## **Climate Change Adaptation in Rural Social Ecological System**

Rishiraj Dutta Space Application Section ICT and Disaster Risk Reduction Division United Nations Economic and Social Commission for Asia and the Pacific



## **Session Objectives**

# Upon completing this session, you should be able to:

- Explain the <u>interaction</u> between components of a socialecological system and CC
- Describe potential climate change impacts on the system
- Discuss various <u>adaptive</u> <u>measures</u> that can be taken at community adaptation in rural contexts

## **Definition - Social-Ecological System**

A socio-ecological system can be defined as:

- A <u>coherent system</u> of biophysical and social factors that regularly interact in a resilient, sustained manner;
- A system that is <u>defined at several spatial, temporal, and</u> <u>organisational scales</u>, which may be hierarchically linked;
- A set of <u>critical resources</u> (natural, socioeconomic, and cultural) whose flow and use is regulated by a combination of ecological and social systems; and
- A perpetually <u>dynamic</u>, <u>complex</u> system with <u>continuous adaptation</u>.

- Social-ecological systems - linked systems of people and nature
- Humans are part of nature
- Delineation between social and ecological systems is artificial and arbitrary



### Learning through a Case from Agriculture Sector

## Livelihood Adaptation to Climate Change (LACC)

- Develop a <u>methodology</u> to transform climate change impact modelling into livelihood adaptation practices
- Strengthen <u>institutional structures</u> to handle climate change adaptation
- Initiate and facilitate the <u>field testing with</u> <u>farmers</u> of livelihood adaptation strategies









## **Eco-systems Considered**

#### **Drought Prone Areas**



## **Key Strategy**



## **Assessing Vulnerability**

## One can, actually, visualize the situation ......



High evaporation rate and temperature

High agricultural drought and dryness



## Local Perceptions –1 On climate variability

- Current climate is <u>behaving differently</u> from the past years. The past climate condition was better (says the elderly people).
- Seasonal cycle (locally called *rhituchakra*) has changed from the past. Where it used to be 6 distinct seasons in the past but now its almost 3 or 4 seasons observed distinctly in a year.
- Climatic conditions have changed due to the <u>God's will</u> (*khodar ichay*) and the cure – the rainfall is in the <u>God's hand</u> (*akasher pani allar haatey*).
- The average temperature in the area has changed. People feel that <u>summer time heat increased</u> and the <u>winter has become shorter</u> and in some winter days <u>cold became severe</u>.

### Local Perceptions –2 On drought situation

- People's perceptions on drought are equated to:
  - a) dryness (locally known as shukna),
  - **b)** consecutive non-rainy days (locally known as ana-bristi),
- Drought is <u>more frequent</u> now than before.
- Prevalence of <u>pest and disease incidence increased</u> and largely associated with HYV rice.
- With adoption of HYV rice the production increased but due to climatic variability adverse impact of drought causes <u>yield reduction</u>.
- Vegetable and fruits (Mango varieties) remain affected due to variations in rain, temperature and drought situations.

## **Risks and Vulnerabilities**

Both types of factors: climatic & non-climatic factors emerged.



Climatic



## **Profiling of Livelihood Groups**



'Non' or 'least' vulnerable groups Large Businessmen

Large Farmers

## **Assessing Future Climatic Risks**

## **Making Synergy of What is Anticipated**

Year	Mean Temperature Change (°C)			Mean Precipitation Change (%)			Sea Level Rise		
	Annual	DJF	JJA	Annual	DJF	JJA	IPCC (Upper range)	SMRC	NAPA
2030	1.0	1.1	0.8	5	-2	6	14	18	14
2050	1.4	1.6	1.1	6	-5	8	32	30	32
2100	2.4	2.7	1.9	10	-10	12	88	60	88

Note: DJF= December-January-February; JJA= June-July-August, SMRC= SAARC Meteorological Research Center (Source: Adopted from IPCC 2001, OECD Report 2003)

- Increasing <u>frequency</u>, <u>intensity</u> and <u>variability</u> of droughts, floods, tropical storms
- Sea level rise and salt water intrusion
- Agriculture will be the most affected sector



### **Future Climate Risk: Drought Spells**



## **Analogy with Past Impacts**

Agriculture/crops failure >> fallow land





Deterioration of water quality/fisheries Environmental degradation

**Livestock loss** 

## **Testing and Designing Adaptation Options**

## **Designing Adaptation Options**



#### **Made Use of Traditional Measures**





## Some farmers innovatively made use of the retained water



#### **Agricultural Adaptations**

 Agronomic management

Water harvesting and exploitation

• Water Use efficiency







- Crop intensification
  and diversification
- Alternate enterprises
- Post harvest practices





#### **Field Demonstration of Prioritized Adaptation Options**











#### Made Use of Alternative Responses



#### Livestock and birds

(that consume less water)







#### Home gardening Dual purpose (optimal use of water & plant)

#### **Trying out Coastal Adaptation Options**





#### **Saline tolerant varieties**

Minor structural adjustments

**Cage fishing** 

More ducks than chicken

## **Strengthening Institutional Set-up**



## **Capacity Building**

#### **Climate risk and impact analysis**

- climate risk analysis methods
- climate change impacts
- viable adaptation options

# act analysis nethods

#### **Climate forecast applications trainings**

- introduction to forecast products
- Application of weather and climate forecast products



## **Community Mobilizations**

- Community awareness raising
- Farmers groups mobilization
- Planning, action and monitoring demonstrations on farmers fields
- Capacity building and training sessions
- Community Risk reduction planning





#### **Gradual Systematic up-scaling of Livelihoods Adaptations**



### **Some Lessons**

- Development, DRR and CCA are integrated issues at the local level
- Moving towards adaptation requires a livelihoods perspective
- Institutional capacity building is key both at national and local levels
- We need comprehensive responses: "WHO does WHAT and HOW best ?"
- Value <u>indigenous/local knowledge</u>; we need to build on those, and integrate it with external "know how"
- Engagement strategy is crucial and the "adaptive learning" at all levels is essential.

