

*“We are witnessing something unprecedented: Water no longer flows downhill. It flows towards money” (Robert F. Kennedy Jr.)*

## MOTIVATION



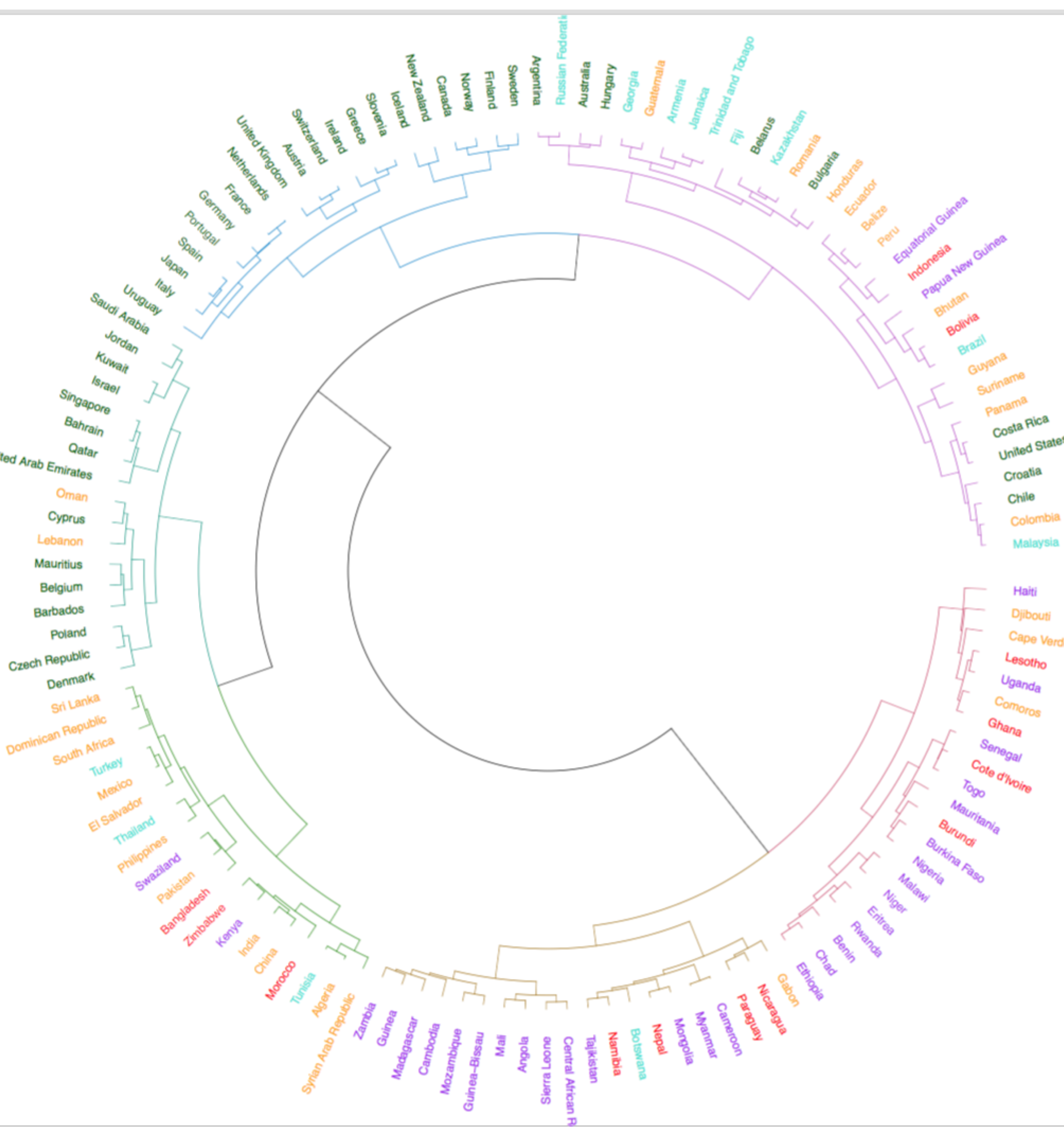
## Water Poverty Index

**Water Poverty Index:** A holistic water management tool to measure water stress at the household and community levels, designed to aid national decision makers, at community and central government level to determine priority needs for interventions in the water sector.

### Five components:

- Resources – physical availability of water (quantity and quality)
- Access – extent of human access to water
- Capacity – effectiveness of water management
- Use – ways in which water is used (domestic, agricultural, etc.)
- Environment – evaluation of environmental integrity of water

## Clustering

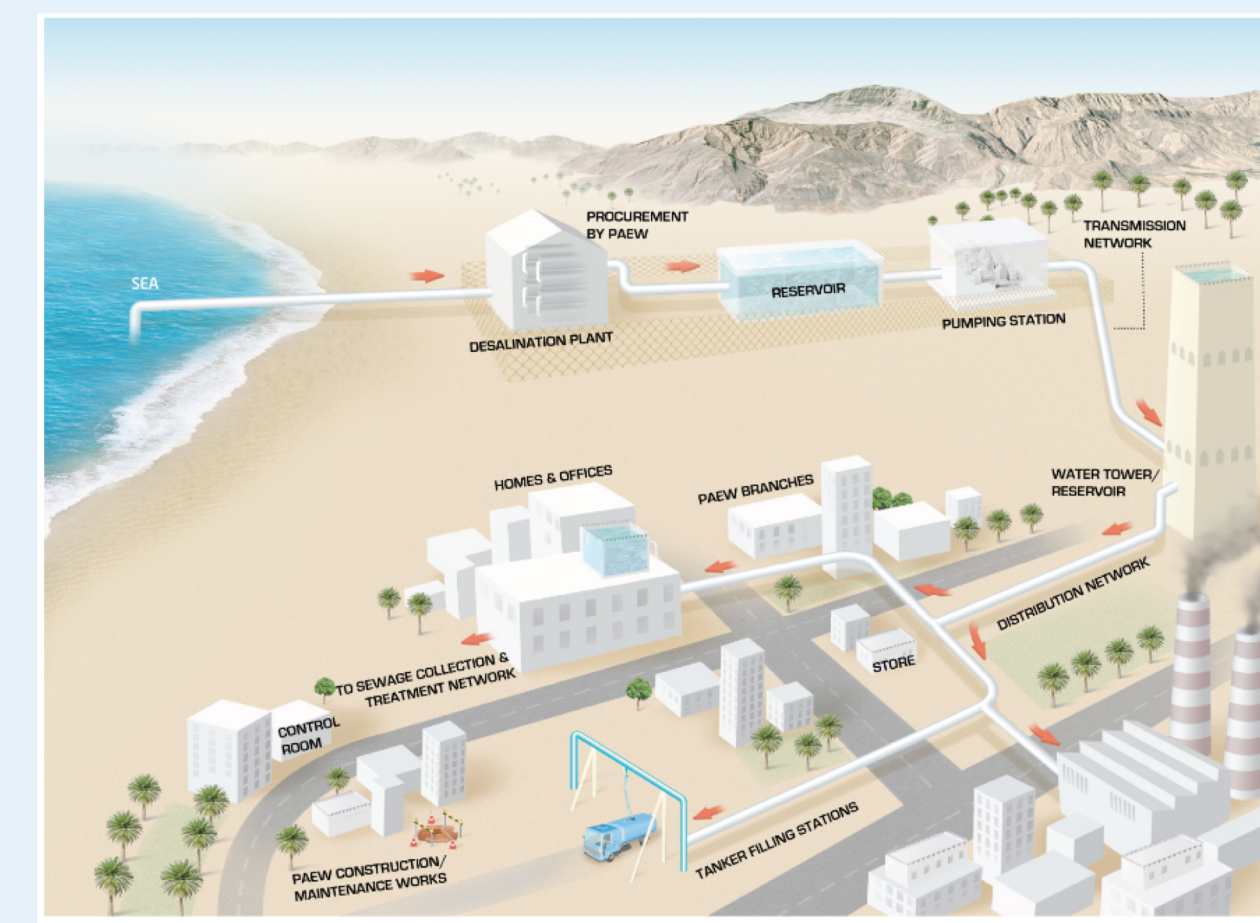


## Clusters of countries

### GROUP 1:

- Arid
- Wealthy (OPEC nations)
- Groundwater depletion has been replaced by desalination
- Centralized water authorities manage and apportion all water use

### Oman's distribution network:

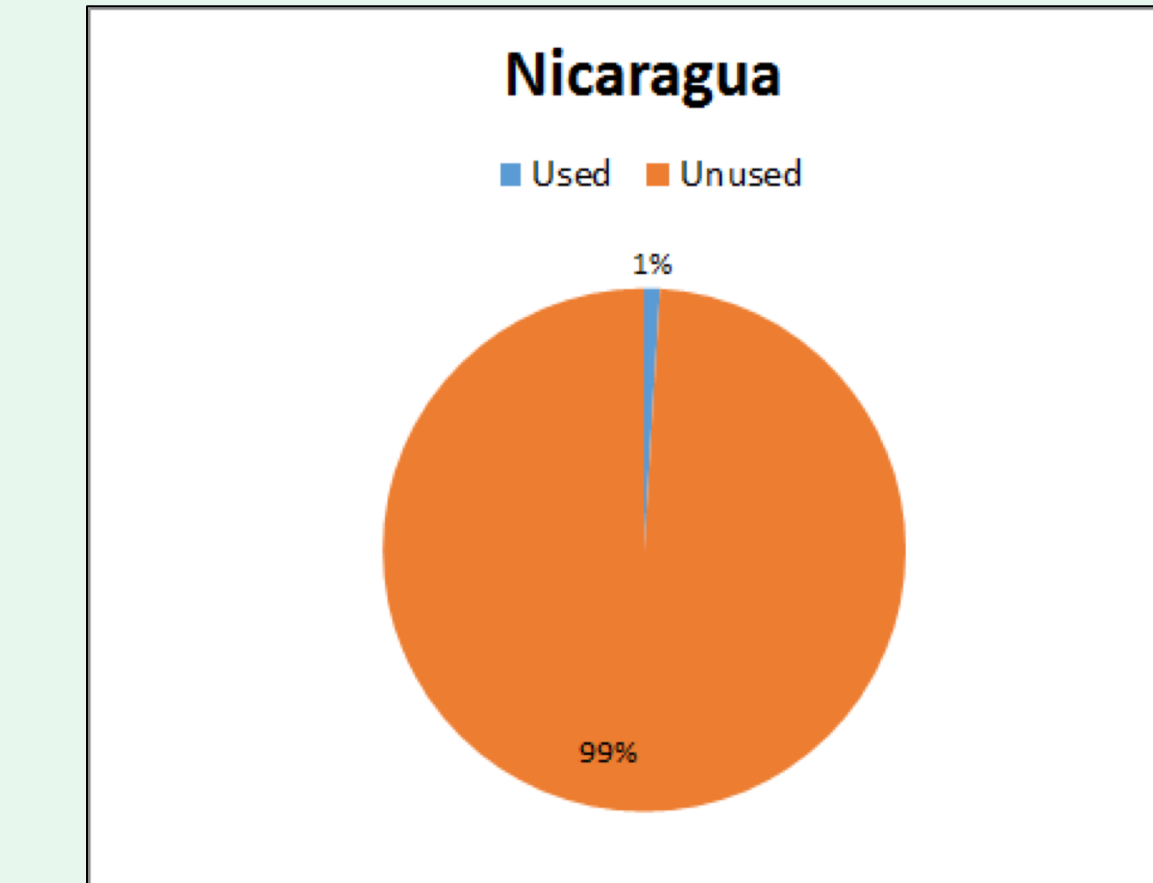
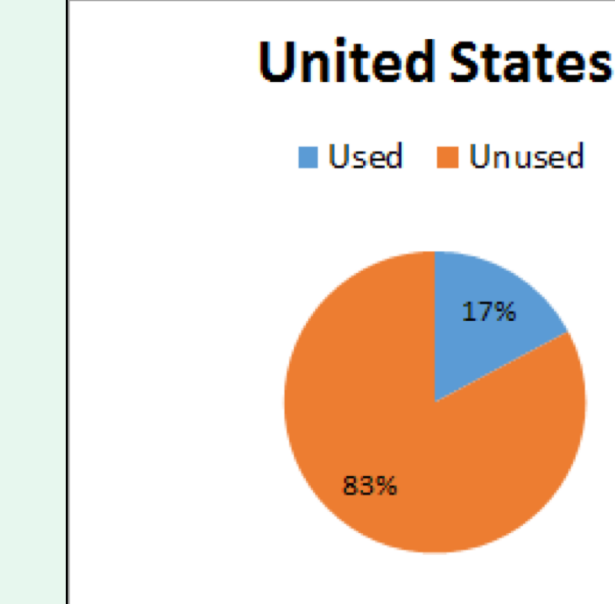


<https://www.paew.gov.om/About-your-water/How-do-we-produce-water>

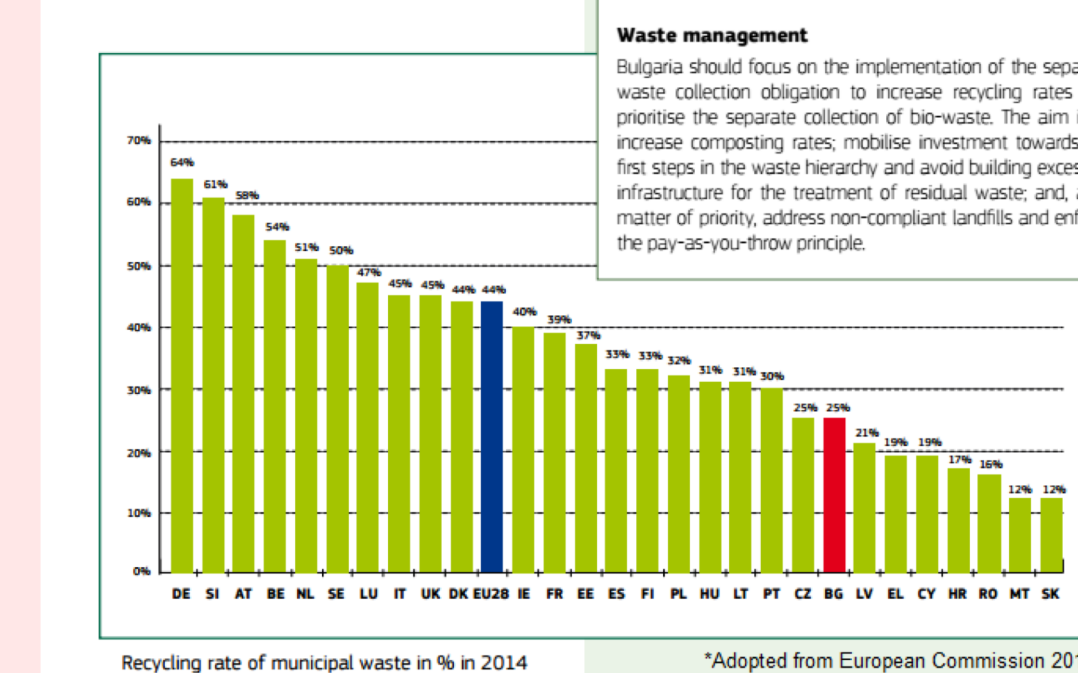
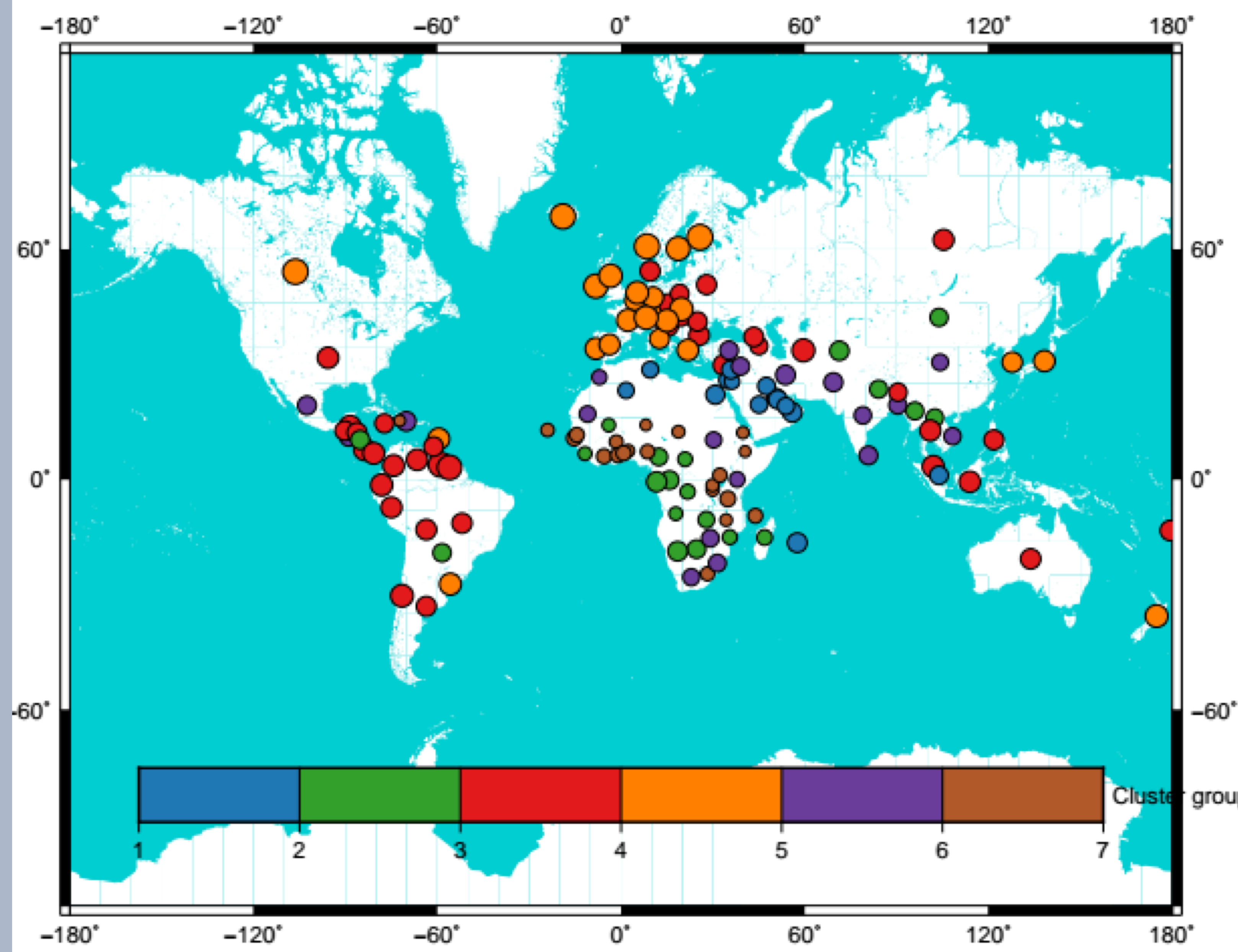
### GROUP 2:

- Highest rainfall of all groups
- Little access to water
- Located around the equator
- Decentralized water distribution networks are common

### Freshwater Usage Per Capita



## Worldmap of Water Poverty Index



### GROUP 3:

- Largely based in South America and Eastern Europe
- “Middling” water quality and often high water use
- Rural areas may be underserved
- Urban infrastructure is often antiquated and stressed

### Case Study: Bulgaria

- Less than 50% of natural bodies of water are ecologically sound
- Inconsistent water monitoring and quality control
- Problems with lead, arsenic, mercury, cadmium, and nitrates

### GROUP 4:

- Largest WPI
- Water is treated and managed fairly and efficiently
- Most gender equal and produce the least waste
- Almost all western European

### Case Study: Netherlands

**Water resources:** 60% from groundwater, 40% from surface water  
**Gender equality:** Embedded in Dutch law. It has better gender equality than most of the other countries.  
**Waste management:** Far ahead of EU policies in waste management and have more or less influenced the European policies

### Case Study: Uganda

#### Water Quality and Access

- 8 million people (of 34 million total) lack access to “improved water”
- Only wealthy, urban areas have water infrastructure

#### Gender Equity

- domestic violence against women due to economic hardship is common
- Female employment outside of the home can be frowned upon

### GROUP 6:

- Scarce water resources
- Low access to drinking water
- Located mostly in Sub-saharan Africa
- Low GDP and little to no centralized water infrastructure



Water storage tank installed in a rural village in Uganda.  
<http://water.org/post-p/catching-rain/>

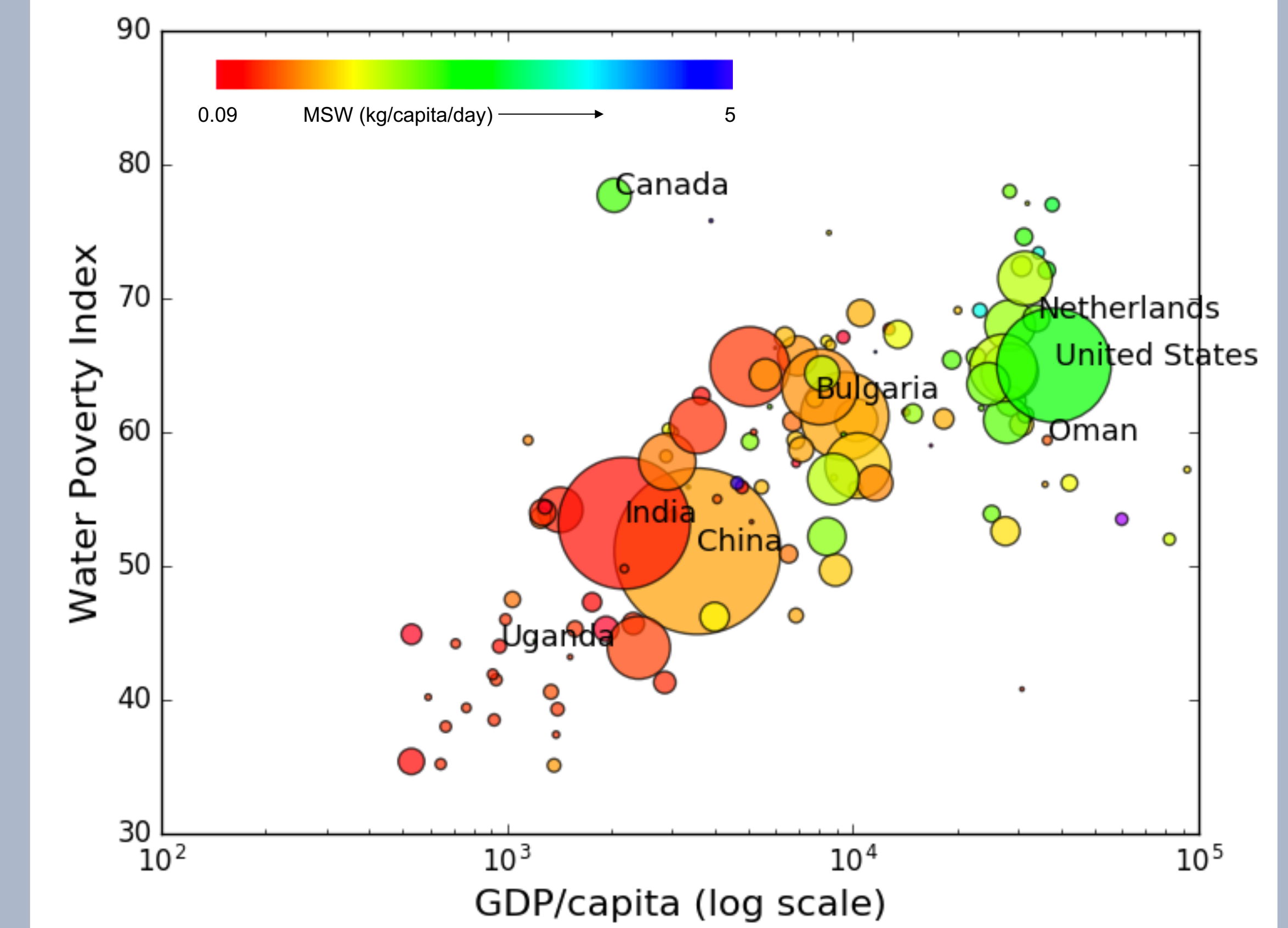
### GROUP 5:

- Primarily developing nations
- Water pollution may be serious in some areas
- Countries dispersed across South Asia, Africa, and Central America

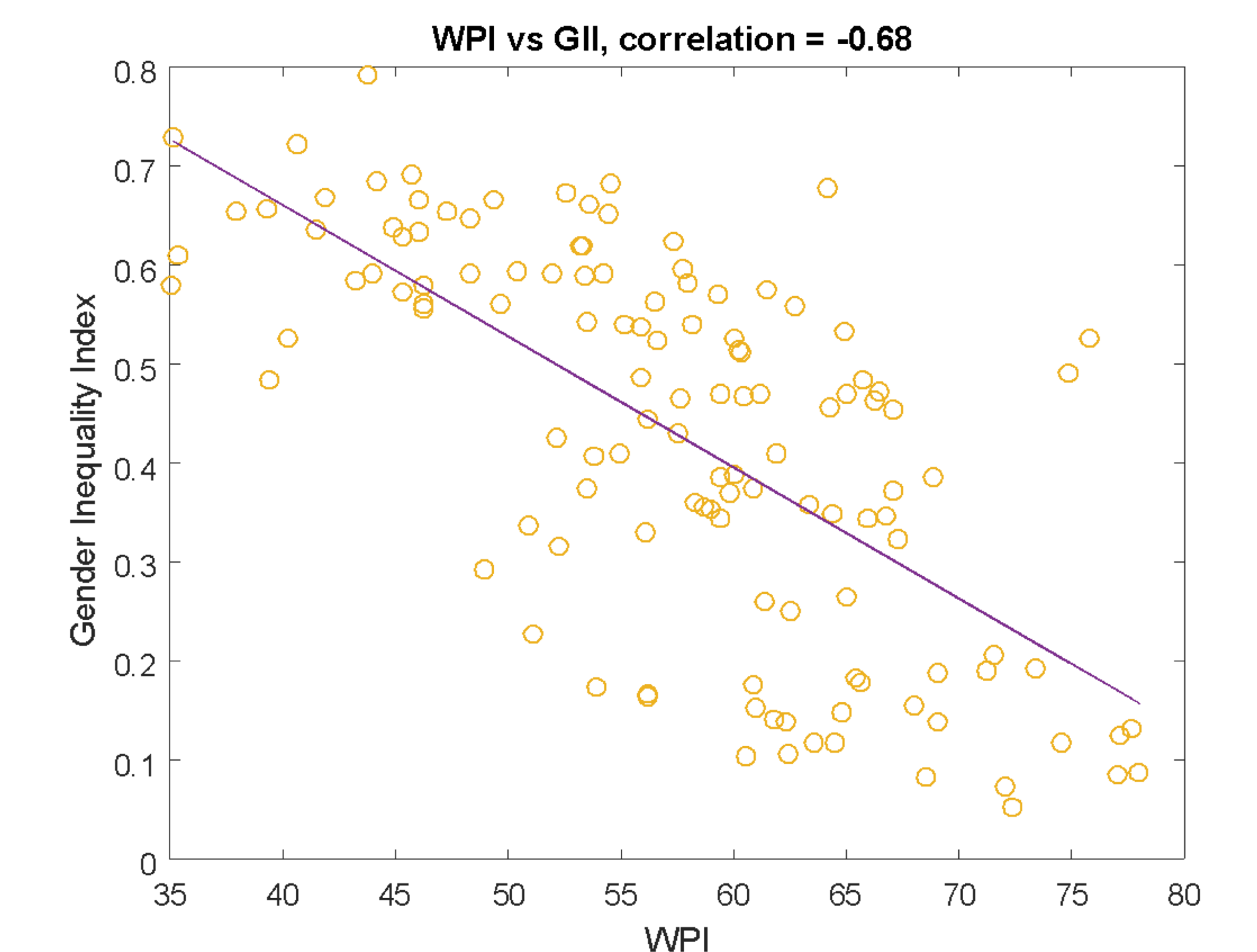
### Case Study: China

**Water resources:** Water shortage and pollution are very serious. A large number of people are lacking access to clean water although it is being improved in parallel with economic growth.  
**Water management:** The responsibility for dealing with water is split between several agencies within the government.  
**Gender equality:** medium  
**Waste management:** Rapid increase in waste generation. Critical solid waste management issues

## Correlation with Mean Solid Waste



## Correlation with Gender inequality



## Conclusion

- Countries cluster well into six classes of water poverty or richness
- Many countries (Group 2) in equatorial regions have adequate freshwater resources but lack the developed infrastructure
- Other countries (Group 3) have sufficient water and economic resources, but mismanage or neglect infrastructure
- Centralized infrastructure is associated with better water security

**Future work:** Are successful water investment strategies transferable across groups?