Water-Energy-Food (WEF) Nexus of India

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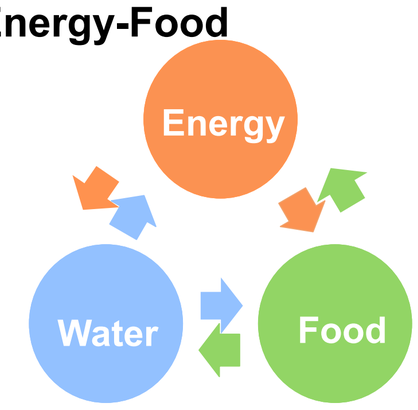
INTRODUCTION

Nexus

A ***nexus*** refers to a connection, link, or relationship between different elements or systems.

Water-Energy-Food Nexus



- The ***Water-Energy-Food (WEF) Nexus*** is an integrated approach to managing and understanding the interconnections and interdependencies between water, energy, and food systems
- "The WEF Nexus seeks to achieve water, energy, and food security simultaneously while ensuring environmental sustainability and minimizing conflicts among resource users" (GWP).
- "The Water-Energy-Food Nexus is a conceptual framework that helps identify trade-offs and synergies between the management of water, energy, and food resources, ensuring that no sector is prioritized at the expense of others."

The ***Water-Energy-Food (WEF) Nexus Index*** is a composite indicator that evaluates the interconnections between water, energy, and food resources across nations

NEED

- Understanding the WEF nexus ***spatially at the National level.***
- There have been very ***limited studies*** done on the National level.
- Need for sustainable and climate adaption ***resource management***
- ***Lack of practicality*** in implementation of Framework

Issue

Global Status

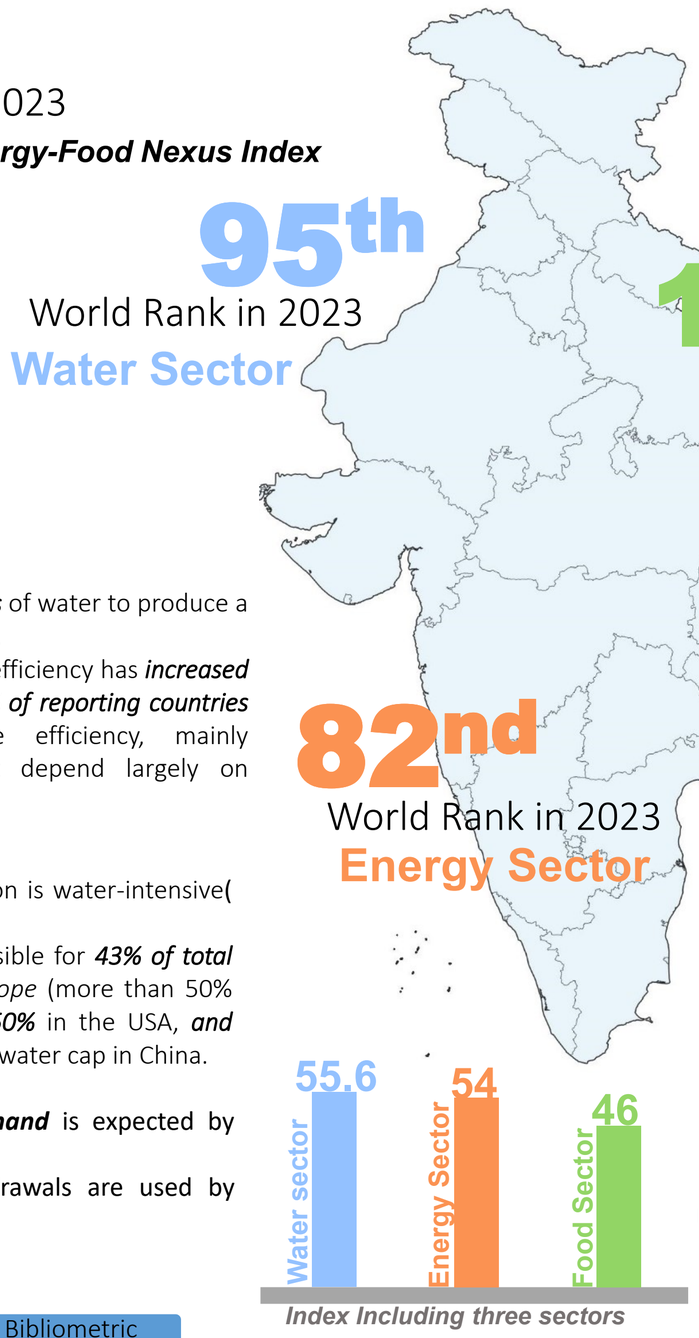
115th World Rank in 2023

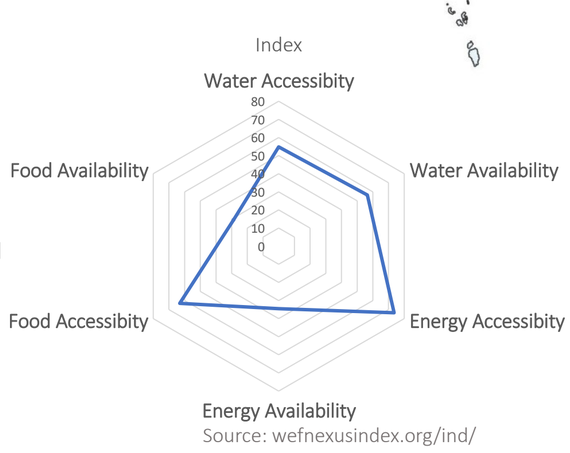
Water-Energy-Food Nexus Index

- Today, it ***takes 2,000-5,000 liters*** of water to produce a person's daily food (FAO 2020).
- From 2015 to 2021 water-use efficiency has ***increased by 20% globally***, however***, 58% of reporting countries*** still exhibit low water-use efficiency, mainly representing economies that depend largely on agriculture. (UN-Water,2024).

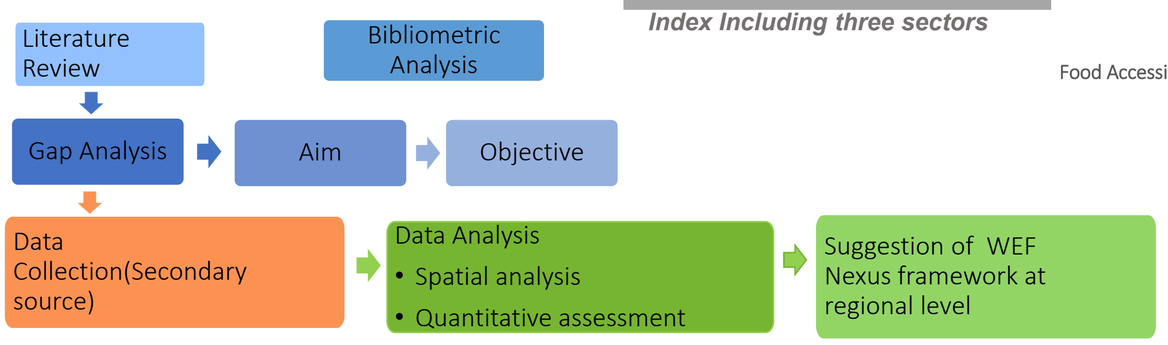
- ***90% of global*** power generation is water-intensive(UN-Water)
- Power plant cooling is responsible for ***43% of total freshwater*** *withdrawals in Europe* (more than 50% in several countries), nearly ***50%*** in the USA, ***and more than 10%*** of the national water cap in China.

- A ***50% increase in food demand*** is expected by 2050.
- 72% of all freshwater withdrawals are used by agriculture(FAO)





Research Methodology



Water

Cause

Unsustainable Water Management And Scarcity

- Over usages/exploitation of water
  - Unstable groundwater pumping
  - Unsustainable use of water in urban.
- Water Pollution
  - Industrial discharge
  - Agriculture runoff
  - Untreated sewage contaminating freshwater
- Climate change
  - Altered rainfall pattern
  - Snowmelt
  - Increased droughts impacting water availability.

Energy

Cause

Reliance on Non-Renewable Sources

- Dependence on fossil fuel
  - Heavy reliance on coal, oil and Natural gas.
- Inefficient energy system
  - Outdated technologies
  - Lack of Energy efficient practices.
- Increasing high energy demand
  - Population growth and Industrialization escalate energy demands.

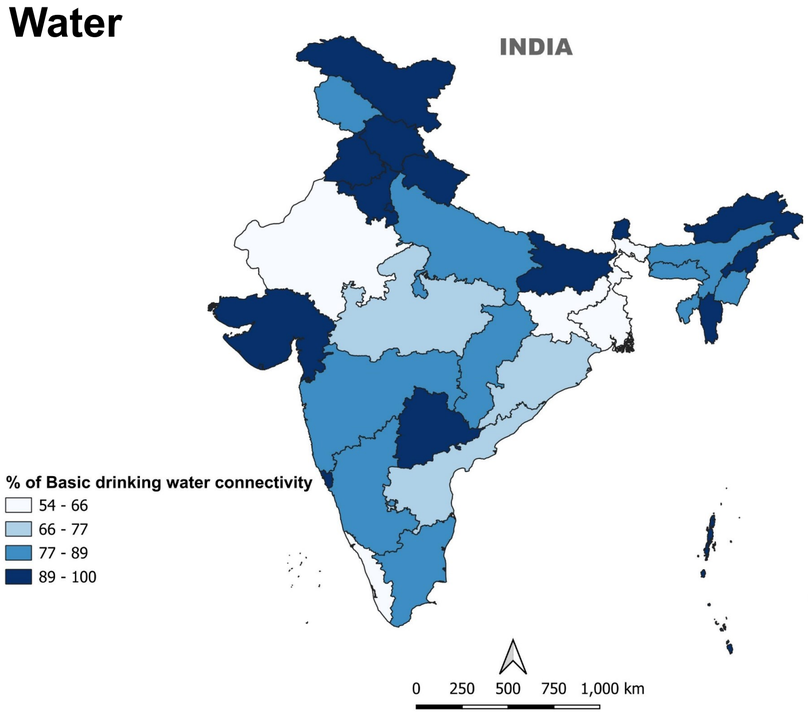
Food

Cause

Food security and unsustainable agriculture

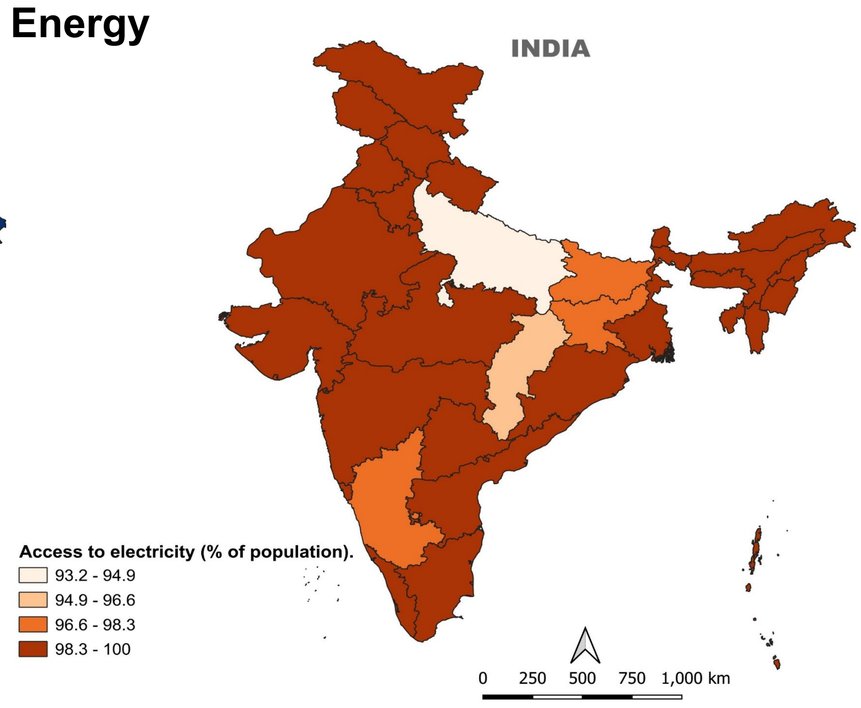
- Low agricultural productivity
  - Degraded soil quality affects crop yield.
  - Overreliance on mono-cropping affects soil fertility
- Economic Barriers
  - High food prices reducing affordability
  - Limited market access smallholder farmer
- Social and Policy Gaps
  - Inadequate food distribution system
  - Inadequate farmer education on sustainable practices

Water



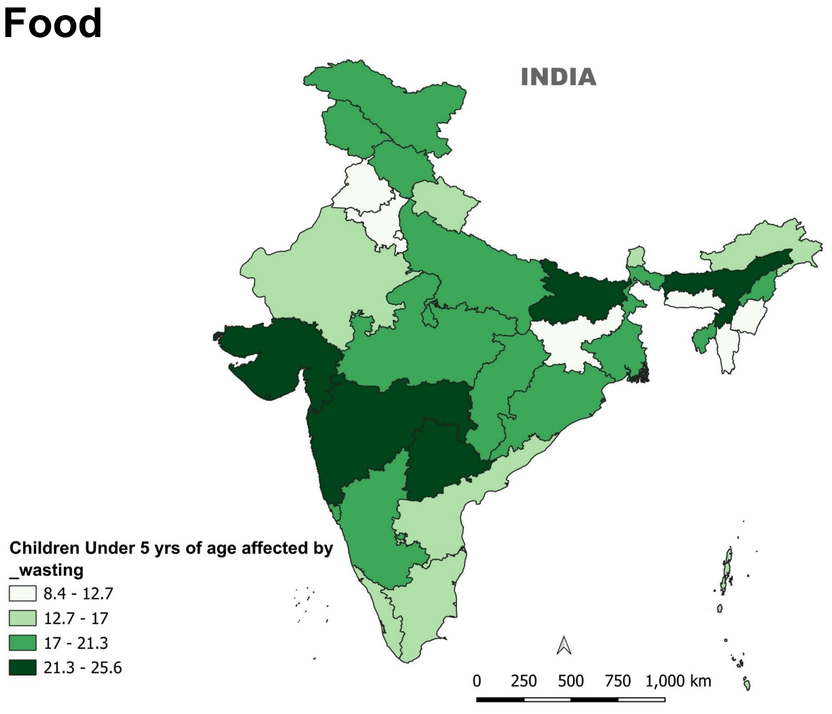
Map: Basic water connectivity (%)

Energy



Map: Electricity connectivity (%)

Food



Map: % of children under 5 yrs of age affected by wasting

Inferences

6 States/UTs have below 75% of HH tap water connectivity
States Kerala has a minimum HH tap water connectivity compared to other states.

7 States/UTs are yet to achieve 100% HH electricity connection
State Uttar Pradesh has a minimum HH electricity connection compared to other states.

States like Bihar, Gujarat, Maharashtra, Jharkhand, and Assam have children under 5yrs who are most vulnerable due to wasting

Way-Forward

- Further study focuses on other sub-parameters and comparative analysis and spatial analysis of States of India
- Correlation & Regression of studied parameters.
- Proposing WEF Nexus framework at regional level.

Global South Academic Conclave on WASH and Climate 2025

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