

**Climate Variability and Its Impacts on Water,  
Energy and Food Systems in South Asia:**  
*Adaptive Water Management Approaches within  
the Framework of IWRM*

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# Rationale

- There is a vast literature now available on the theoretical and empirical aspects of climate change, and adaptation, particularly on the use of IWRM approaches.
- In Asia-Pacific region, climate variability is also a serious a challenge, causing droughts and floods, resulting in vast devastations of human, social and natural capital.
- Literature is available on the theoretical and empirical aspects of climate variability at the national and sub-national level for countries like India, but scanty
- An analysis of the nature and degree of variability in various climate parameters in different regions could help understand how they interact in a climate system. **This is a new area for water resource professionals working on climate related issues**

# Rationale: continued...

- There is limited knowledge of the impact of climate change on hydrology and water resources specific to river basins--the available knowledge is based on simulation models.
- Most river basins in arid tropics experience very high variability in climate parameters
- **An understanding of hydrological changes resulting from climate variability in such regions can provide strong leads on the kind of impacts climate change can induce on water resources**
- Far less is understood about how the climate induced impacts on water resources affect the energy and food systems. Droughts and floods adversely impacts food production through crop failures and damage to crops
- They cause food shortages, and affects nutritional security for hundreds of millions of poor farm households

# Rationale: continued...

- Demand for energy in rural areas increase manifold during droughts. Hydropower production declines during droughts. Availability of biomass, a key energy source for rural areas, is affected by water availability.
- The understanding of socio-economic, gender and environmental impacts of climate variability is very generic, and is not grounded on robust field evidence.
- **The impact of climate variability or change on communities would vary across regions**, owing to the differences in physical environment, socio-economic system characteristics, cultural settings and the institutional and policy regimes

# Rationale: continued...

- Unless we know how the communities are going to be affected by different types of climate shocks, effective strategies for adaptation are unlikely to come forth
- As regards adaptation, there is a growing body of literature on adaptive water management in the context of climate change. But, the issue is that they are too generic to be applied to any specific context.
- In South Asia region, the water systems are very complex. Many water supply systems (sources) are private and decentralized.
- Several of the technological options which are generally applied to formal and centralized water supply would fail, due to the unfavourable institutional and policy framework. Economic viability and financial feasibility is also an issue

# Rationale: continued..

- **As regards market instruments for demand management**, poor monitoring and weak enforcement of legal and regulatory framework reduce their effectiveness. Political acceptability of instruments such as pricing of water is an issue. So, the viable alternatives need to be explored
- In many developed countries, there are institutions responsible for water resource management and inter-sectoral water allocation. Well defined water rights exist for groundwater and surface water, recognized by national or provincial laws.
- The capacities of line agencies in water also vary widely between developed countries and developing countries of South Asia. **Hence, alternative institutional models which fit the socio-ecological and institutional and policy context need to be explored**

# Project Objectives

- The objective of the manual is to create a South Asia level platform for informed debate on the ways to reduce the vulnerability of the region's water, energy and food systems to the impacts of climate variability. The specific objectives are to have an informed debate on the following:
  - ❖ How climate variability impacts on water resources and the manner in which they affect the water, energy and food systems
  - ❖ Their impact on the socio-economic systems, particularly the poor and the vulnerable sections
  - ❖ The adaptive water management approaches in the larger framework of IWRM that would mitigate these impacts.

# Scope and content

- ❖ Development of a conceptual framework to analyze the impact of climate change and variability on water, food and energy systems in the South Asian context.
- ❖ Present state of the art knowledge on climate variability in South Asia for the range of climate variables, and the impact of climate variability on hydrology and water resources in the country, using empirical analysis of macro and micro level data
- ❖ Illustrate the impact of climate variability on water supplies, energy systems and food production in South Asia, with empirical analysis of micro and macro level data

# Scope and content

- ❖ Analysis of the socio-economic and health consequences of extreme hydrological events, particularly droughts & floods
- ❖ Analysis of the impacts of climate variability on women, poor and other vulnerable sections of the community
- ❖ Technological strategies for adaptive water management which are capable of internalizing the negative implications of climate variability on water supplies and demand for water in the key water-demanding sectors of the economy
- ❖ Institutional interventions and economic instruments for adaptive water management for water, food and energy security in South Asia

# The modules

- **Module 1:** Variability in the Range of Climate Parameters for South Asia and its Impacts on Hydrology and Water Resources
- **Module 2:** Conceptual framework for analyzing the impact of climate variability on water, energy and food systems in distinct typologies of South Asia
- **Module 3:** Impact of Climate Variability on Water, Energy and Food Systems in South Asia
- **Module 4:** Socio-economic and Health Impacts of Climate Variability, particularly Droughts and Floods in South Asia
- **Module 5:** Impacts of Droughts and Floods on Women, Poor and Vulnerable Sections of the Community
- **Module 6:** Technological Strategies for Adaptive Water Management within the framework of IWRM for mitigating the Impacts of Climate Variability
- **Module 7:** institutional alternatives and economic/fiscal instruments for adaptive water management for water, energy and food security in South Asian region

# Knowledge Gaps

- ❖ Data on impact of climate variability on water resources-- stream flows, groundwater recharge etc. in Nepal, Bangladesh, Pakistan, Afghanistan, Sri Lanka
- ❖ Impacts of climate variability (droughts for instance) on energy systems--hydropower generation; energy demand in agriculture
- ❖ Socio-economic impacts of droughts in Pakistan, Sri Lanka etc.--impact on domestic food security, health, nutrition
- ❖ Socio-economic impact of floods in Bangladesh; adaptation to floods