Nile Cooperation for Results Project (NCORE/CIWA-AF2)

**Dam Safety Awareness Workshop for Policy Makers**

and High-Level Officials
10-11 January 2019
(Bishoftu/Debrezeit, Ethiopia)

**Dam safety in Eastern Nile**

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Workshop Objectives
➢ To enhance awareness on basic dam safety concepts;
➢ To inform the causes of the recent dam failure incidents around the world with mitigation measures *(what do we learn from these incidents?)*;
➢ To provide an overview of standard dam safety management and the role of high level officials, regulators and dm owners;
➢ To provide basic concepts of communication in dam safety management;
➢ To create a discussion form among high level officials for further development of cooperation to ensure the safety of dams in the Eastern Nile. *(capacity building, regulatory framework, etc..)*;
➢ To update the progress on Eastern Nile dam safety management.
“GERD to collapse within years” Al-Masry Al-Youm (AMAY), November 1, 2018

Ex-head of the Water Resources Research Center and international dam expert, Ahmed Al-Shennawi, has predicted the collapse of the Grand Ethiopian Renaissance Dam (GERD) after a few years of its operation.

“The dam was built on active earth cracks, meaning the area is prone to constant earthquakes; one of those will definitely lead to the collapse of the entire building.”

What is the historical record of seismicity in the GERD project area? How susceptible is RCC Dam for seismic action?
Eastern Nile Dam
Safety Management
Background
The Nile Basin

11 countries:
- Burundi,
- D.R. Congo,
- Egypt,
- (Eritrea),
- Ethiopia,
- Kenya,
- Rwanda,
- South Sudan,
- Sudan,
- Tanzania,
- Uganda
Centers of NBI

- Eastern Nile Technical Regional Office (ENTRO), Addis Ababa, Ethiopia
- Nile Sec, Entebbe, Uganda
- NELSAP CU, Kigali, Rwanda
The Eastern Nile Sub basin

Four countries
- Egypt,
- Ethiopia,
- South Sudan and
- Sudan

Tributaries/sub basins
- Abay/Blue Nile
- Baro-Akobo-Sobat
- Tekeze-Atabara-Setit
- Main Nile
The earliest recorded dam (first dam in history): On the Nile River at Kosheish, Egypt where a 15-metre high masonry structure was built about 2900 BC for domestic water supply.

At present, the Eastern Nile countries host more than 30 large dams with a combined total storage capacity of more than 250BM$^3$ (> 25 % of African existing dams storage capacity)
Dams in Eastern Nile

- These dams have multipurpose benefits and some of them provide flood protection for more than 150 million people; serve about 6 million hectares of irrigated land; generate 5,000 MW(+6450 MW – GERD) of electricity; and are major sources of domestic water supply.

- Most of these dams are composite (embankment + concrete) type and some of them have served for more than 50 years.
Some Existing and Under construction Dams

I. **Aswan High Dam**, the second largest storage capacity in Africa (162Bm^3), Egypt

II. **Merowe Dam**, 67 m high Composite dam (Embankment and Concrete) (1250MW power generation capacity, Sudan)

III. The highest (188m) concrete arch dam in Africa (Tekeze dam, 300MW, Ethiopia)

IV. 145m high RCC **Grand Ethiopian Renaissance Dam (GERD)**, under construction (6450MW)
Why Dam Safety matters?
Why Dam Safety matters?

Dam safety is concerned with two closely related but different aspects:

I. **The safety of the dam itself, appurtenant structures and the service it delivers (flood control, power, irrigation, drinking water supply, etc) and;**

II. **The safety of the population, property & the environment in the vicinity of or downstream of the dam**

Therefore, the main objective of a dam safety program is to ensure that dams perform as intended and do not pose unacceptable risks to public safety, property, and the environment.
Why Dam Safety matters?

Safe functioning of dams is not only determined by their original design and construction.

As knowledge of hydrology, seismicity, geological environment and technology advances, a dam once regarded as safe may not be safe for its service life.
Why Dam Safety matters?

Dam failure may be caused by a number of factors including inadequate spillway capacity, seismic events, design error, inadequate quality control during construction, internal erosion, foundation instability, poor maintenance, human error, etc.

Any single dam failure in a trans-boundary river would entail more than economic damage, and way further complicate regional security;
A dam safety program was initiated in Eastern Nile in 2013.

**Objective:**

*To enhance the capabilities and skills of Eastern Nile Regulators, planners, designers, dam owners, operators, etc. in design, construction, operation, maintenance and overall safety of dams.*

As part of the program, the first two key activities were:

- A comprehensive review of existing *policy, legal, institutional framework and technical arrangements*, and comparisons with international *best practice* and state of the art within and outside the continent;
- Based on the assessment, prepare a Road map which shall include a recommended *approach, process, time schedule, and implementation modalities* and arrangements for preparation.
Why Dam Safety matters?

The situation assessment had identified the following key issues:

- Growing number of large dams; Some of them are aged dams (do not meet the current state of practice and knowledge); More understanding of causes of dam failure, which was not fully understood before 30-40 years ago (e.g. Seismic activity, flood hydrology);

- Inadequate human (very critical) and institutional capacity (no responsible entity at national and regional level);

- Lack of trans-boundary dam safety management coordinated mechanism: over 150 Million people in major urban centre along the Nile corridor.
Why Dam Safety matters?

- More development and expansion of urbanization d/s of dams, which were not available during the construction period.

- Neither regional nor national guidelines and dam safely regulatory framework are available. Practicing different guidelines and standards (E.g. Spillway design flood);

- Uncertainty of climate change on the operation and safety of dams;
Why Dam Safety matters?

➤ The Road Map
Put a recommendation and implementation arrangement:

➤ To establish “National Dam Safety Units” to be established as the regulators within existing government ministries specifically dealing with dam safety
➤ To establish an overarching “Regional Dam Safety Unit” to provide leadership and coordination of the dam safety management program;
➤ To develop and implement dam safety regulations specifically dealing with dam safety with the force of law in each country; and
➤ To enhance the technical and management capacity of the institutions as well as key stakeholders responsible for planning, design, construction, operation and safety management of dams.
Training workshops were conducted and more than 250 professionals had been trained in various dam safety related topics.

Participants:
- Parliamentarians, Regulators, dam owners, dam operators, consultants, experts, young professionals, university staffs, civil societies, Journalists, etc.

Outside of the Eastern Nile countries
Exercising PFMA at Koga dam, Ethiopia

The training program encompassed practical exercise of dam safety assessment in one of the Eastern Nile dam, Koga dam, Ethiopia. Similar assessments were done on Tekeze, Fincha, Neshe, Koka (Ethiopia), Rosseiries and Sennar Dam (Sudan)
TRAINING

Dam safety inspection and monitoring, Sennar Dam, Sudan

Instrumentation and surveillance, upper Atbara, Sudan
INTERNSHIP PROGRAM

Involved graduate (Masters, PhD) students, post-doctoral researchers from academic institutions as well as young staff in Ministries (Water, Irrigation and Electricity) across the Eastern Nile countries.

A total of 15 young professionals engaged in the training program
GUIDELINES AND TRAINING MODULES

The three countries are now established a dam safety unit at national level (regional coordinator at ENTRO is also appointed);

Regional dam safety regulatory framework is at draft level.
Awareness Workshop for Policy Makers and High-Level Officials

Workshop # 7 Report
4 to 5 December 2014
Adama, Ethiopia
ICOLD General Assembly (2016)

Agenda No. 13.1.2, (Update the Terms of Reference of Committee on Dam Safety) intended to develop “‘Development of a dam safety regulatory framework” and “Development of generic dam safety guidelines”. ENTRO’s guidelines and framework as a basis for the development ICOLD bulletins.
ICOLD-2017 and 2018, discussion on the draft bulletins, Committee on Dam Safety meeting, Prague, 2017 and Vienna 2018

The final draft bulletin is ready and will be submitted to ICOLD-CDS soon