water Resources Engineering
Addis Ababa University, Ethiopia (e-mail: yilmash@yahoo.com)

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In a transboundary river basin where there is <u>all inclusive water management/allocation agreement exists</u>, impacts assessment to a new project/dam can be determined in an orderly manner using existing scientific methods.

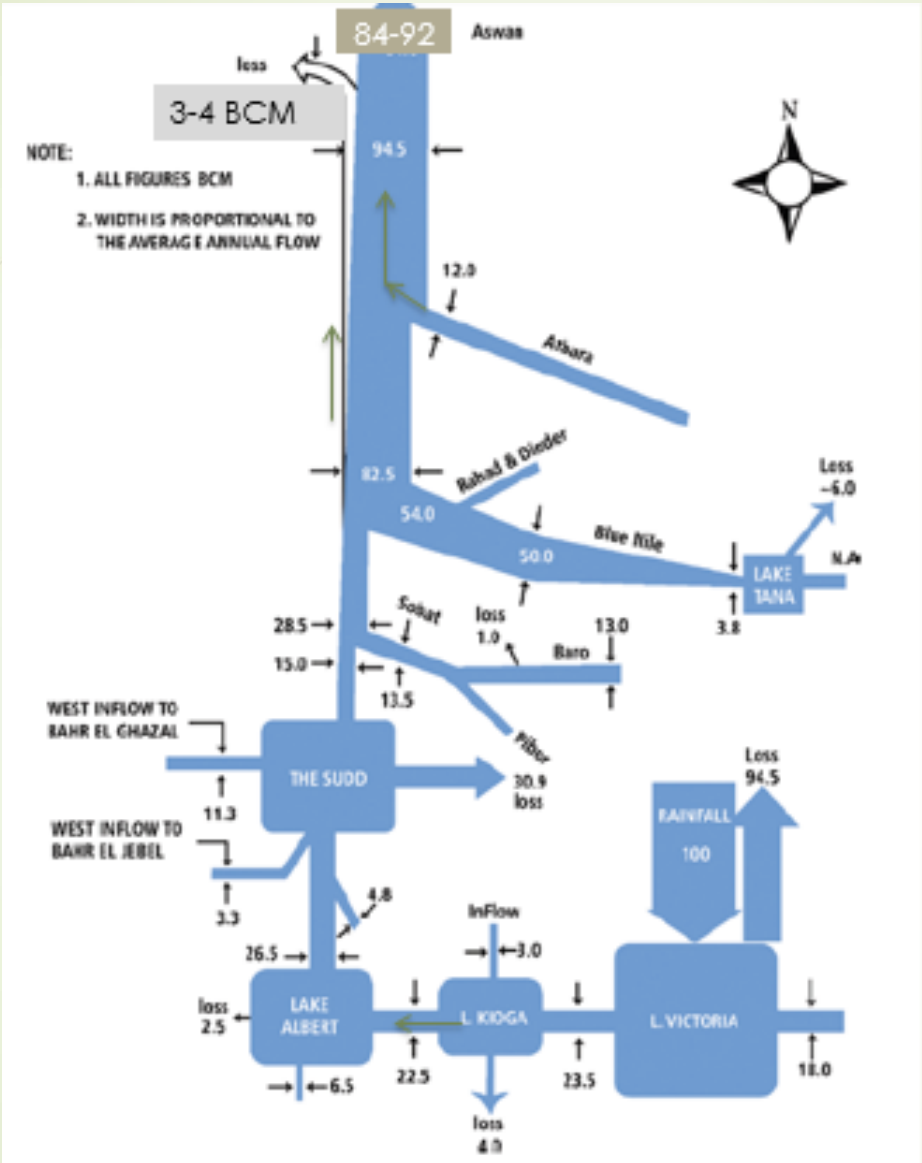
In such situation, the limiting factor could be the availability and quality of data to be used in the modeling, and capacity of models to reproduce the reality.

- River natural flows and losses (seepage/ overflooding, evaporation);
- Irrigated area, water applied and return flow;
- Estimate of various abstractions in including water supply;

A serious challenge, however, occurs where there is no all-inclusive water management/ allocation agreement exists as the case of the Nile river and the water resources is consumptively utilized to the limit.

NBI study presented in the 2017 NBDF forum in Kigali has revealed that the Nile river water resources is basically fully utilized mainly by irrigation and reservoir evaporation (about 14 BCM in Sudan and 72 BCM/year in Egypt including HAD 13 BCM/year evaporation)

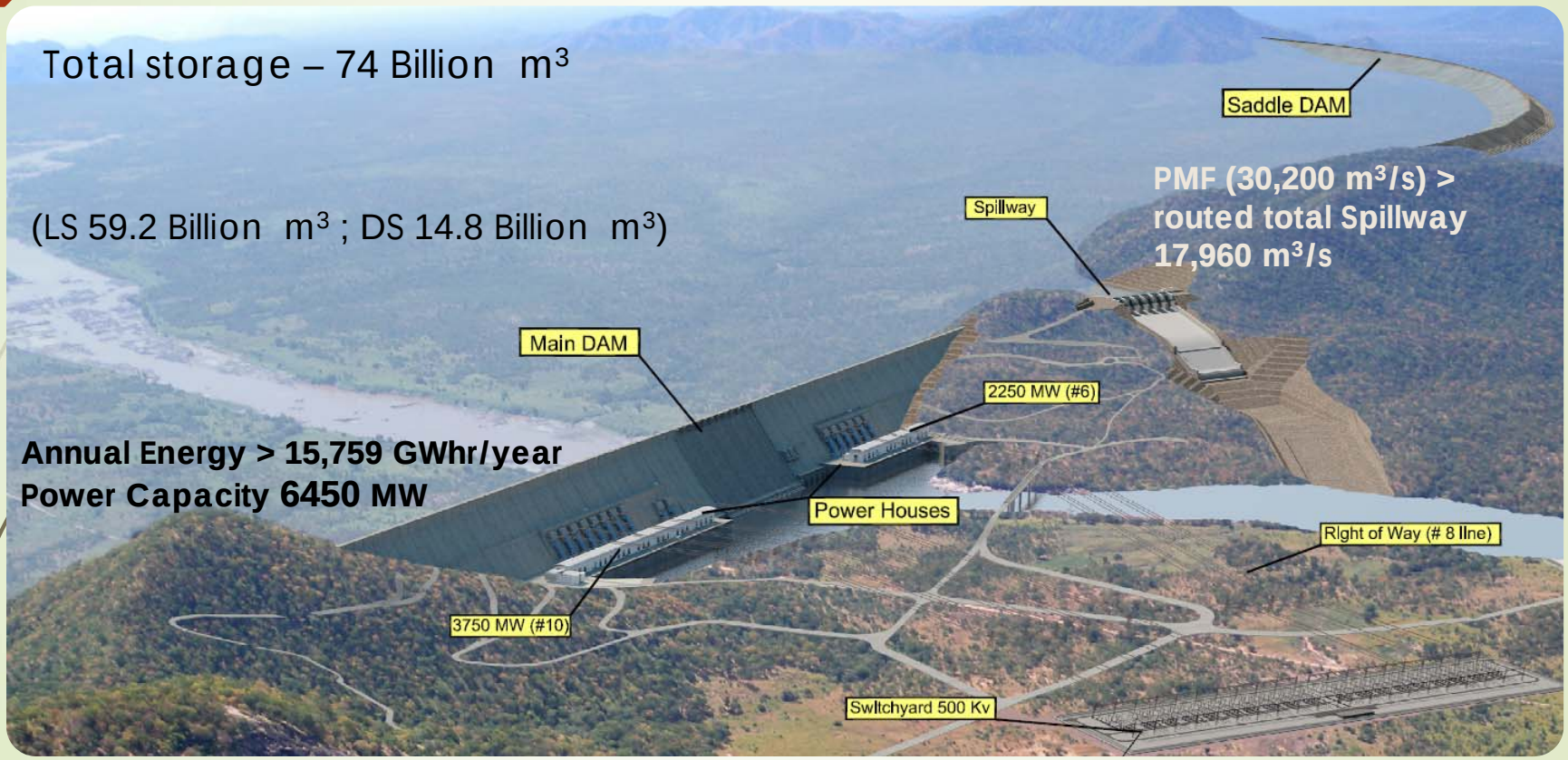
Nile river Water Resources



① **~86% of Nile flow is contributed by Ethiopia**

② 70% of Ethiopia annual river flows is generated in the Nile basin

Grand Ethiopian Renaissance Dam (GERD) - 2nd April 2011 – Construction Start



What are the challenges?

The number of years to fill the dam?

Impacts on the d/s countries during filling and norma operation?

Ethiopia invited Egypt and Sudan to look into these matters together-

What are the challenges:

1st Transboundary Environmental and Social Impact Studies (TESIA) requires baseline / reference case from which GERD impact is measured.

2nd to jointly fix the threshold level to determine if impact is significant or not (after agreeing first of reference case).

This paper proposes the use of a stated preference water resources modelling approach for Eastern Nile Water Resources Management in case of conflicting interests and no water allocation rules exist using RiverWare.

Step	SP Modeling Components	
1. Natural case	**Modelling (calibrating and simulation) Nile system on the natural flow condition (no development) case.**	RiverWare software technically and on transparent way can be constructed to do these tasks.
2. SP Reference Scenarios creation	**Construct water simulation models on the 3 SP Reference Scenario cases suggested by (allows us to moving away from statuesque):** **Ethiopia** | **Sudan** | **Egypt** **water utilization level of Ethiopia / Sudan / Egypt during filling and steady operation. Each country can present their "equitable and reasonable water allocation" cases to form as part of the reference scenario. In such arrangement it is possible to estimate retroactively the benefit /losses would have been accumulated to the three countries by comparing to the "current" level of utilization.**	
3. Quantify baseline impact indicators	**Assess water quantity and its hydrograph, water quality leaving at each country borders, hydropower generated, reservoir water level variations in each country for the three SP Reference Scenario cases.**	
4. Quantify impacts	**Assess the impact of GERD (changes occurring) on the three SP Reference Scenarios case during filling and steady operation. This will give at least six complete impact outcomes (for selected filling and operation plans).**	
5. Find win-win solutions to be presented to the decision makers	Produce matrix of SPs and impacts. Define countries SP for fixing the threshold of significant harm. Look into the possibilities of a win-win solution at EN system operation while GERD is filled and start long-term operation. This process may allow the three countries to collaboratively find middle ground to partly satisfy their needs and interests.	


Thank You