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MINISTRY OF WATER AND ENERGY  
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XVIII  
World Water Congress  
International Water Resources Association (IWRA)  
Beijing, China | September 11-15, 2023

# 第 18 届世界水资源大会

水与万物：人与自然和谐共生

中国·北京 | 2023 年 9 月 11-15 日

三号通知

## Green Energy (Hydro Power) in Ethiopia

### By Shiferaw Demisei

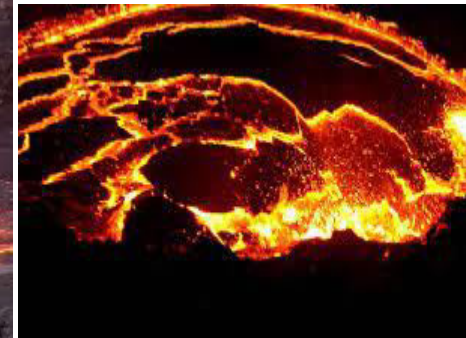
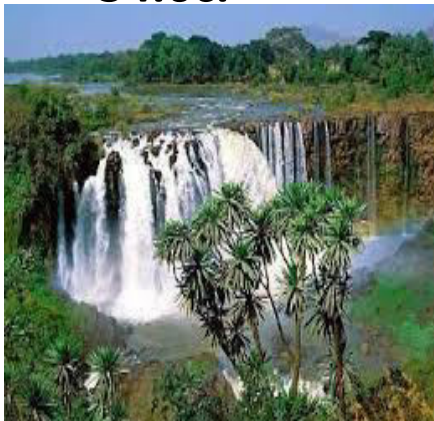
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# 1. Overview of Ethiopia

- **Population** – about 120 million (second most populous nation next to Nigeria)
- **Economy** - Fastest growing economy in the region, with 6.3% growth
- Ethiopia aims to reach lower-middle-income status by 2025.
- **Climate** - diverse climate and landscape.
- Ranging from **equatorial rainforest with high rainfall and humidity** in the south and southwest, to the **Afro-Alpine** on the the Simien and Bale Mountains, to **desert-like conditions** in the north-east (**Denakil Depression**), east and south-east lowlands.
- Topography Ethiopia is a land of wonder and attraction, a land of contrasts and surprises, of remote and wild places.
- There are 25 mountains whose picks rise over 4000 metres and the hottest place in the world Dalol is found in Ethiopia with an average temperature of 34.6c.



# 1. Overview of Ethiopia....

- Economy & Currency The local currency is the Ethiopian birr (ETB), made up of 100 cents.
- Recently, Ethiopia has had a fast-growing annual GDP and it was the fastest-growing non-oil-dependent African nation.
- Agriculture accounts for almost 41% of the (GDP), 80% of exports, and 80% of the labour force.
- Products Ethiopia exports to the world market include coffee, pulses, cereals, cut flowers and vegetables, gold, leather products, and oilseeds



# 1. Overview of Ethiopia....

- Ethiopia has it's own Calendar, Time & Alphabets,
  - Julian calendar consisting of 12 months of 30 days each and a 13th month of 5 or 6 days, making Ethiopia 7 and half years behind the Gregorian Calendar.
  - Ethiopians celebrate the New Year on the 11th of September Ethiopia is in the GMT +3 hours time zone.
  - The sun dictates the Ethiopian time, when you get up early in the morning you start by counting one and you end up at twelve when the day ends, and start counting again from one when the night begins and end at twelve o'clock just before the sun rises in the morning.
  - The Ethiopian midday and midnight is six o'clock.

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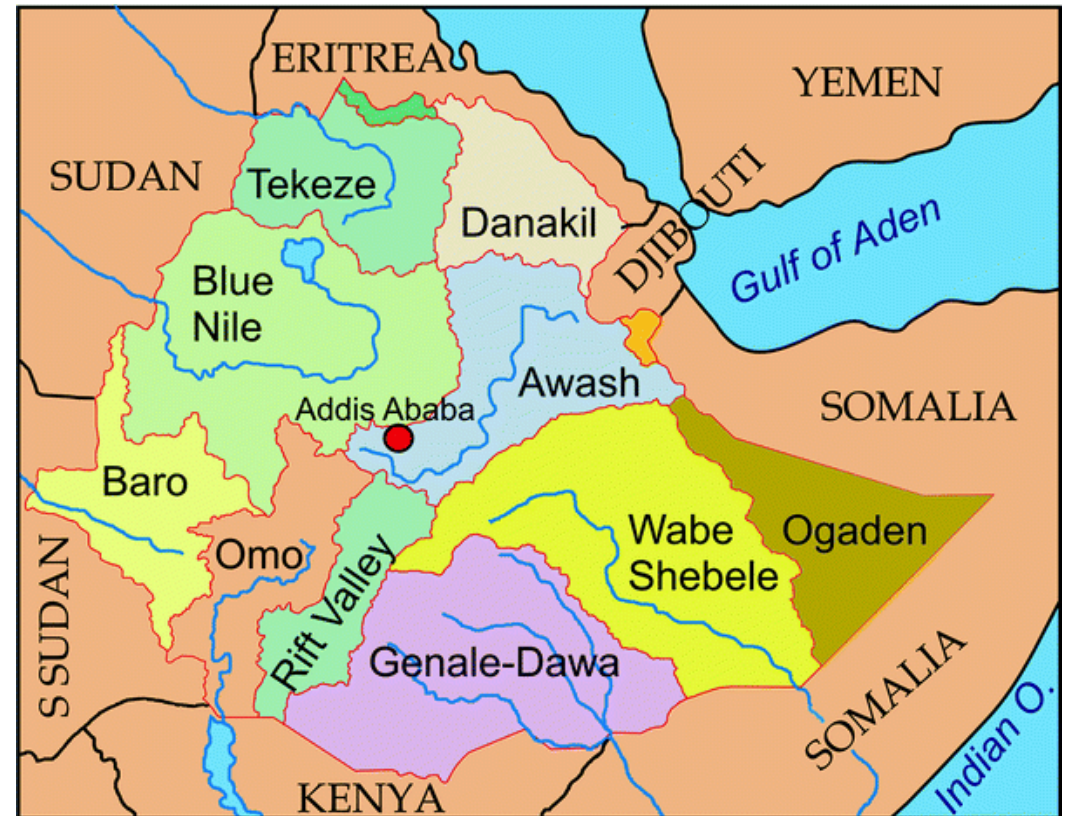
# 1. Overview of Ethiopia....

- Tourism Ethiopia has earned the distinction of having the most UNESCO World Heritage sites in the world – ten in total.
- New tourism attraction sites are in development (Addis (unity park, Friendship square - developed by Chinese gov't support, Entoto), Goregora, Wenchi, Koyesha...)



## 2. Energy situation of Ethiopia

- The Ethiopian Highlands are Africa's largest continuous mountain range.
- Ethiopia is often referred to as the “water tower” of Africa because of its abundant water resources, the greatest in the whole of Africa.
- More than 30 rivers originate in the Great Plateau, 14 major rivers pour off the high tableland.
- It also has the greatest water reserves in Africa.
- Among the numerous lakes, Lake Tana in the north is the source of the Blue Nile.

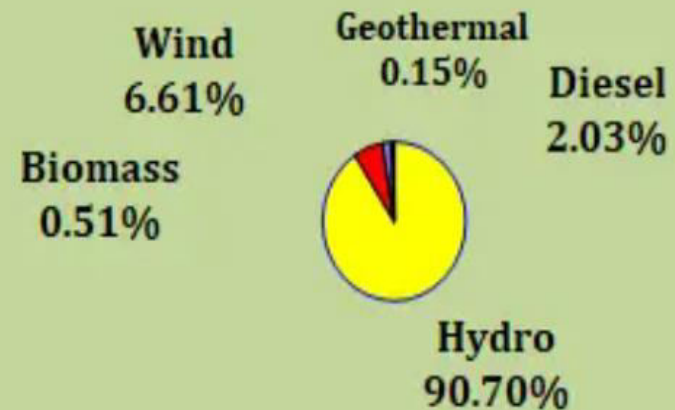




## 2. Energy situation .....

- Currently, EEP producing 5273.77 MW of power by managing 22 power generating stations.
  - Among them, 16 are from hydro, generate a total of 4818.2 MW from hydro, from wind 324 MW, Geothermal 7.3 MW, from Diesel 99.7 MW and from Biomass 25 MW
- Already supplying power to the neighboring countries of Djibouti and Sudan, Ethiopia has further ambitious plans to connect East Africa with Southern Africa via a powerful transmission line.
- The first step is a 500 kV transmission line to Kenya and further agreements with Somali have been signed and negotiations with Tanzania completed.


**SHARE OF INSTALLED CAPACITY BY SOURCE**

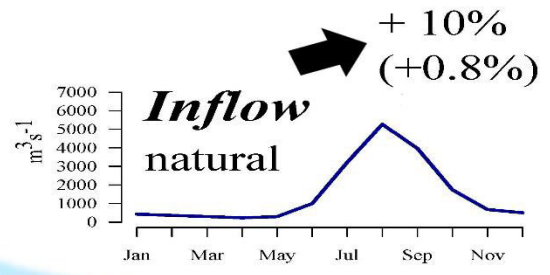
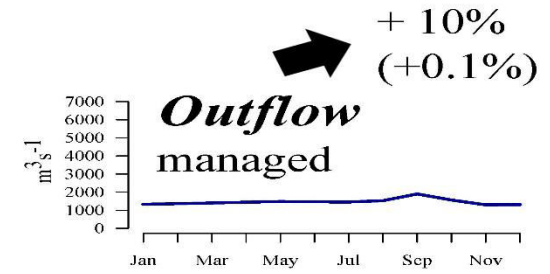
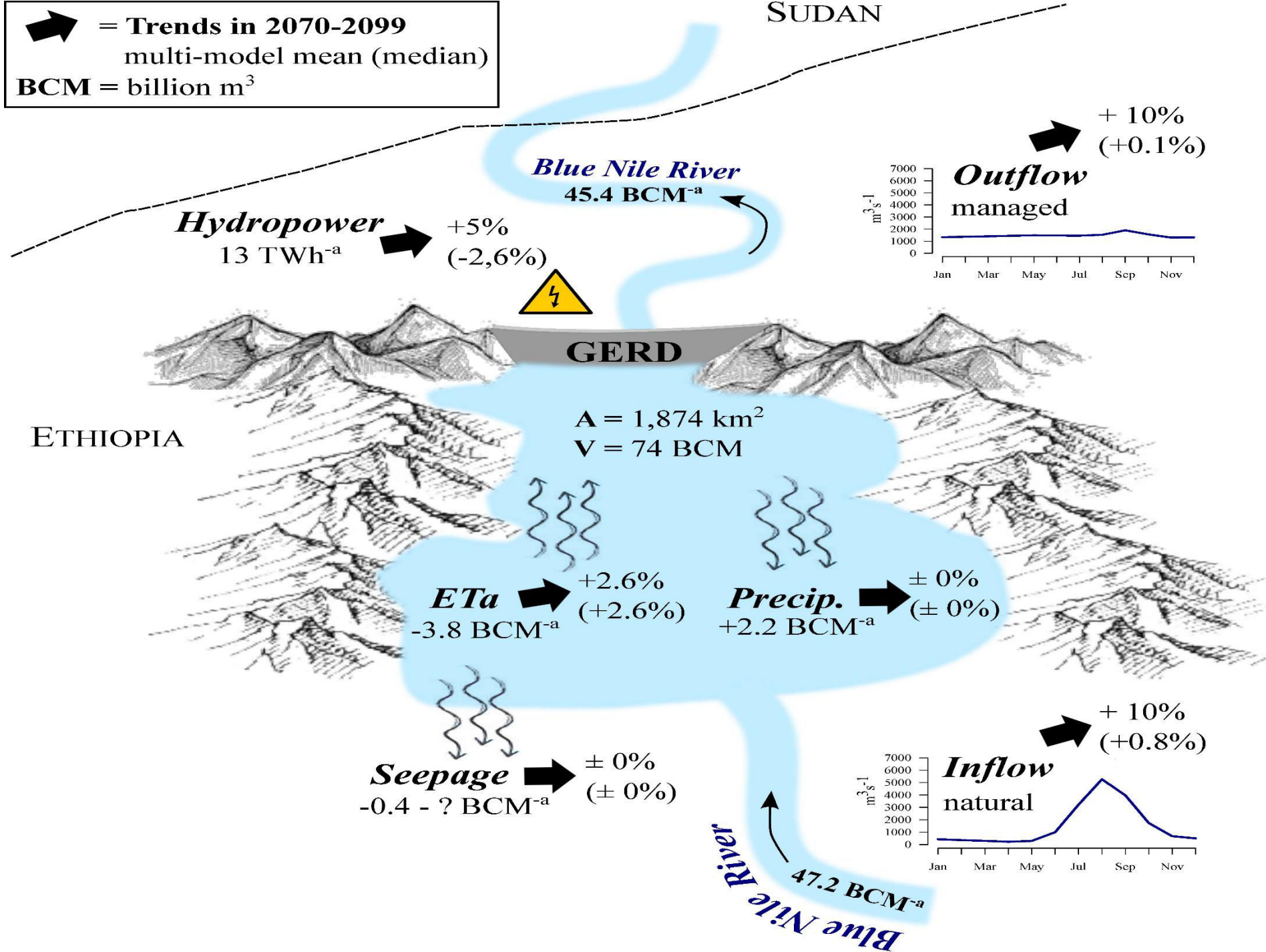




### 3. The Grand Ethiopian Renaissance Dam (GERD)

- **LOCATION – West Ethiopia, Benishangul-Gumuz Region, Guba**
- **Built on Abay (Blue Nile) River, which is located about 40km east of Sudan**
- **86% of the Nile river flows from Ethiopia.**
- **The project is owned by Ethiopian Electric Power (EEP).**
- **CONSTRUCTION STARTED – April 2011**
- **Dam will have 145 meter tall, 1,780 meter long and composed of roller-compacted concrete (RCC).**

 = Trends in 2070-2099  
 multi-model mean (median)  
**BCM** = billion m<sup>3</sup>





## Grand Ethiopian Renaissance Dam (GERD) ....

- The Project also includes a gated spillway, two non-gated emergency spillways, one 500 kV substation and switchyard, a 240 km transmission line.
- The dam has been 90% completed
- For Ethiopia, the dam will be a spring board for the countries Socio economic development.



# The performance of GERD in Water storage, Water supply, power Generation

- RESERVOIR CAPACITY – 74 billion cubic meters
- The size of the reservoir at full supply level went up to 1,874 km<sup>2</sup>
- Two powerhouses, 13 units (2x 375 MW and 11x 400 MW) at 5,150 MW capacity,
- expected annual generation of 15 TWh/a, doubling the annual national electricity output.
- It will be the largest hydropower project in Africa.



# The performance of GERD in Environmental protection

- The presence of GERD initiates watershed management activities in Ethiopia as to protect it from sedimentation.
- regulated flow of water from GERD will improve agriculture
- The impact from evaporation of water from GERD will be minimal compared with other dams in Nile, which will help in water conservation.
- Water evaporation from Aswan High Dam, as well as other dams in Egypt, equates to around 19 billion cubic metres.
- Grand Ethiopian Renaissance Dam, therefore saving about six billion cubic metres of water.







# Challenges and Issues Affecting the Development Power in Ethiopia

- There are a number of challenges that have hindered the development and full scale harnessing of some of the crucial energy resources in Ethiopia.
- The more conventional challenges have to do with capacity barriers including technical, technological, economic and institutional weaknesses.
- However, perhaps the stronger barrier is political.
- The Horn of Africa region has, and still is experiencing one of the worst political instabilities in the continent.
- The adverse impacts of political conflicts are both national as well as regional in nature.

# Challenges...

- Nationally, in addition to consuming important resources that could have been invested in the overall development of the country, internal political instability locks up parts of a country with good prospects of energy or other economic resources making such areas unsafe, insecure and hence, inaccessible by potential developers.
- It is an unfortunate fact that crucial economic resources such as oil are usually situated in conflict ridden parts of a country or a region.
- Regionally, political instability (actual or perceived) makes the evolution, development and economic integration of regional energy/power markets an unattractive option and the task formidable.
- This challenge is, of course, on top of the natural preferences of national governments 'not to rely on imported energy sources' beyond a certain point.



# Challenges...Hydropower

- For Ethiopia, it is an undeniable fact that
  - Lack of technology and
  - lack of internally raised finance are important barriers (GERD)
- Rural settlements in Ethiopia are highly scattered resulting in dispersed demand, which in turn makes the supply of electricity prohibitively expensive to remote rural areas.
- Rural demand for electricity is not only dispersed, but electricity consumption is also very low, which makes returns on investment less attractive.
- Political instability in the Horn of Africa sub region is a key issue that has hindered cross-border electricity trade
- Hydropower projects on international rivers is a serious issue affecting exploitation of hydro resources to its fullest extent in Ethiopia. (not supported by financiers)
- Another important issue to note in the Ethiopian electricity sector is that electricity generation is almost entirely hydro-based and affected by climate change



**THANK  
YOU!**