

**GEOGRAPHIC ASPECTS OF
HYDROPOLITICS:
NILE AND MEKONG RIVERS**

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*2020 International Conference on the Nile and GERD: Science,
Conflict Resolution and Cooperation, August 20-21, 2020*

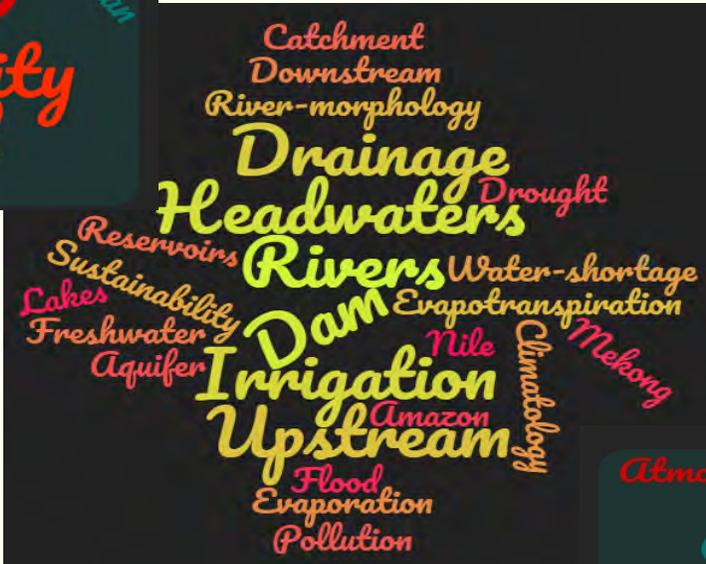
Background

- ❑ **Hydropolitics** is the systematic study of conflict and cooperation between states over water resources that transcend international borders (Elhance, 1999).
 - ❑ It is a highly complex, multidimensional, and multidisciplinary subject.
- ❑ One of the factors complicating hydropolitics is geographic.
- ❑ Analyzing the “geographic” factor of transboundary rivers could shed light on a better understanding of the complexity of hydropolitics.

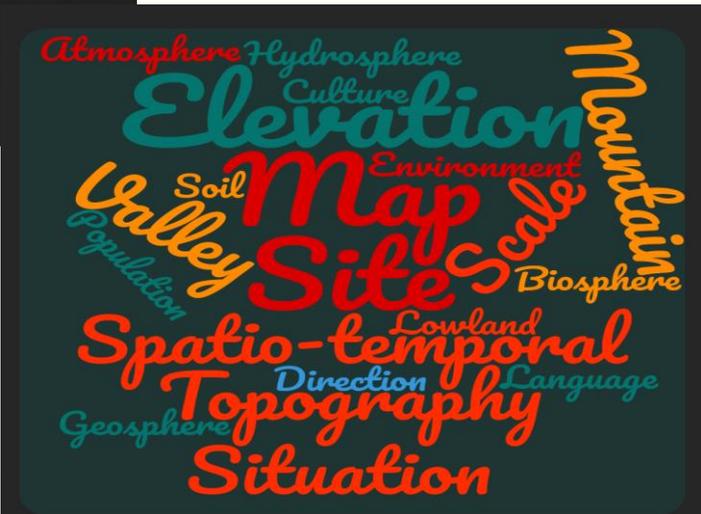
Politics, Hydropolitics & Hydrogeopolitics



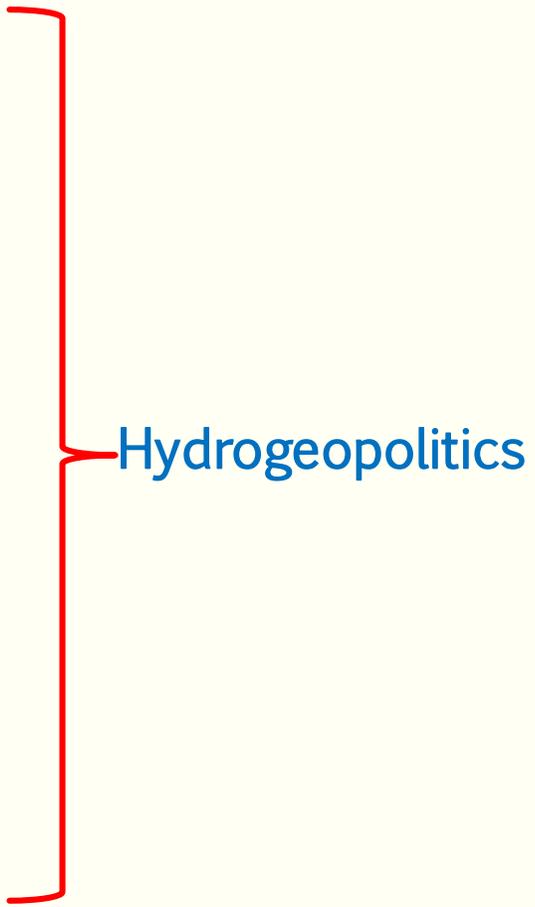
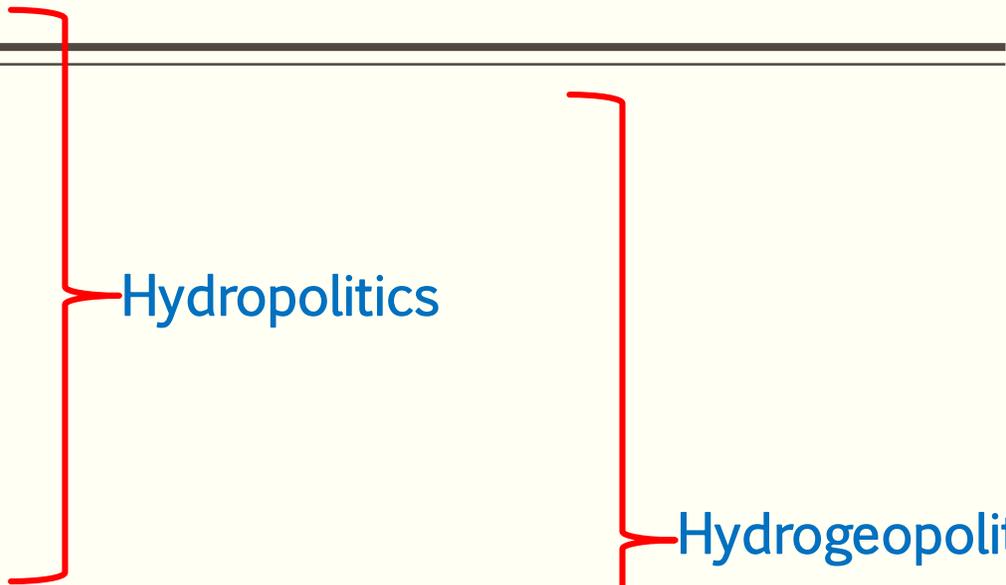
Politics



Hydrosphere



Geography



Commonly held narratives

- ▶▶▶▶ Upstream countries, by virtue of their topographic positions, exert their power over transboundary rivers: polluting, damming, diverting, even blocking water flows.
- ▶▶▶▶ Ethiopia could rely on its rainfall for food production and economic development (and therefore shouldn't touch Abay/Nile).
- ▶▶▶▶ Egypt is the gift of the Nile → "No Nile" equates to "No Egypt".

Objectives

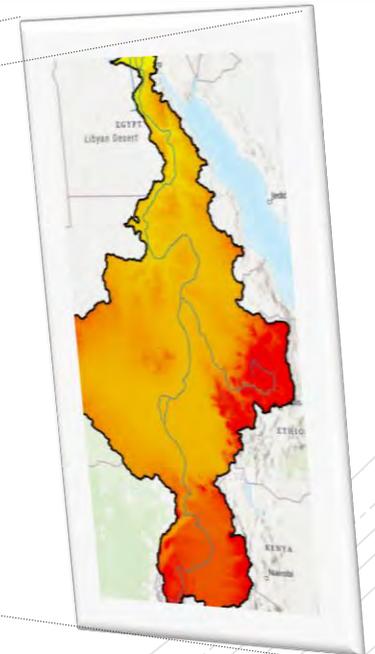
- ❑ Assess Ethiopia's biophysical resources vis-à-vis the topographic position it occupies in the Nile Basin.
- ❑ Assess the likely scenario of land and water resources → as it pertains to the future condition of river basins
- ❑ Ascertain if the narrative “No Nile - no Egypt” makes sense

A three-pronged approach

Biophysical Assessment:
Topography, climate, land resources

Hydropolitical Argument: In the light of biophysical factors

Mekong River Basin:
As a comparative tool





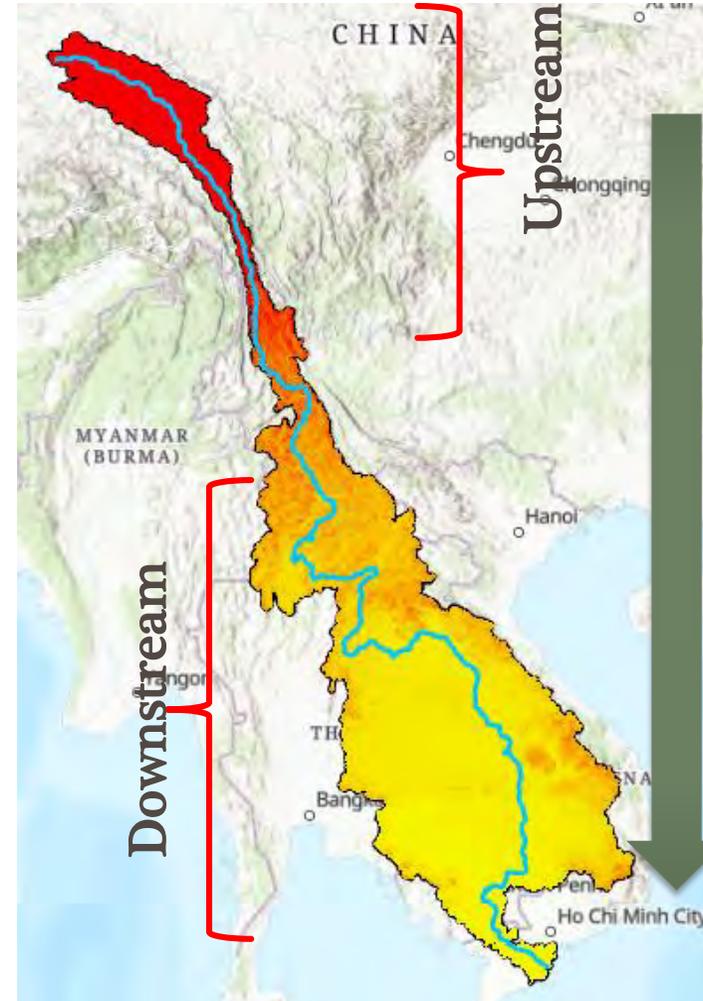
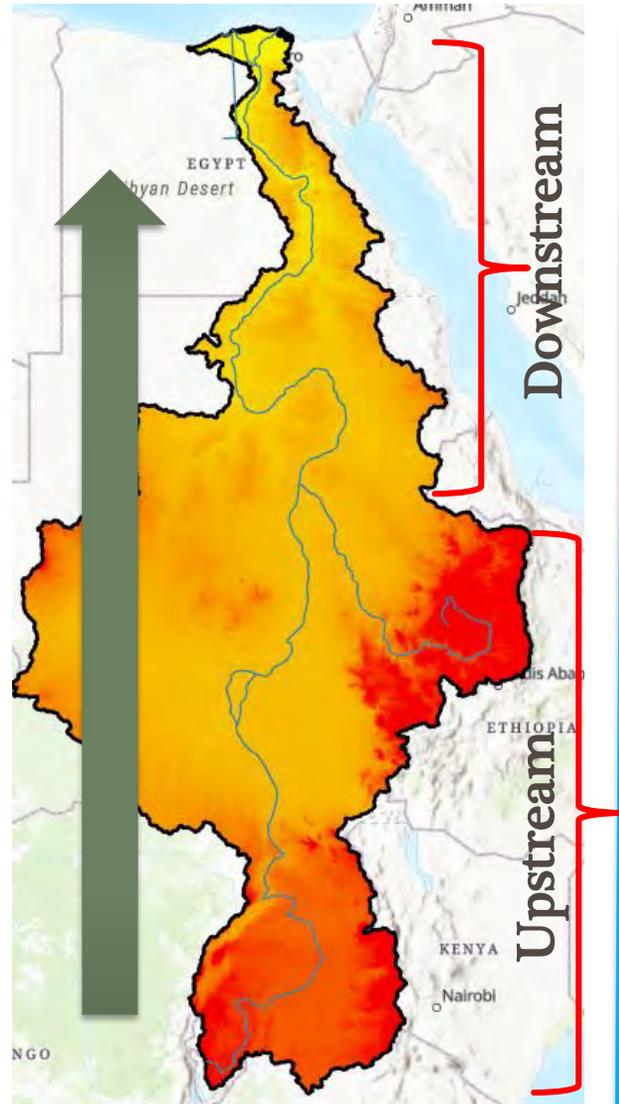
Why Mekong?

- While biophysical and hydropolitical landscapes of the two international rivers differs, there are also similarities that could generate important lessons.
- **The two river basins:**
 - Became the focus of hydropolitical discourse.
 - Harbor **311 million people**: 251 million in Nile (20% of Africa) and 60 million in Mekong (3.8% of SE Asia).
 - Overwhelmingly shared by poor and rural communities.

Nile and Mekong: Physical Characteristics

Nile River Basin

- 6,650 km long (the longest in the world).
- Basin: 3,400,000 km²
- 10% of Africa.
- Discharge: 2,830 m³/s
- Sources: Tana and Victoria Lakes
- Mouth: Mediterranean Sea.



Mekong River Basin

- 4,350 km long (12th in the world).
- Basin: 795,000 km²
- 3.8% of SE Asia
- Discharge: 16,000 m³/s.
- Source: Tibet, China
- Mouth: China Sea.
- "The rice bowl of Asia"

Dams: Nile and Mekong River Basins



- Mekong is highly developed: 40 vs. 440

While Nile has over 250 million people, and Mekong has 60 million; the number of dams in Mekong is 11 folds

Nile= 1 dam/87,000 km²

Mekong= 1 dam /180 km²

Data and Sources

Data	Source	Description
Shapefiles	http://geoportal.icpac.net/documents/478 ; https://data.opendevlopmentmekong.net/	Basin and administrative boundaries
DEM	The Shuttle Radar Topography Mission (SRTM)	30 seconds (elv 30s)
Population	https://www.unocha.org/ ; https://sedac.ciesin.columbia.edu	Gridded Population of the World, Version 4 (GPWv4) for year 2000, 2005, 2010, 2015 and 2020.
Bioclimatic variables (Historical and Projected)	https://www.worldclim.org/	Rasterized Global Climate Models (GCMs) data- only MRI-ESM2-0- (2021-2040, 241-2060, 2061-2080, 2081-2100). 0.5-minutes spatial resolution
Soil	ISRC (https://www.isric.org/)	250 m resolution: soil depth, OM, CEC, pH, ...

Methods of Analysis

- GIS (ArcGIS Pro & QGIS) platform to conduct raster and vector-based analyses (buffer, stream profile, overlay, ...)
- Statistical Analysis

Result #1: What's topographic position got to do with Ethiopia?

❑ Merits of upland positions

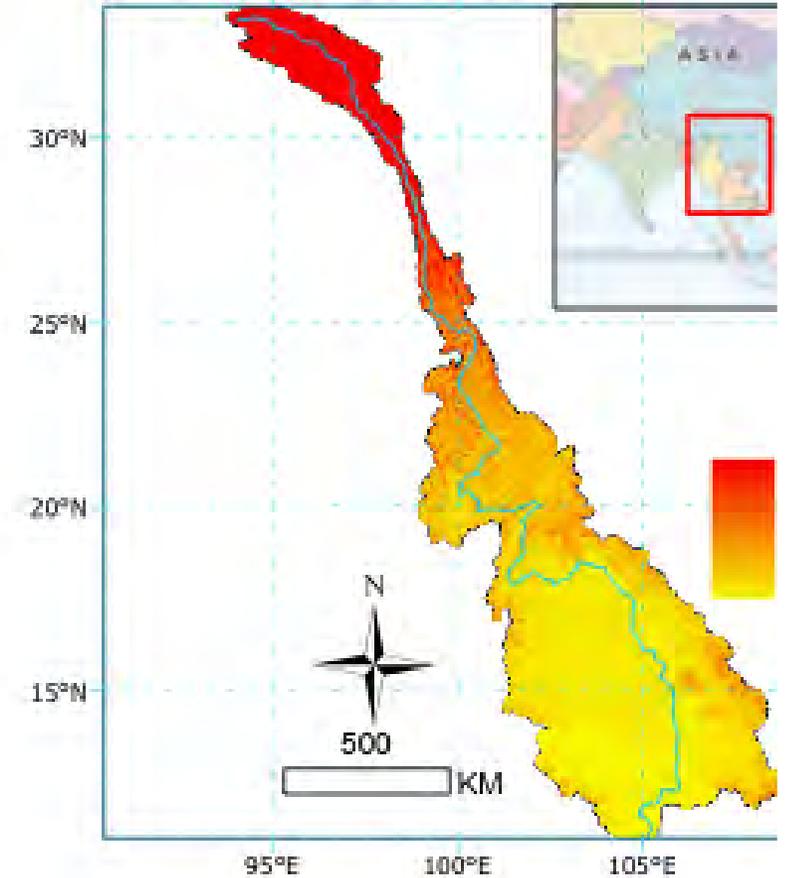
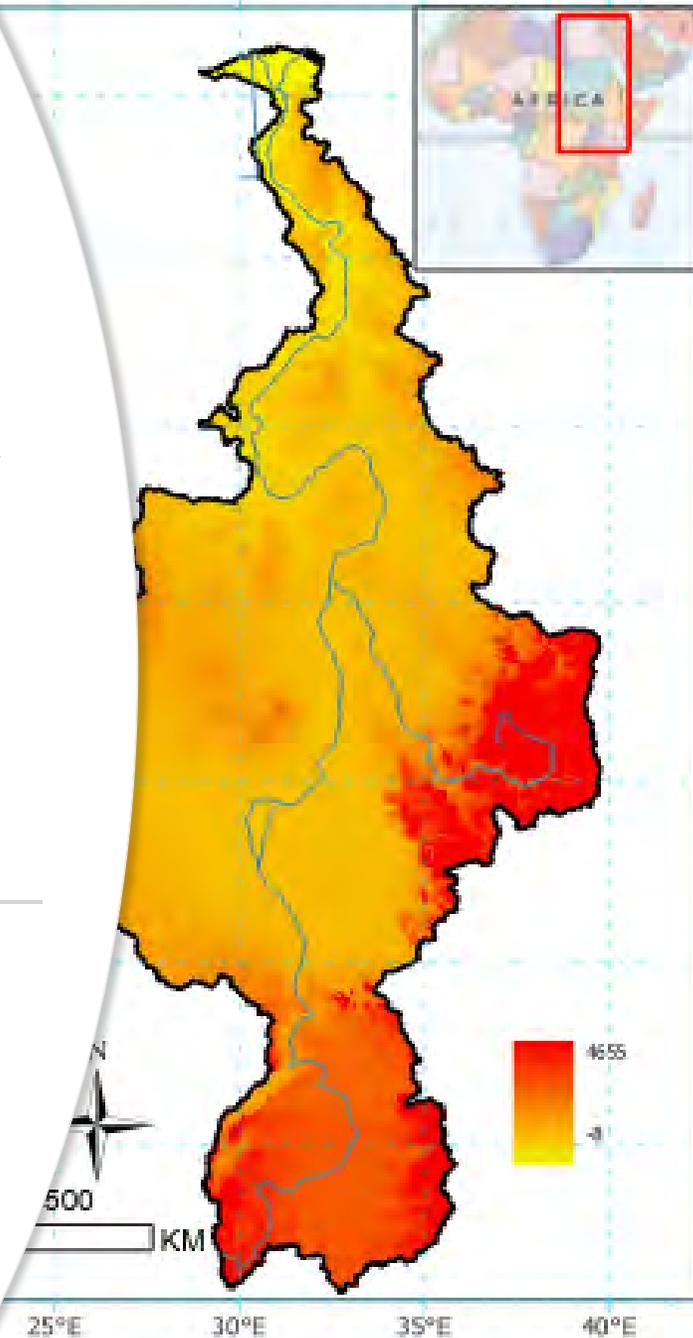
- ❑ Defense.
- ❑ Enjoy cooler temperature in the tropical regions (but a disadvantage in the middle and high latitude)
- ❑ Less susceptible to tropical diseases (e.g., malaria).
- ❑ Exercising the control of transboundary rivers (e.g., USA, Turkey, China, Spain, India, ...).

❑ Demerits of upland position: worsening the situations of poorer countries.

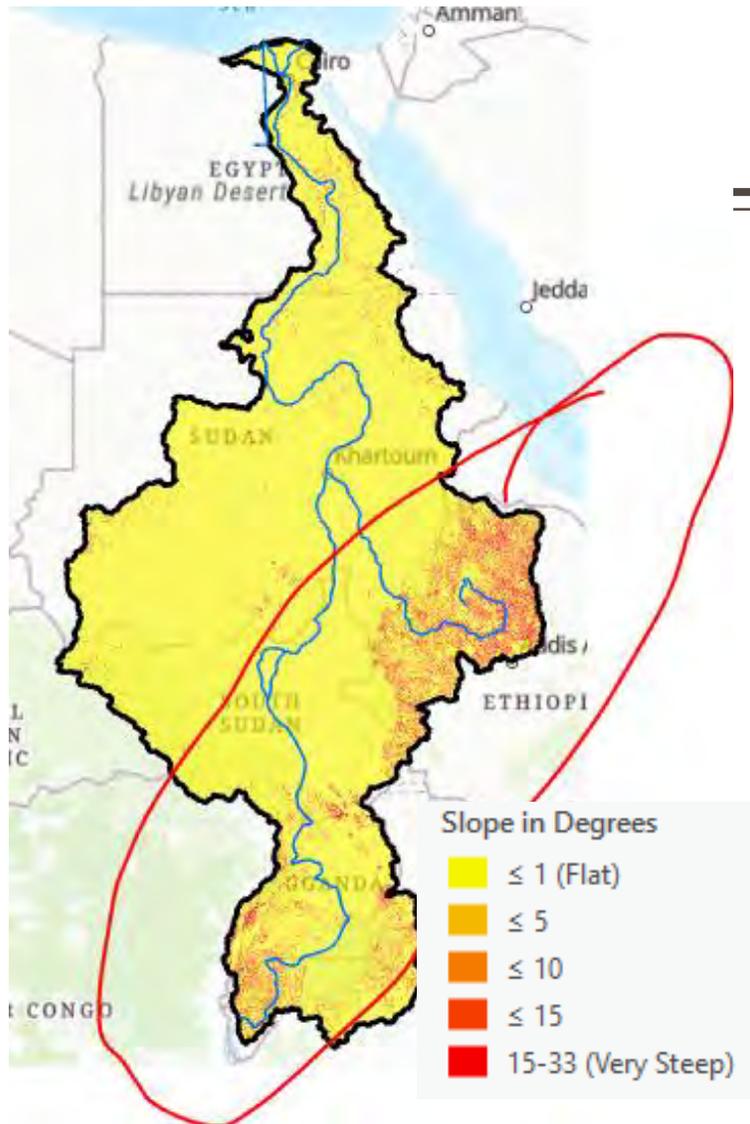
- ❑ Topographies are rugged
- ❑ Susceptible for hazards, e.g. landslide.
- ❑ A high rate of soil erosion, leads to shallow soils.
- ❑ Little or no potential for mechanized farming (due to steep slope angle).
- ❑ Mountain communities increasingly marginalized due to downhill flow of natural assets at unsustainable rates.
- ❑ Areas with elevation less than 100m and closer than 100km to the coast housed around one quarter of the global population (Cohen and Small 1998; Small and Nicholls 2003),

DEM: Nile & Mekong

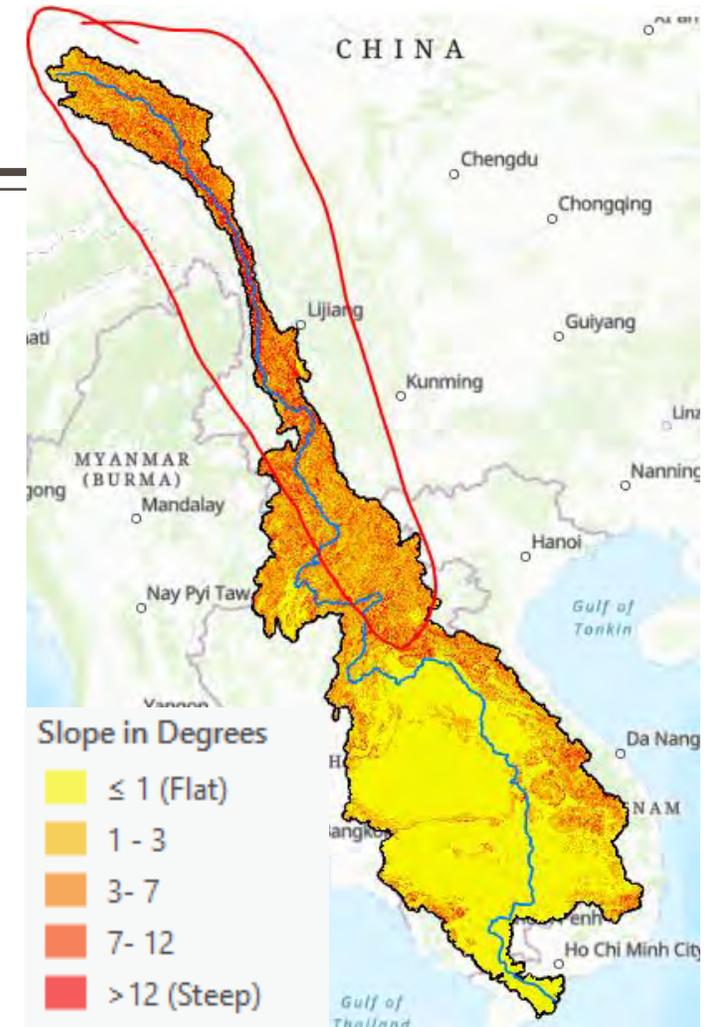
- Upstream terrains are represented by red and downstream by yellow color



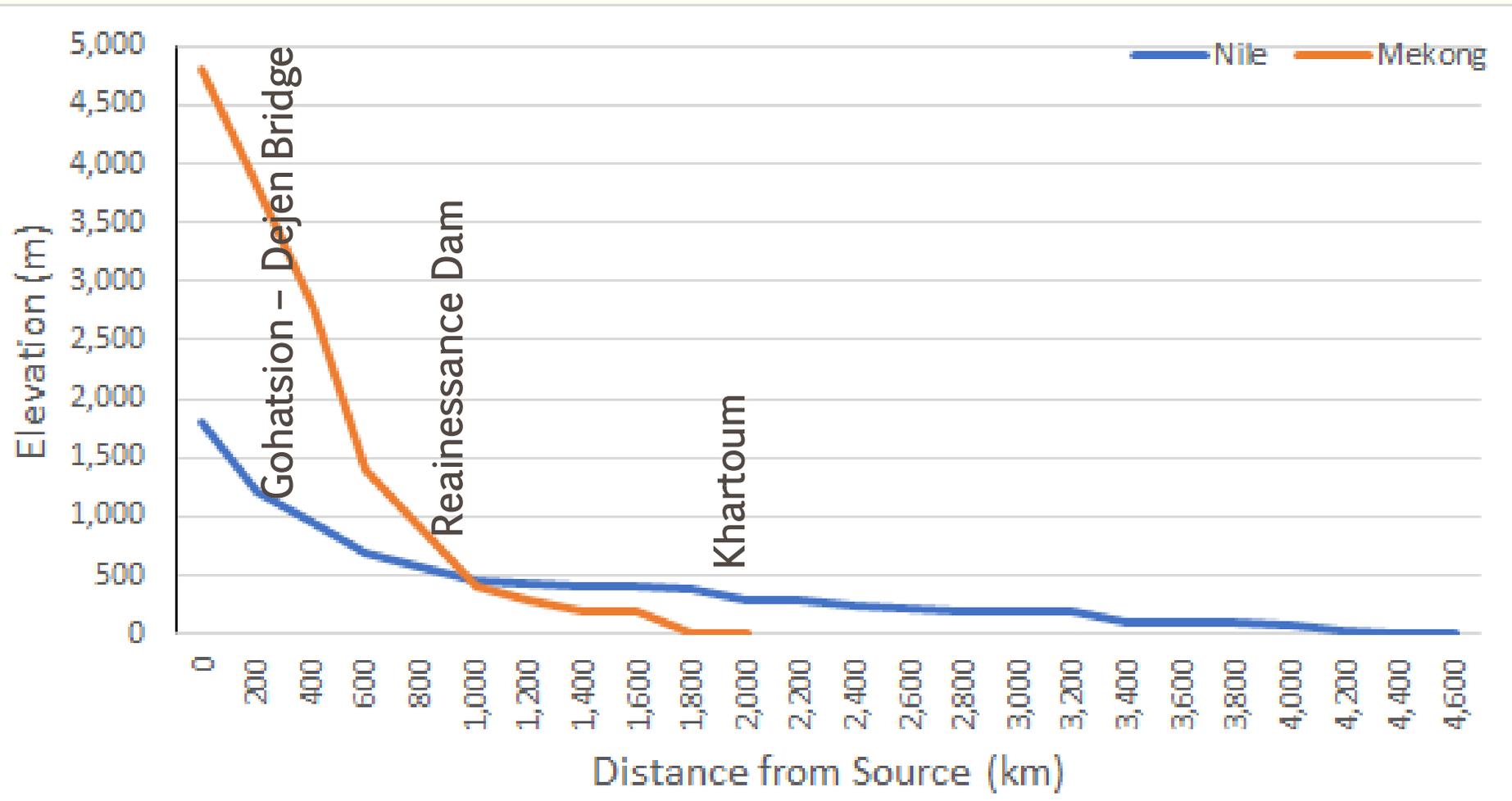
Slope



- From DEM, a slope map is generated
- Both headstreams have a steep gradient terrain.
- While Egypt occupies the flatter parts of Egypt, China occupies the steeper part.

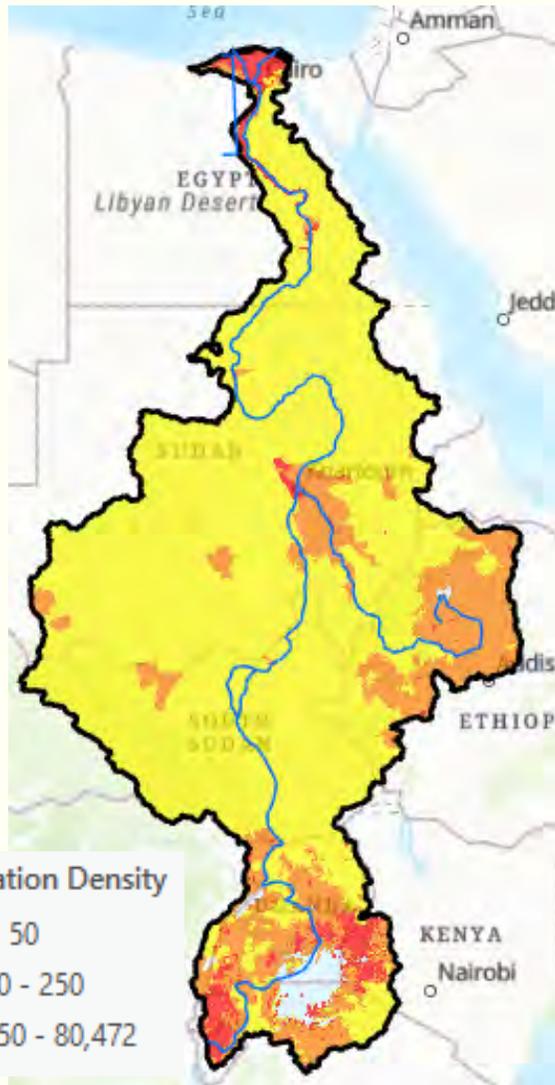


Longitudinal profile of BlueNile/Nile and Mekong

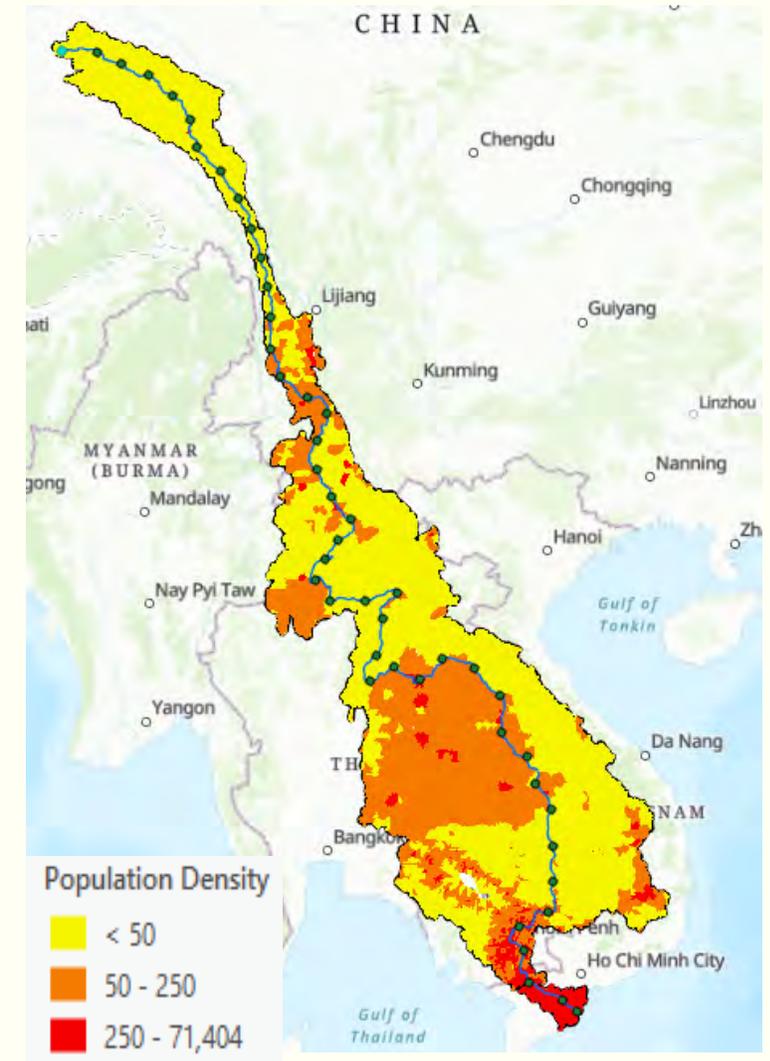


- Mekong's show a steep decline of elevation: within the first 600 km
- Blue Nile is some how moderate, but still steep within Ethiopia

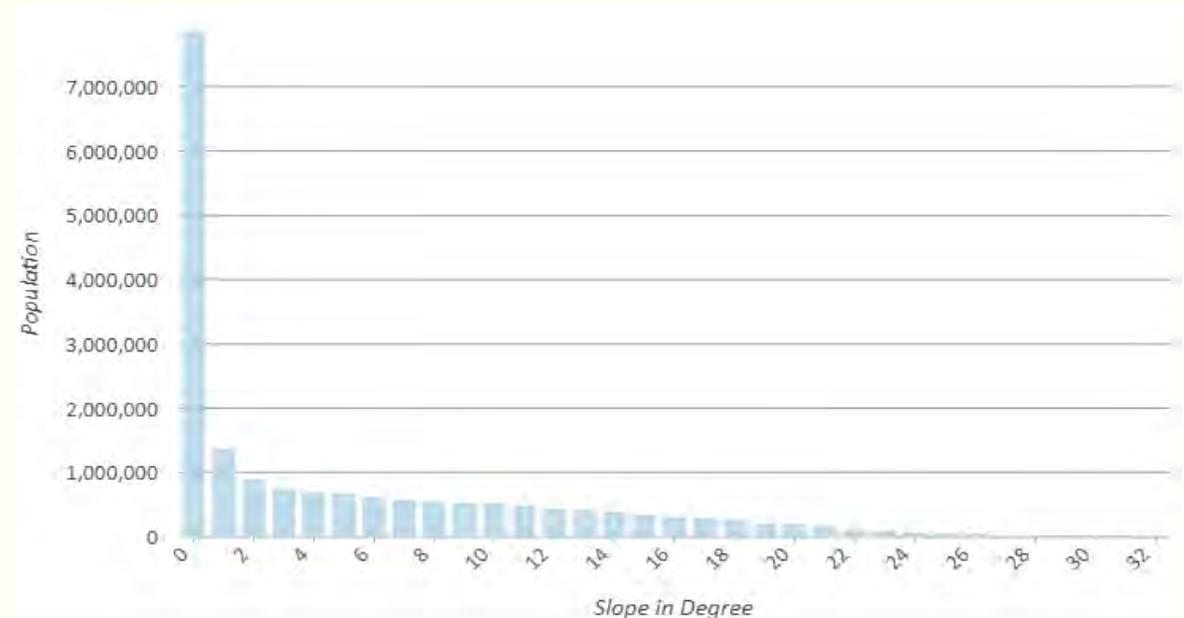
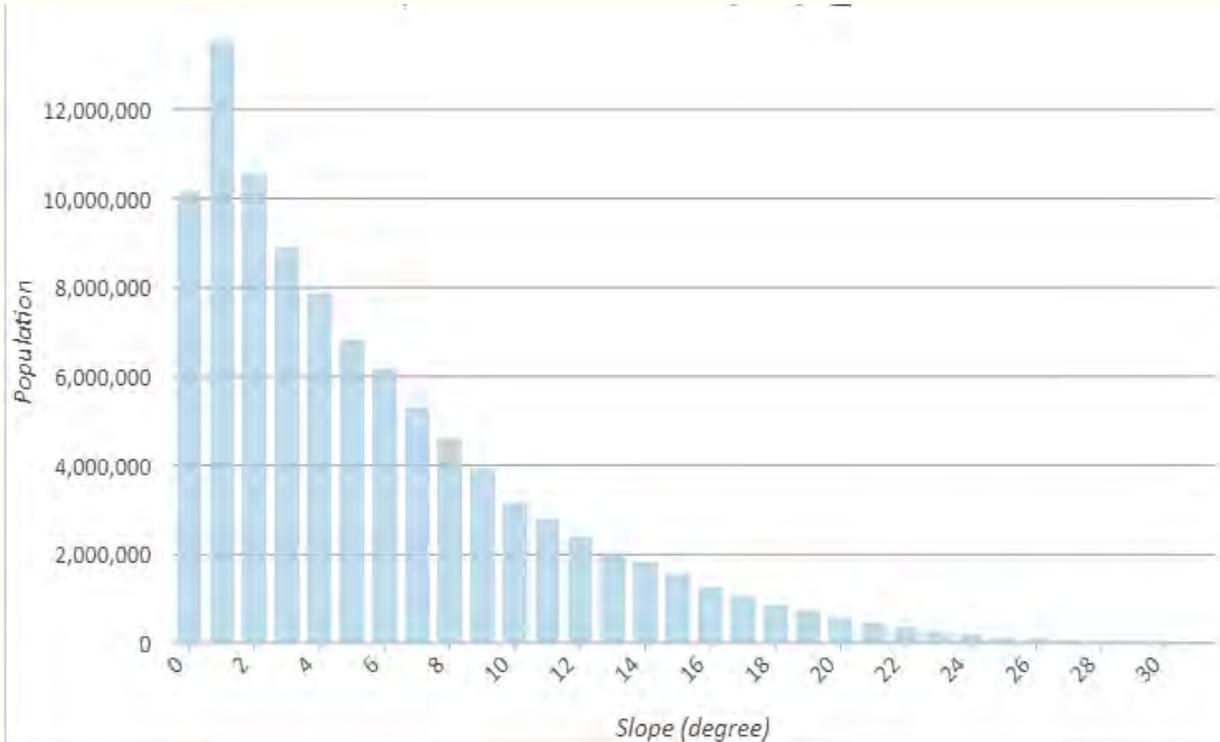
Population Densities: Nile and Mekong Basins



- Unlike Mekong and other basins of the world, the upper and lower ends of Nile are densely populated.
- No wonder why those upper stream countries have not advanced in modern agriculture through mechanized farming



Population and Slope Relationship: Nile and Mekong Basins



- The overwhelming majority of Mekong basin are concentrated within 0 – 2 degrees.
- Over Nile, we see population settlement encroached onto steeper slopes.

Result #1 underscores that, being in the upstream position is challenging → Ethiopia's agricultural economy depends on it.

Result #2: Is Future Promising?

Given the current trends, → **No!**

- I. Demographic pressure will be higher.
- II. Leading to higher demand for water, food, and energy resources.
- III. This results in dwindling land carrying capacity.
- IV. Which ultimately worsen food insecurity and vulnerability to natural disasters.

The question is “How”?

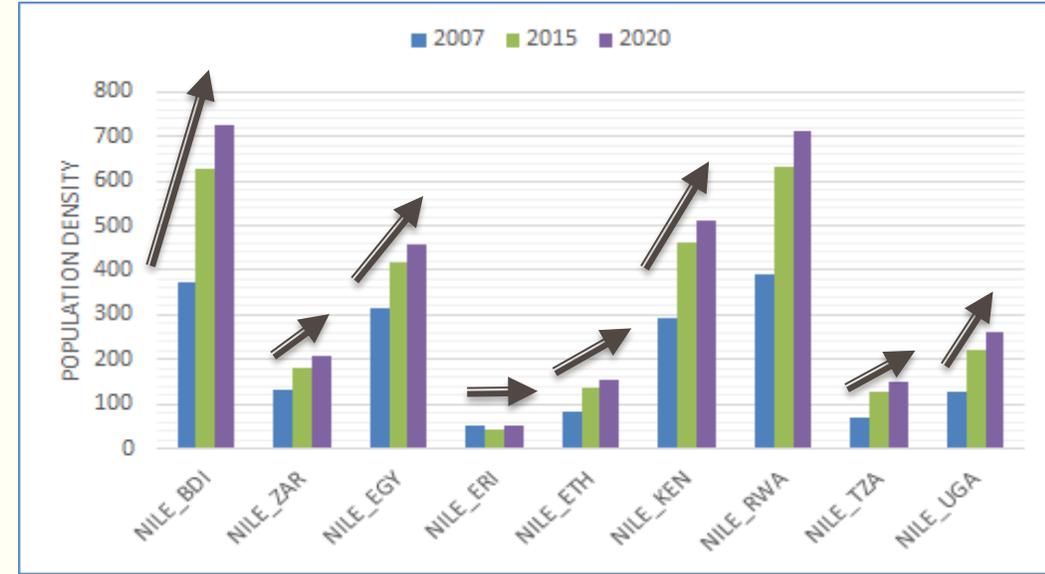
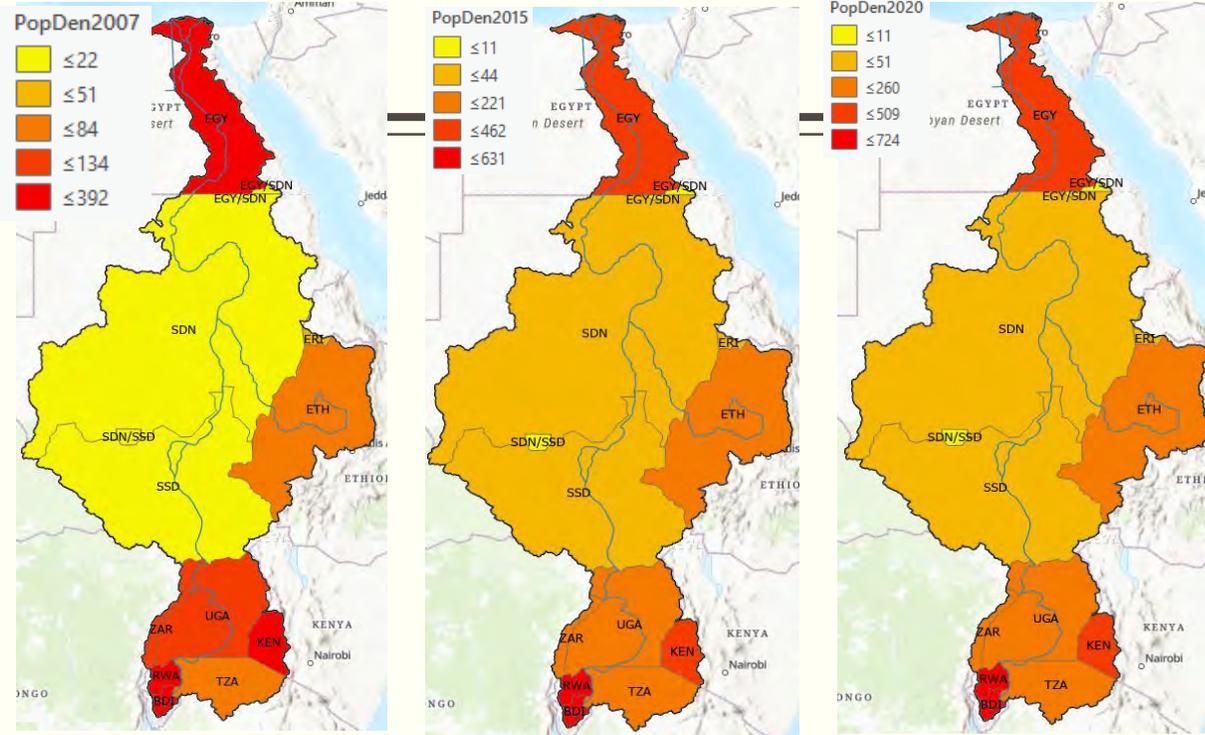
Population Growth: Nile Vs. Mekong

Population in both basins grow fast =>

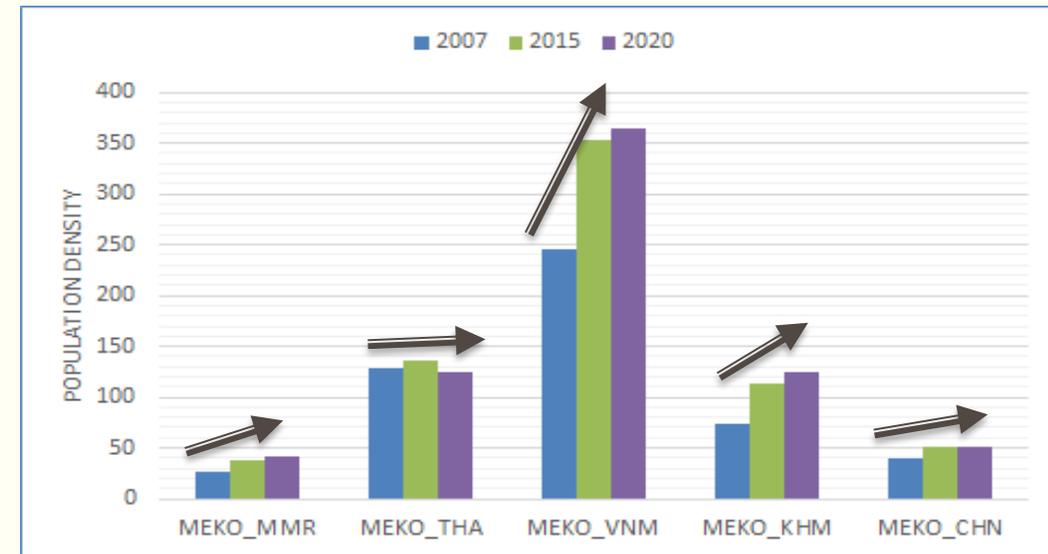
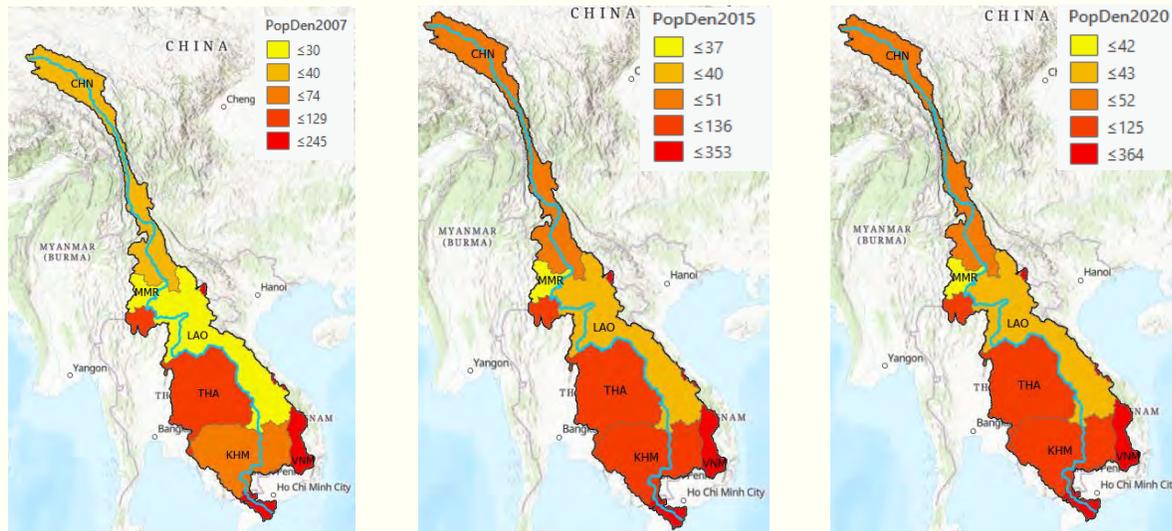
Shortening of doubling year:

- Egypt: 30 yrs; Ethiopia: 24 yrs; Vietnam = 43

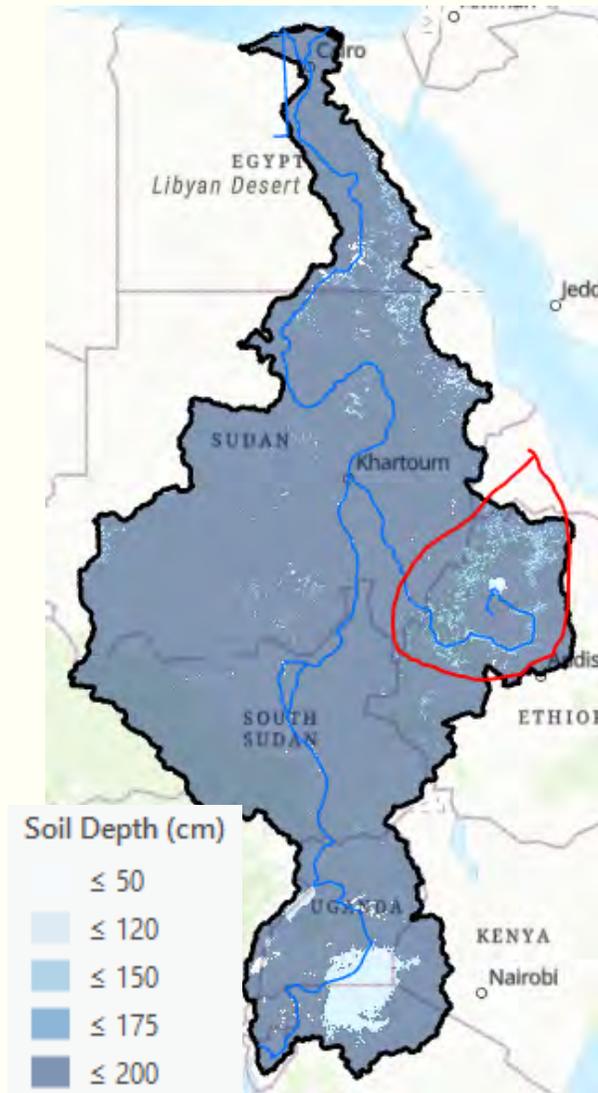
Nile Basin



Mekong Basin

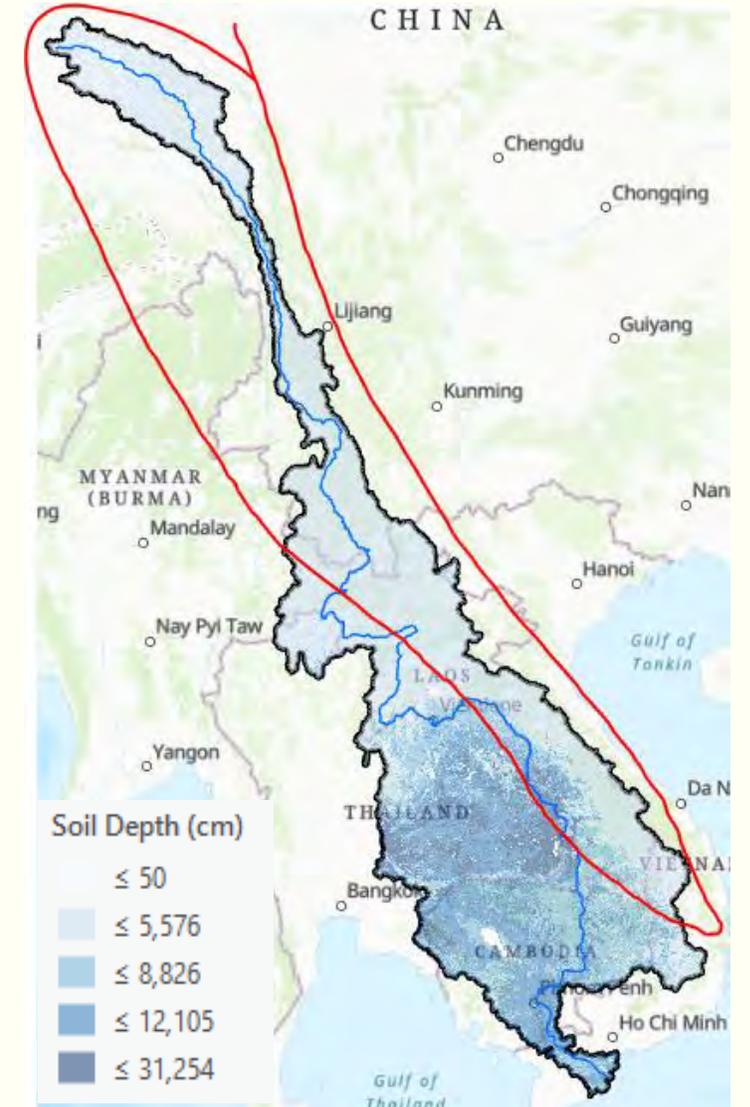


Land resource is debilitating (Soil Depth)



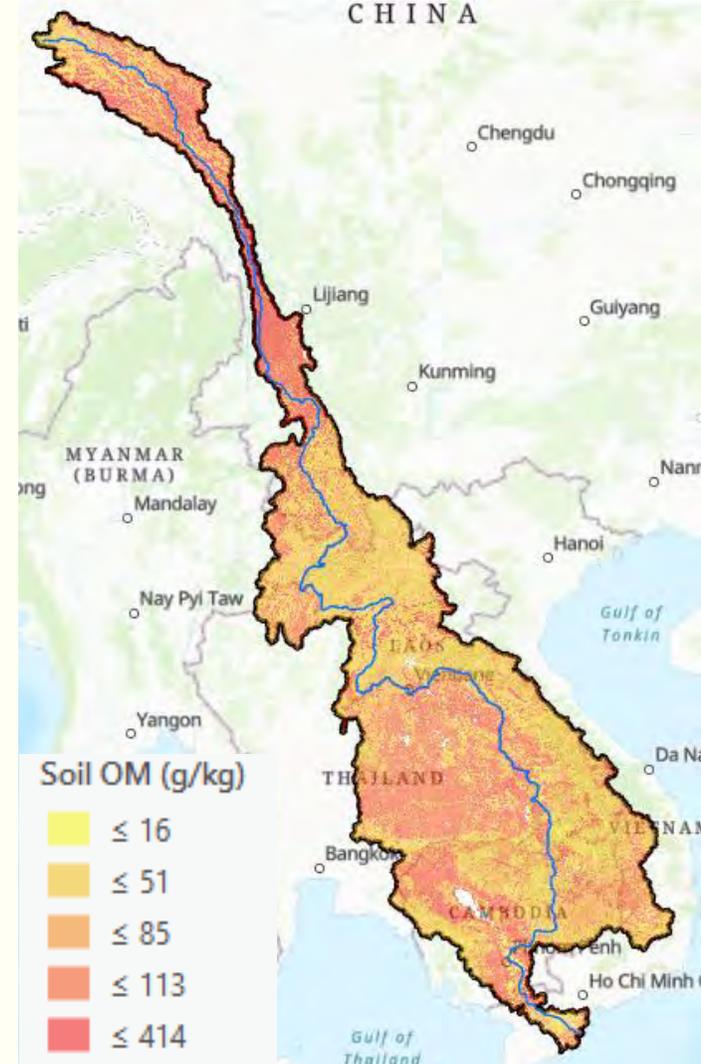
Already, soil depth in the Ethiopian highlands is shallow.

- Reduced soil depth means, reduced stock of soil nutrient and water
- Which ultimately result in a range of negative consequences on soil quality

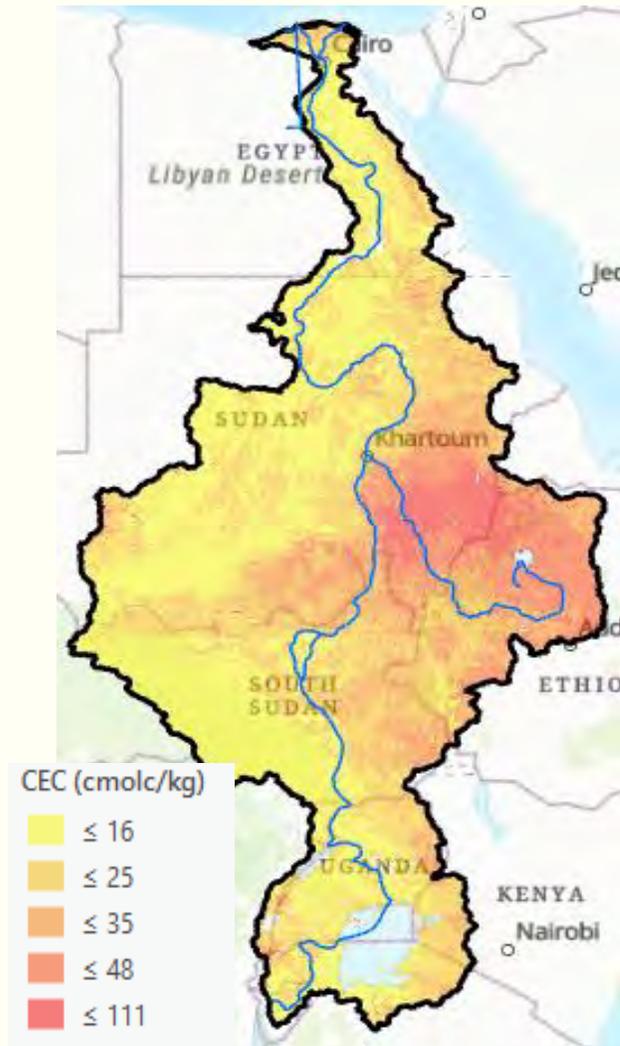


Land resource is debilitating (Soil OM)

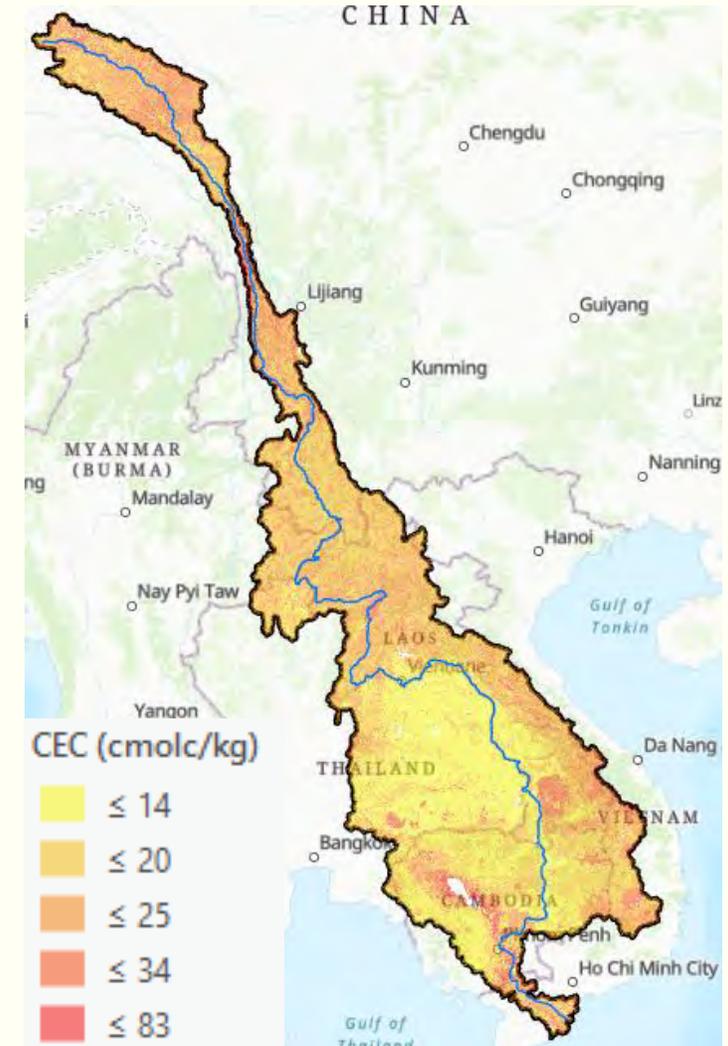
- SOM is an important quality indicator,
- However, it is undergoing a declining trend which is going to be bad for the future
 - Soil erosion
 - Complete removal of crop residue for various purposes
 - Use of cow dungs for fuel purposes



CEC is another soil quality indicator, which is declining

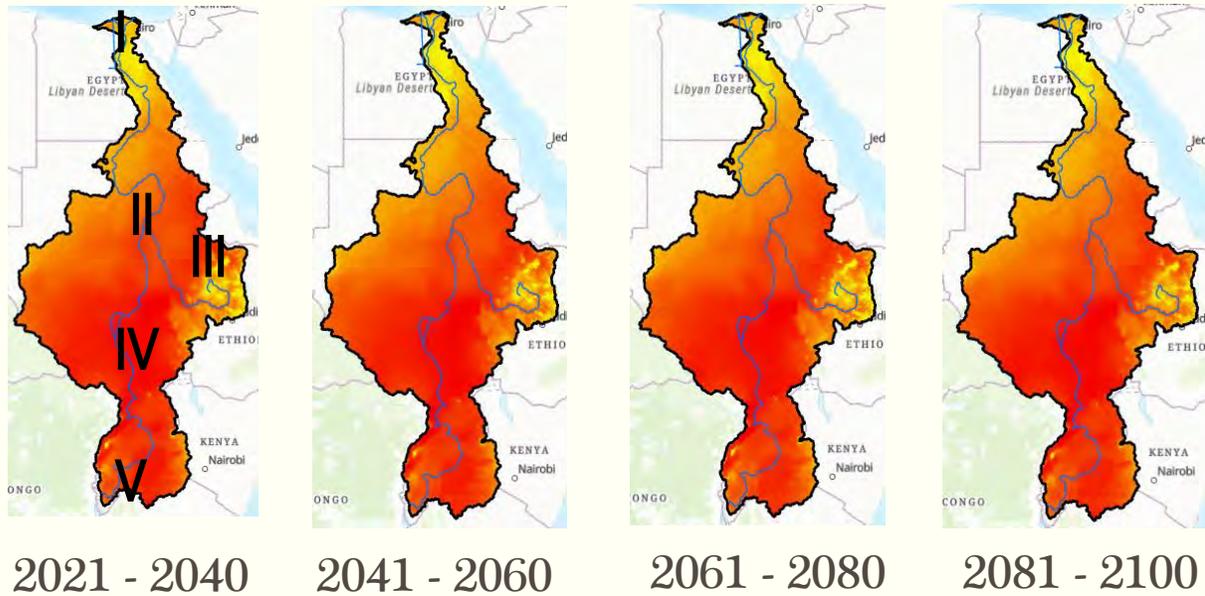


- CEC enhances soil aggregation and soil structure
- Continuous cultivation of the land results in reduced CEC



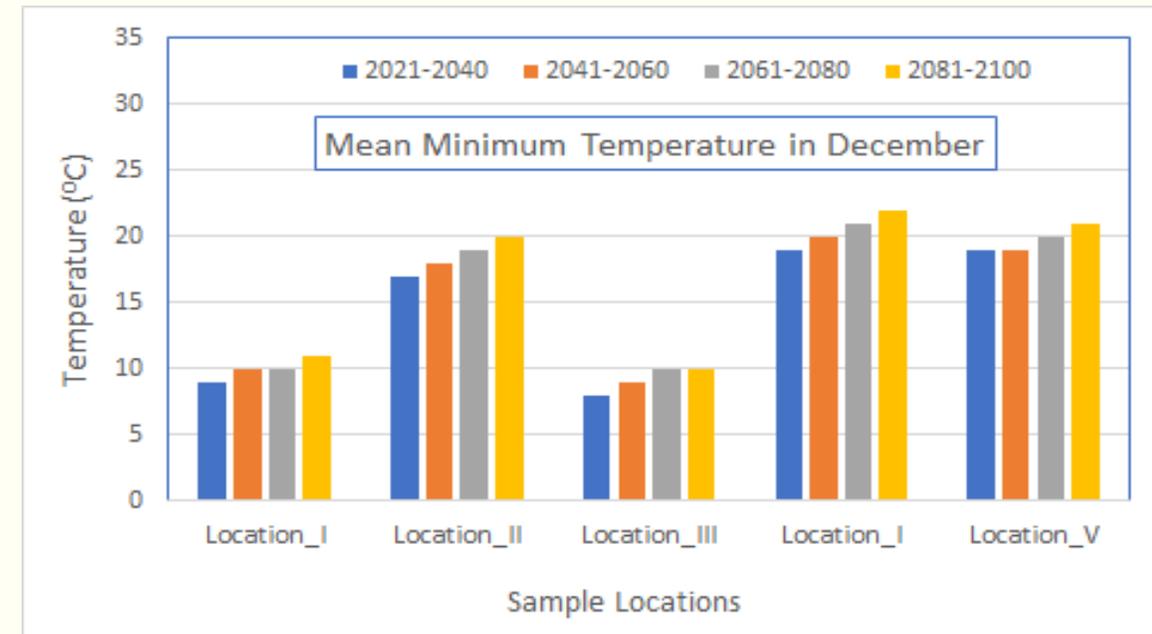
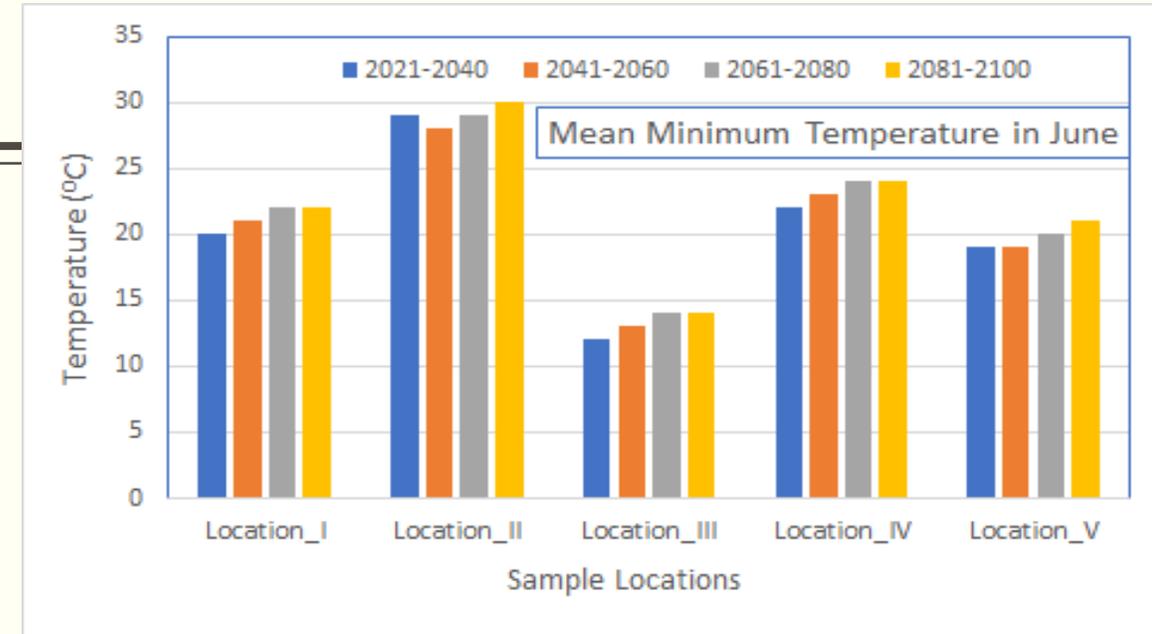
Patterns of Mean Minimum Temperature in Nile Basin (2021 – 2100)

- Used GCMs generated prediction, averaged for years 2021-2040, 2041-2060, 2061-2080, 2081-2100
- Selected **five (5)** sample locations
- Only for June (summer) and December (Winter)

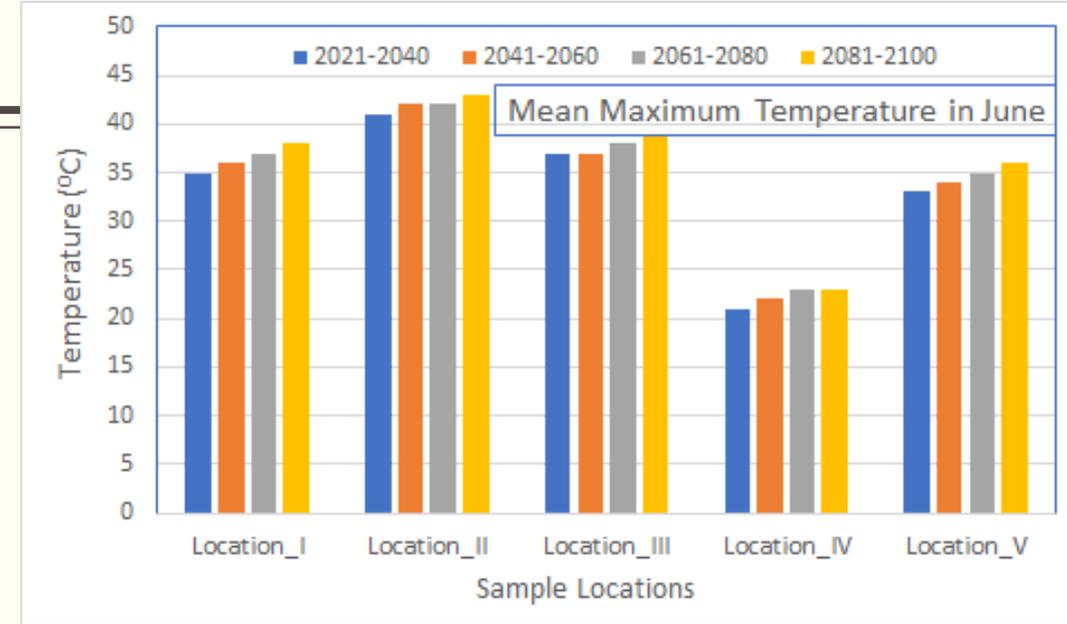
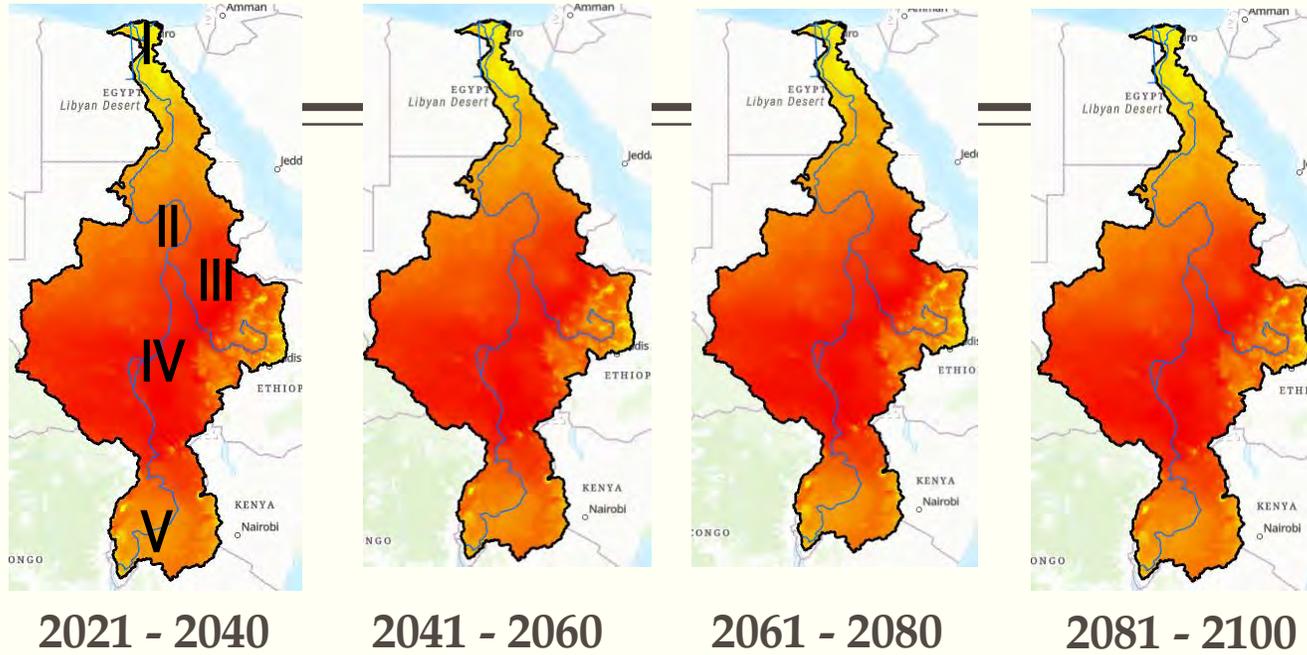


Discernible patterns

- Increased mean minimum temperature: both in June and December

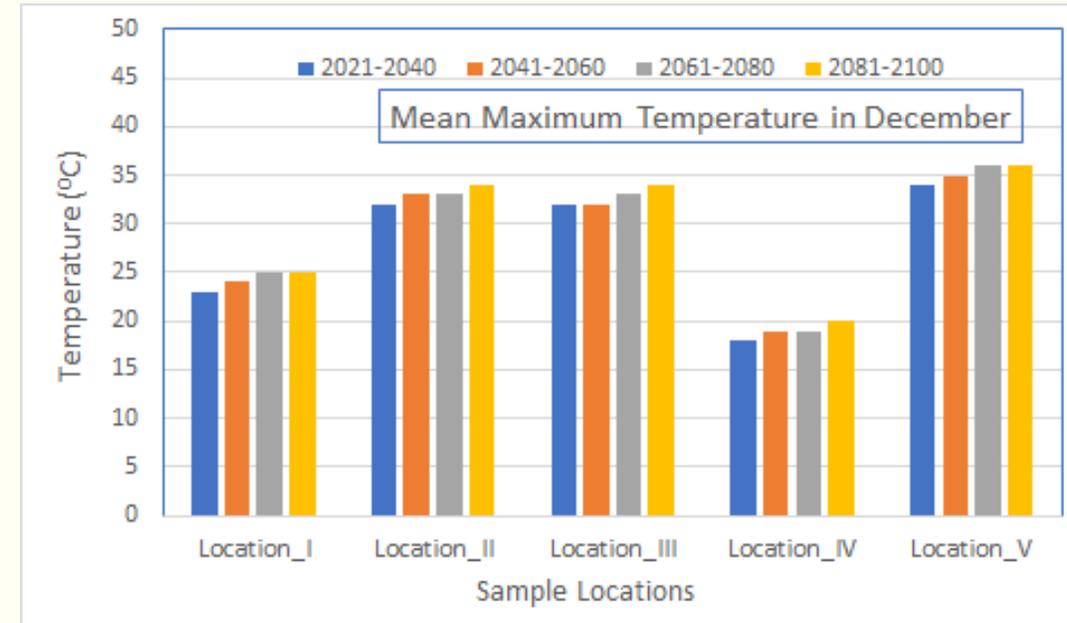


Patterns of Mean Maximum Temperature in Nile Basin (2021 – 2100)

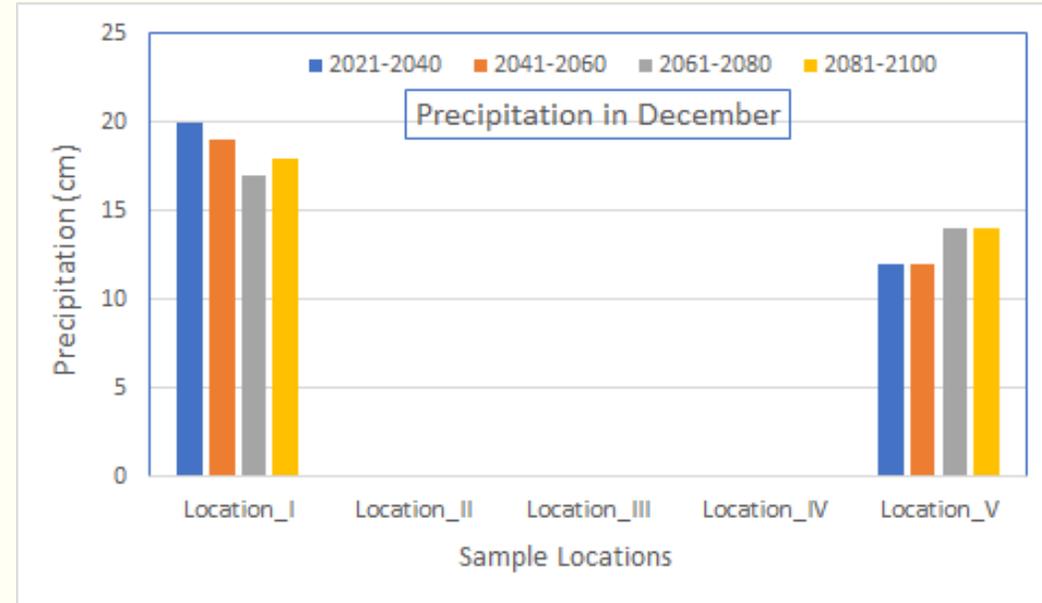
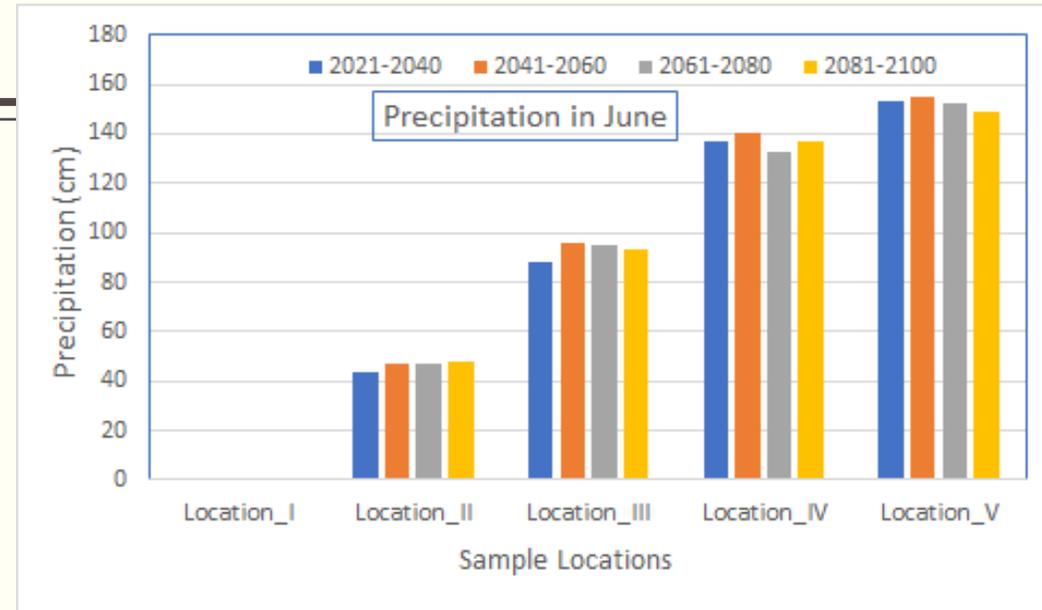
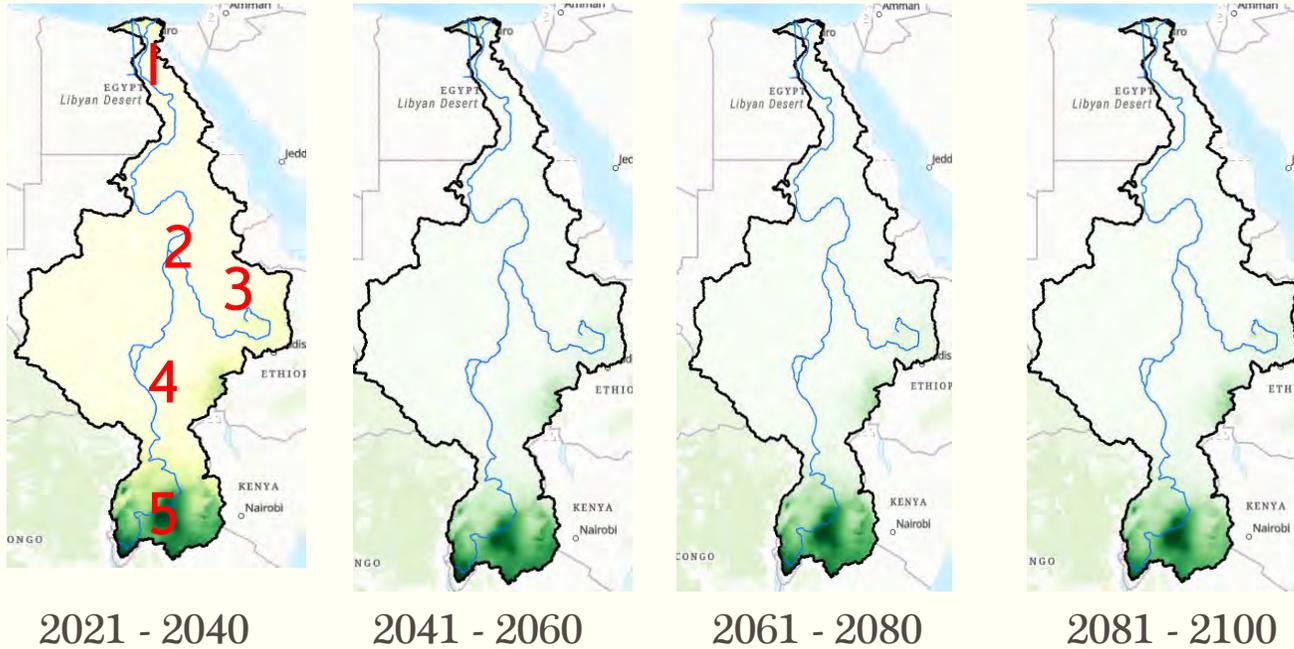


Discernible patterns

- An increase in mean maximum temperature: June & December.
- Implications on:
 - Higher evaporative demand.
 - Increased water shortages,
 - Heat waves, etc.



Patterns of Precipitation in Nile Basin (2021 – 2100)



Discernible patterns

- ✓ Precipitation is all over the map
- ✓ Reduced amount is bad for sure.
- ✓ Increased amount, could trigger
 - ✓ frequent flooding,
 - ✓ Erratic temporal and spatial distribution
 - ✓ An increased soil erosion, filling of dams

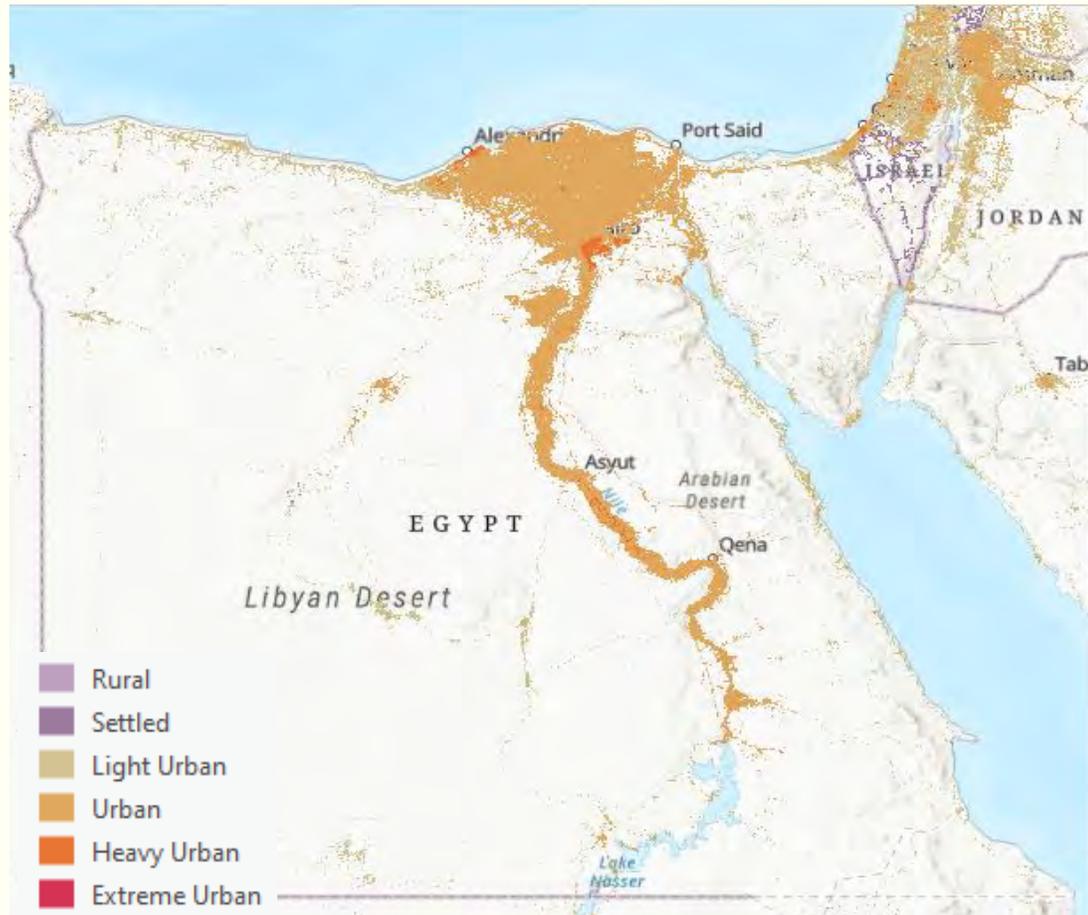
Predicted impact of climate change unique to the Mekong

- Due to increased demand for electric power and the transition to green energy sources, China is building dams at unprecedented rate.
 - Affect 20% of the world's freshwater fish catch in the Lower Mekong
 - Turn off the tap for the countries downstream during drought
 - Holding on to that water for leverage
 - Unexpected dam release cause rapid rises in river level that have devastated communities
 - Affect the river ecosystem
- Typhoons and floods would be more intense and frequent
- Long coastlines and heavily populated low-lying areas make the region the most vulnerable to weather extremes and rising sea levels.

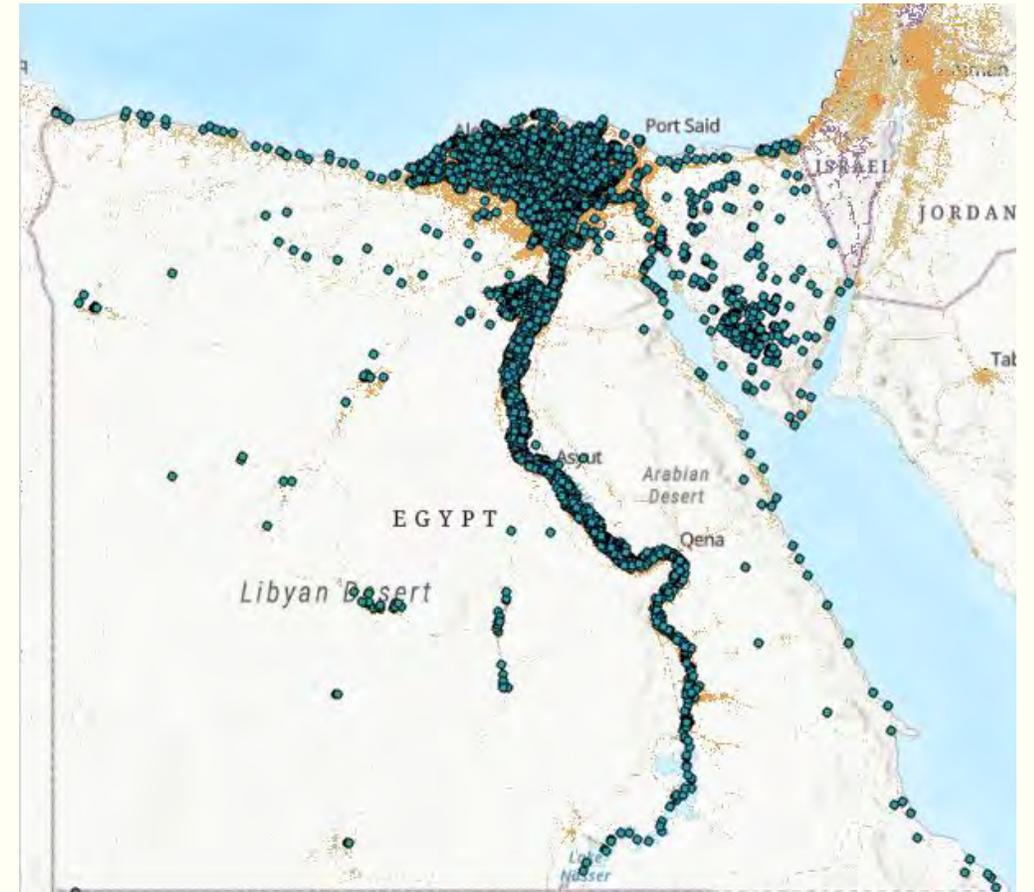
Result # 3: **Do Egypt cease to exist without Nile?**

- ❑ For coastal cities, desalination is a competitive choice. Currently, about 21,000 desalination plants in operation around the globe.
- ❑ The International Desalination Association claims that 300 million people get water from desalination,
 - ❑ The biggest ones: United Arab Emirates, Saudi Arabia, Israel.
 - ❑ Singapore desalinating water for US\$0.49 per cubic meter.
 - ❑ Israeli desalinate water for < US\$ 0.40 per cubic meter.
 - ❑ Perth operating a reverse osmosis seawater desalination plant. The same is true in Sydney.
 - ❑ A joint venture between Israel and Jordan built a large desalination plant on the Red Sea: piped 100 miles north through Jordan to replenish the Dead Sea.

Egypt's Population Settlement vis-a-vis Red Sea and Mediterranean Sea

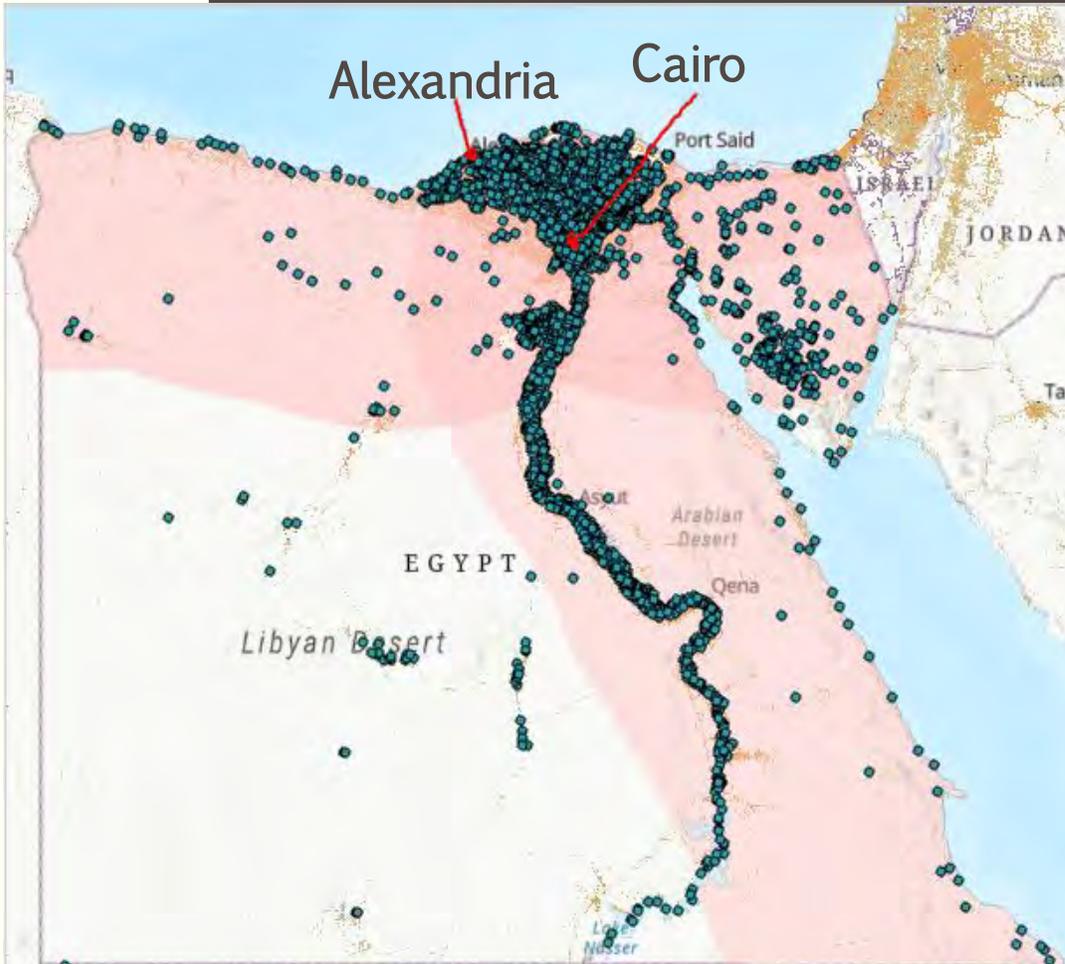


95% of the *population lives* within 20 km of the Nile River and its delta



Population centers are concentrated along the Nile River.

Using a 300 km **buffer** from the two Seas



- Over 97% of the settlements in Egypt are located within 300-km from Red Sea and Mediterranean Sea.
- Against the backdrop of these potentials, Egyptians are upping the ante by capitalizing on the extreme case scenario (*playing a victim card*):
 - *"No Nile means, no food, no state, no historical monument, no pyramid. In short, no Egypt"*

Conclusion

- ❑ For a poor country like Ethiopia, damn to be in the upstream and damn to be in the downstream. What matters most is power.
 - Paradoxically, Ethiopia is categorized in the upstream nation (becoming a "counter-hegemon"), which is attempting to flex its muscles on downstream countries.
- ❑ If a country is poor, it doesn't matter if it is in the upstream or downstream.
- ❑ Given the dynamics of demographic and biophysical variables, Ethiopia couldn't satisfy its growing demand with rainfall alone. Using Blue Nile is going to be a necessity for Ethiopians.
- ❑ Egypt is not going to die due to reduced Nile water flow. To balance the future water deficit, Egypt could effectively harness the Sea waters.
- ❑ Egypt couldn't continue business as usual, anticipating to enjoy 55.5 million cubic water of water from Nile. To make this happen,
 - ❑ Ethiopia should not only adopt a hands off Abay, but also divert Shebelle and Awash rivers to feed into the Nile. Or ... Ethiopia should slash its current population by 75%.
- ❑ Whether Ethiopia use the Abay water or not, the Nile discharge would decline in the future.

Recommendations

- In the hydropolitical arguments, Ethiopia should demystify the “No Nile- No Egypt argument” by popularizing the hidden potential of dieselization from Red Sea and Mediterranean Seas. We could also include ground water
- The diplomatic pressure on Ethiopia is huge. Ethiopia is considered as a reckless upstream hegemon. Climate change should be anchored in the use of Abay. And make it the future climate resilient.
- The role of nongovernment actors is huge in influencing the policies of financial institutions and governments. That way, we could at least gain the support of international pressure groups, non state actors, activists and journalists.