Parched earth – drought resilience in the Ugandan economy

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Outline

- It's getting hotter and wetter over time; strange, but true.
- The economy, climate and the environment are linked...
- How is Uganda's climate landscape?
- What are trends in the climate landscape?
- What does the future hold?
- There are already losses from climate extremes..
- But, it's not too late to act..

Introduction

- Climate change is projected to increase drought intensity and frequency worldwide as precipitation patterns change and temperatures rise (Wanders and Wada, 2015).
- Lack of precipitation causes meteorological and agricultural drought, and later, hydrological drought (Sheffield et al., 2012).
- Climate models predict that extreme weather events will become more frequent in the 21^{st} Century (see e.g., Hertel et al.,2010; IPCC, 2022).
- Note that the most vulnerable populations and systems are being disproportionately affected by the rise in weather and climate extremes.

Introduction

- While Africa has contributed among the least to greenhouse gas emissions, it is a primary casualty of the resulting damage.
- The continent is experiencing losses attributable to climate change, e.g., biodiversity loss, water shortages, reduced food production, loss of lives and reduced economic growth (IPCC, 2022).
- While Uganda's climatic landscape is moderate, it has also been experiencing frequent and severe extreme weather events.

Floods

- Episodes of erratic rainfall have led to busting of river banks, mudslides and landslides causing human and economic losses in the highlands.
- In the low lands, floods exert the same of extent of damage.
- The damage from natural disasters has caused deaths and economic losses that run in millions of dollars (World Bank, 2021).

Figure: A young girl draws water from a flooded river in Western Uganda. (Source: **World Bank, 2021**)

Drought

- Agriculture is under threat due to frequent episodes of drought.
- Employment, income, food security and nutrition are at stake.

Figure: A withered maize garden in Otuke District, Northern Uganda (Source: **The Independent Publication, 2021**).

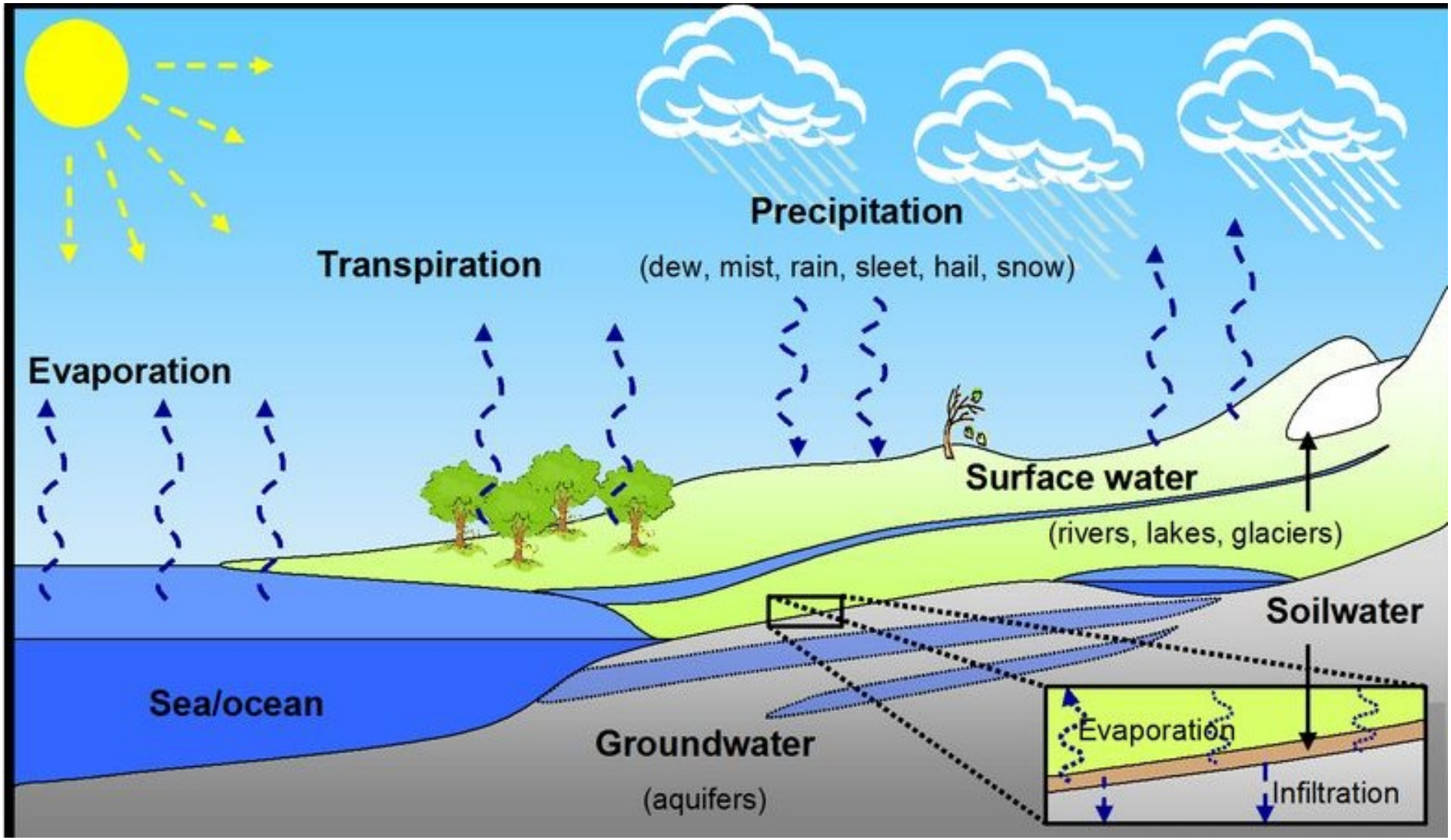
Danger from these extremes is real..

- Severe drought conditions between 2010 and 2011 caused an estimated loss of US$1.2 billion, (equivalent to 7.5% of Uganda's 2010 GDP).
- The most drought-prone areas lie in the cattle corridor spanning Western, Central to mid Northern and Eastern Uganda.
- Environmental degradation, weak irrigation infrastructure, and the weak disaster preparedness safetynets are key contributory factors to increasing drought risk.
- Cognizant of the looming danger, Uganda has made proactive in identifying and addressing climate risks to its development, i.e., developing a National Climate Change Policy (NCCP).
- The NCCP seeks to ensure a harmonized and coordinated approach towards a climate-resilient and low-carbon development path for sustainable development.

Any public policy measures to arrest the situation?

- The COVID-19 pandemic had implications for climate action including a delay of development of the Climate Change Bill, enhancement of the Nationally Determined Contributions among other issues.
- The pandemic resulted in the re-alignment of public expenditure. This affected the financing of interventions to enhance resilience, restoration of degraded and protected ecosystems.
- However, commitment to ensure that the economy is climate resilient ramain a major focus of public policy through several measures.
- In an executive message to the MWE (April 2020), the President highlighted the suicidal implications of human activity in wetlands, steep mountain ridges, shorelines, and river banks.
- Measures to rid the fragile ecosystems of wanton destruction exist. With the creation of an environmental police unit, this is expected to remain a permanent surveillance exercise.

How is the economy & climate linked?The Hydrological Cycle



And Uganda's climatic landscape?

- Uganda is located in East Africa at latitude of $1°30'S - 4°N$ and $29°30'E - 34°E$ on the East African Plateau. Its climate is tropical, but is moderated by its high altitude.
- Temperature varies little throughout the year. Average temperatures in the coolest regions of the south-west remain below $20°C$, and reach $25°C$ in the warmest, northern most parts.
- The annual rainfall varies from $500 - 2800mm$, with an average of $1180mm$ (NEMA, 2008).
- Seasonal rainfall in Uganda is driven mainly by the migration of the Inter-Tropical Convergence Zone's (ITCZ) relatively narrow belt of very low pressure and heavy precipitation that forms near the equator.

- The ITCZ movement has creates two rainfall regimes in Uganda (a Unimodal rainfall regime for areas way from the Equator, and a Bimodal rainfall regime for areas near from the Equator).
- Bimodal rainfall regime (i.e., the first rains within March–May and the second rains during September–November).
- In northern Uganda, the period between the first season and the onset of the second season is short, causing it a unimodal rainfall regime.
- The unimodal rainfall regime experiences three cropping seasons, March-May (MAM); June-August (JJA) and September-November (SON).
- With climate change however, the on-set and cessation of the afore-mentioned seasons is increasingly becoming unpredictable.

Current climate trends

- **Temperature**
  1. Mean annual temperature has increased by $1.3^{\circ}C$ since 1960, an average rate of $0.28^{\circ}C$ per decade.
  2. Significant increases in the frequency of hot days, and much larger increases in the frequency of hot nights.

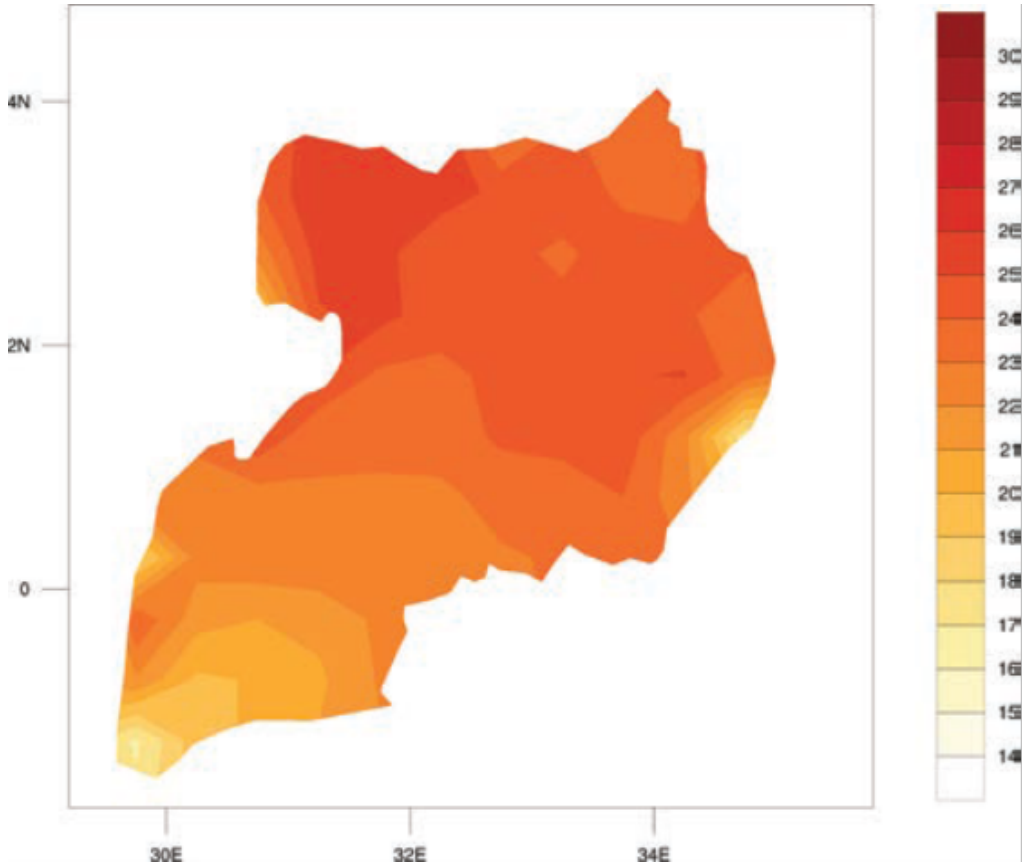


Figure: Average annual temperature, 1991–2021 (Source:**World Bank, 2021**).

Precipitation

1. Annual rainfall is decreasing especially the March-May (MAM) season.
2. MAM rainfall have decreased by $6.0mm$ per month per decade (4.7%).

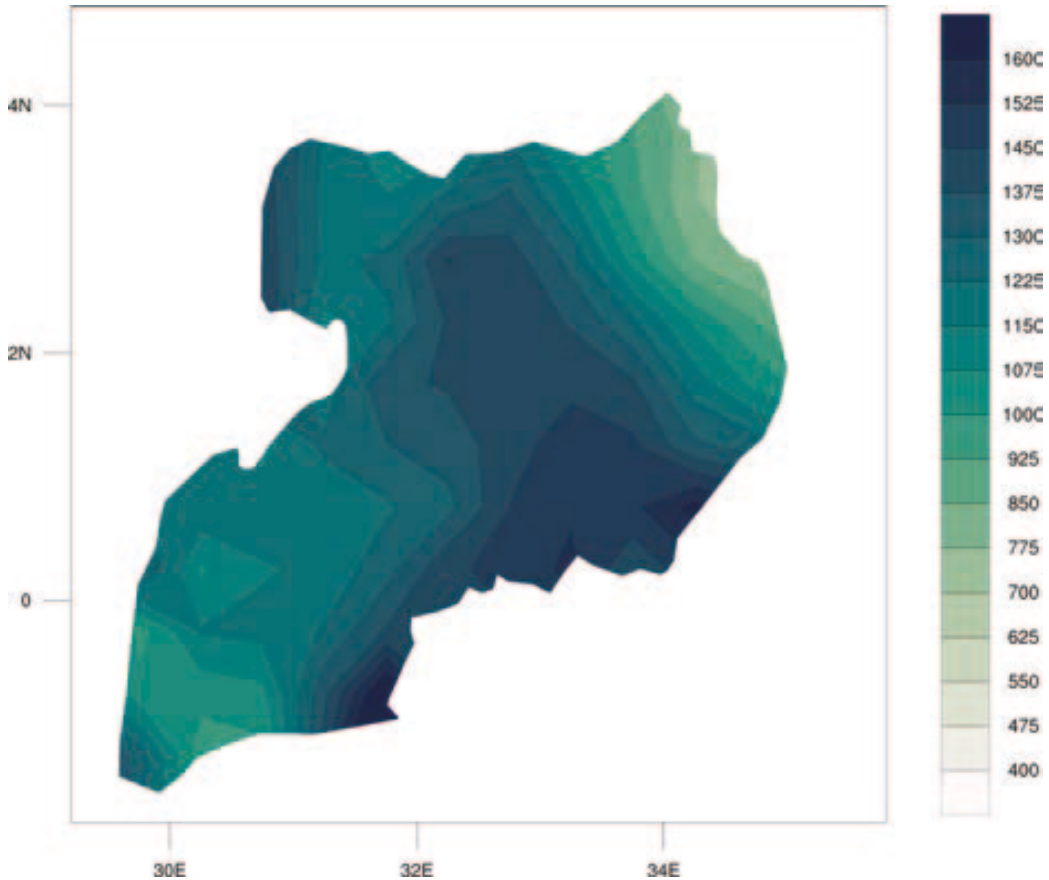


Figure: Average annual rainfall, 1991–2021 (Source: **World Bank, 2021**).

What does the future have in stock? **What studies say...**

- **Temperature**
  1. Average annual temperature is projected to rise by $1.0 - 3.1^{\circ}C$ by the 2060s, and $1.4 - 3.7^{\circ}C$ by the 2090s. **More hot days and droughts ahead...**
  2. All projections indicate few cases of 'cold' days and nights.

- **Rainfall**
  1. Average rainfall will increase in annual rainfall. **More and more floods in the future?...**
  2. **Note:** The key issue is timing (i.e., outset and cessation) which is the key determinant of plant growth, yields, post-harvest activity etc.

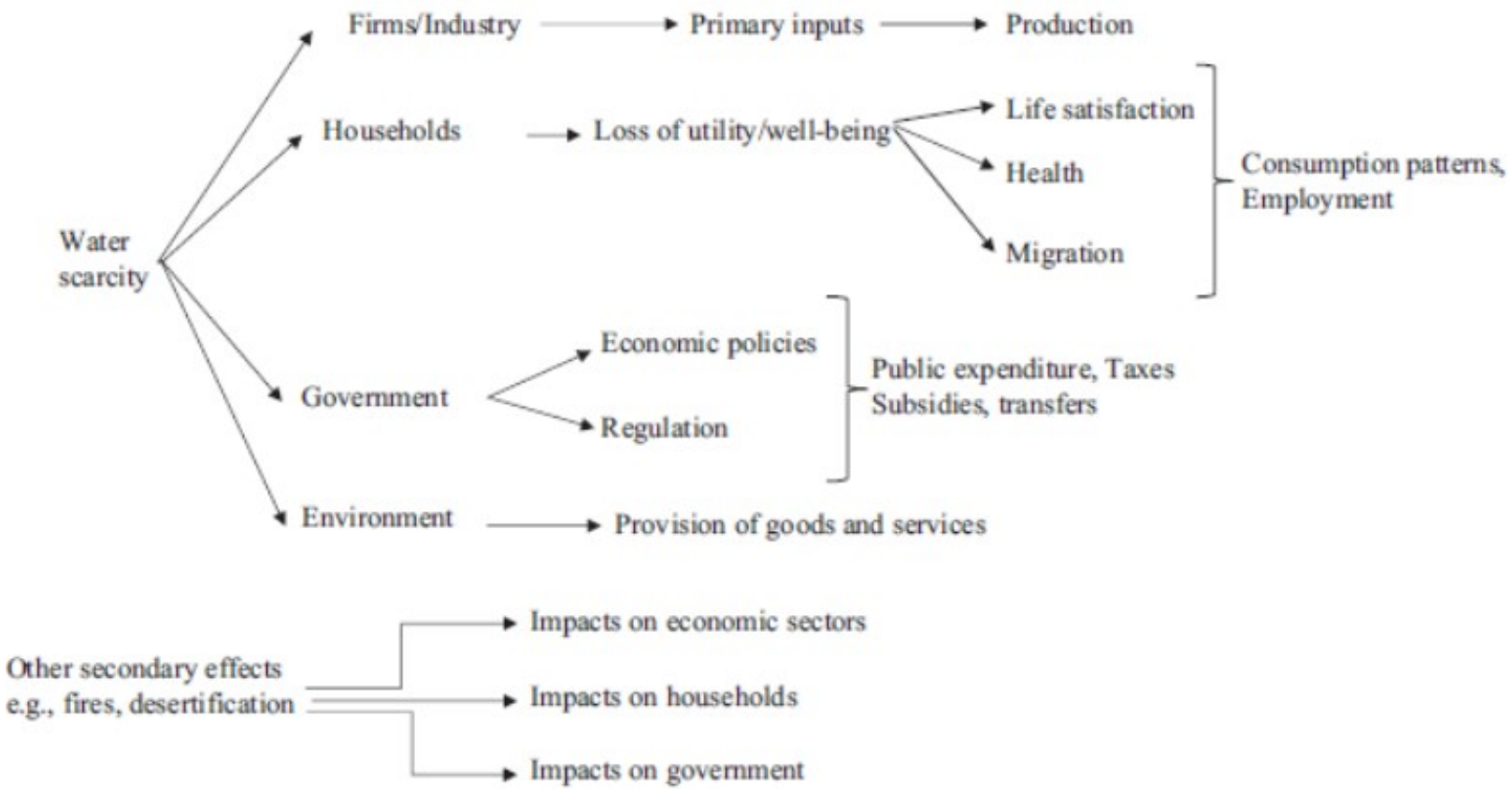
CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Annual Temperature Anomaly (°C)	**+0.6 to +1.5** (+1.0°C)	**+1.2 to +2.5** (+1.8°C)	**+1.9 to +3.9** (+2.8°C)	**+2.6 to +5.2** (+3.7°C)
Annual Precipitation Anomaly (mm)	**−23.5 to +25.9** (+1.4 mm)	**−25.9 to +32.5** (+2.9 mm)	**−26.5 to +45.1** (+7.37 mm)	**−26.0 to +63.1** (+13.6 mm)

Figure: Projections of rainfall and temperature, 2020–2099 (Source: **World Bank, 2021**).

Then.. our own analysis of the economic impacts

- The pathways through which climatic extremes impact the economy are many. However, the primary trigger is loss in production.

Conceptual framework



How are the impacts on the economy analyzed??

- A negative productivity shock was imposed.
- Many ways we do this; here, I present two:
  1. A reduction in productivity of factors of production in rainfall dependent sectors, e.g., agriculture.
  2. A partial and temporary closure of industries that depend on agricultural inputs.
- In our analysis, the figures used were obtained from scientific studies of different temperature and rainfall scenarios.
- Analysis of the impact on non-agricultural sectors was done by reducing capital utilisation in those sectors as they respond to a drought.

What we find?

- Drought causes GDP to decline by 4.59%. It lowers productivity across various agricultural industries.
- Reduction in agriculture leads to a shutdown of capital in the agric-dependent sectors.
- Given sticky real wages and fixed capital stock, the loss in GDP is due to reduced employment, and reduced use of capital.
- Employment declines by 5.1%. A decline in employment can imply higher job losses, induced by the agricultural sector productivity losses.
- Household consumption declines by 4.61%, underscoring the welfare impact of a drought.

What we found at a macro level

Macroeconomic results (% change deviation from the Baseline)

Variable description	Percentage change
Aggregate employment	-5.12
Inflation	1.31
Exports prices	2.67
Exports	-5.20
Imports	-0.24
Real GDP	-5.01
Aggregate primary factor use	-2.86
Real household consumption	-4.61

Source: Author's computations.

And at sector level???

- Agriculture suffers as expected.
- Agriculture dependent sectors suffer as well...
- The loss in employment is somewhat minimal.
- **Note:** Changes in employment have a direct impact on household welfare via household income.
- Household welfare is also affected by the resulting inflation.

A call for more action

- Public policy must focus on measures to cope with the climate extremes and also improve the level of preparedness.e.g.,
- Development of **infrastructure to store and supply reliable water for production, and drainage infrastructure in flood prone areas.**
- Jealous protection, conservation and rejuvination of the dwindling ecosystems which have suffered due to weakly regulated human activity. **Green financing and increased environmental regulation.**
- The forest cover is nearly facing irrevisible damage. **Implication: You are messing up of the water cycle!**
- **Re-greening the country's landscape** has twin benefits: **carbon trading** and **maintaining the hydrological cycle.**
- Proactive development and use of **improved crop varieties, livestock, soil conservation methods**.

Thank you