

# Climate Change, Rural livelihoods and Fisheries: A case study of Rajnagar block in Kendrapada district of Odisha, India

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## Introduction

Odisha is one state which is most vulnerable to climate change mainly for two reasons, one is its natural setting and the second is the high incidence of poverty where most of the people have very little capacity to cope with the climate extremes and variability. The slightest climate variability which has become a regular happening result in loss of production and income, make the poor struggle to make up losses and restore back to normalcy. The framework of the poster is based on Sustainable Livelihood Approach (DFID, 1999).

## Objectives

To study the impact of climatic variables on livelihood of marine fisher folk and farmers, particularly focusing on their asset base and subsequent adaptation strategies

## Study Area

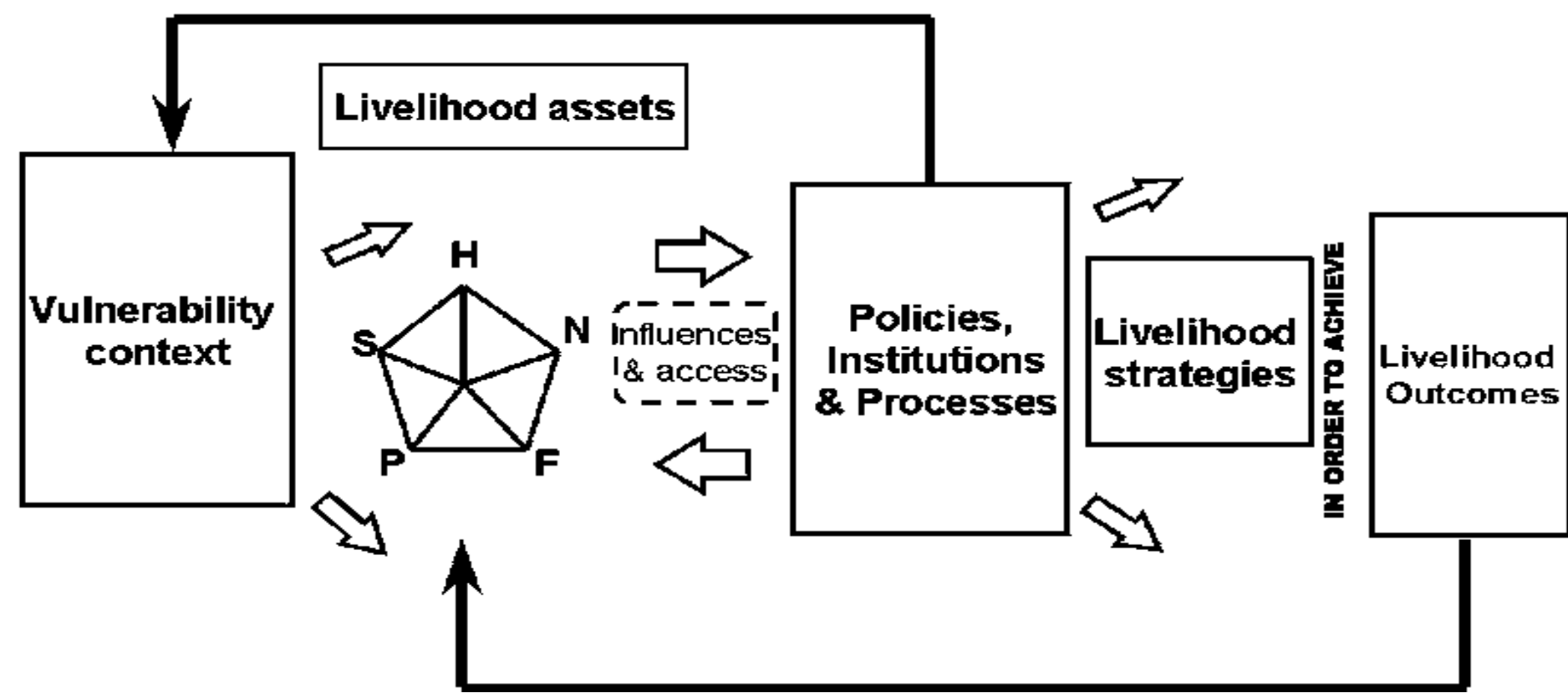
Kendrapada district, a part of coastal Odisha, is characterized by fragile environment, prone to flood and cyclone, low and highly variable rainfall, high water deficiency, frequent rainfall failure, and of late also emerging as a drought prone district. This is also one of the worst cyclone affected districts in Odisha.

## Methodology

Two sample villages (Sundripal and Pentha) from Rajnagar block were purposively chosen because of their proximity to sea and high degree of vulnerability to Climate Induced Natural Disaster(CINDs). These two blocks practically lie on the delta and floodplain of Brahmani river. Both the villages are exposed to multiple natural hazards, but dominant by flood both from the river and storm surges (cyclone) in the Bay of Bengal.

A field survey has been conducted in study villages to understand the perception of the local community about the impact of climatic variables as well as perceived impact of such changes on natural resource base and the livelihood options. The analysis of climatic variables has been carried out based on climatological data of Odisha and the village level perception of local communities on implications of these, as well as other environmental changes on their livelihood. The perception analysis has been done at village level.

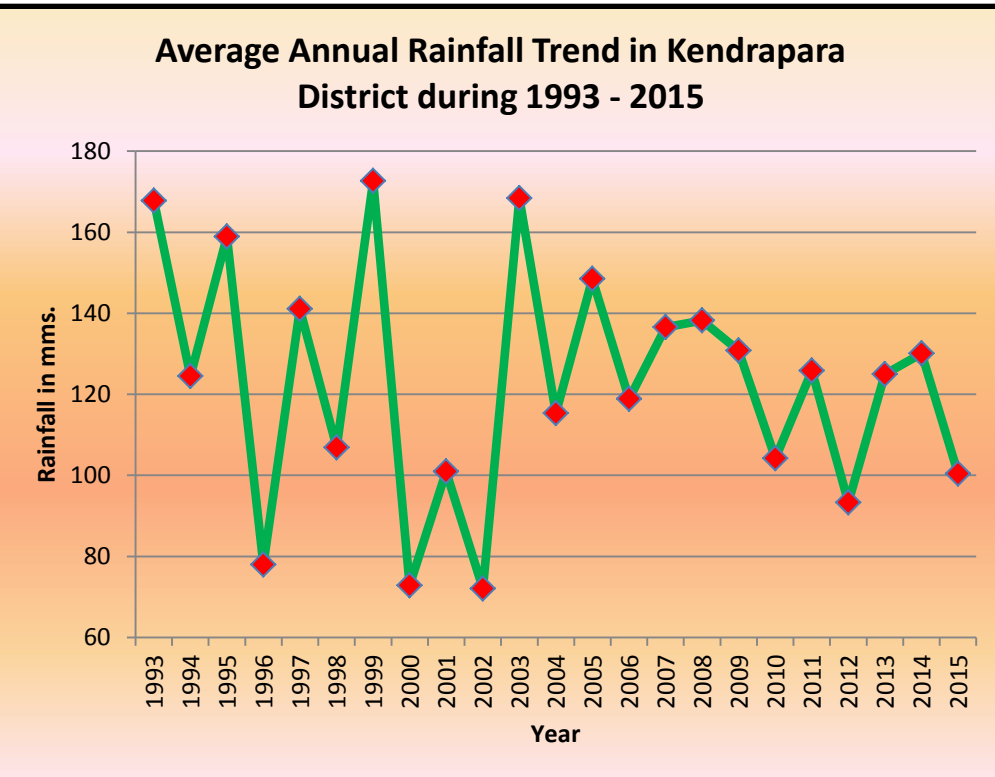
## Framework for Analysis



Source: Sustainable Livelihood Approach Guidance Sheets. DFID (2000)

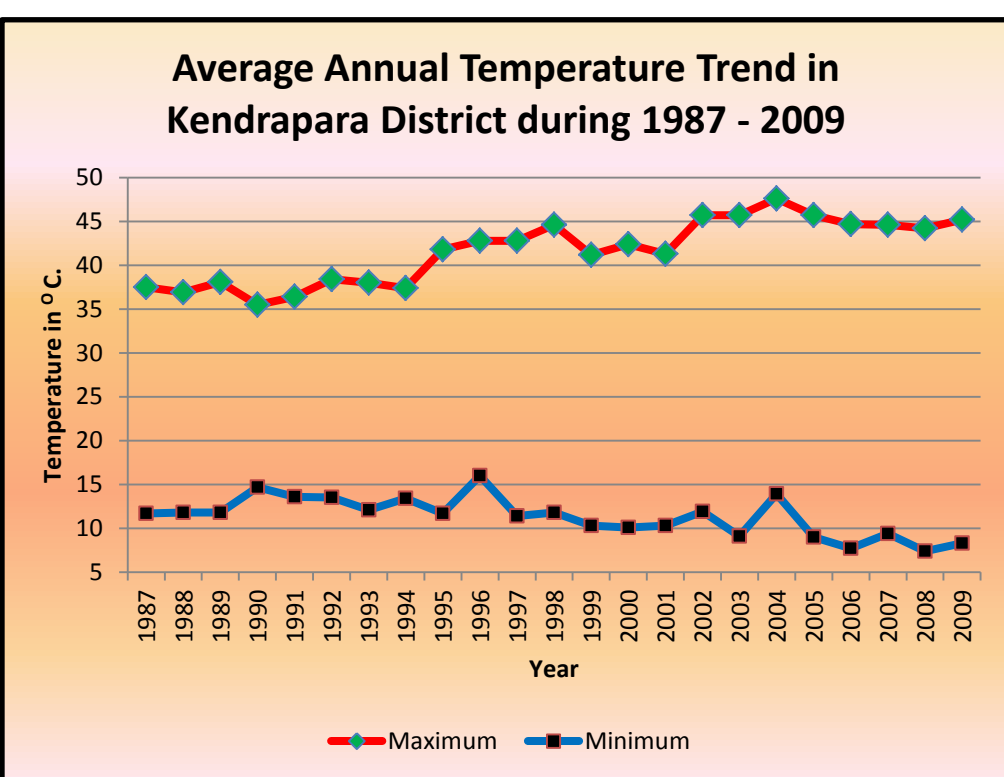
## Indicators of Climate Variability

### Rainfall



Source – Climatological data of Odisha

### Temperature

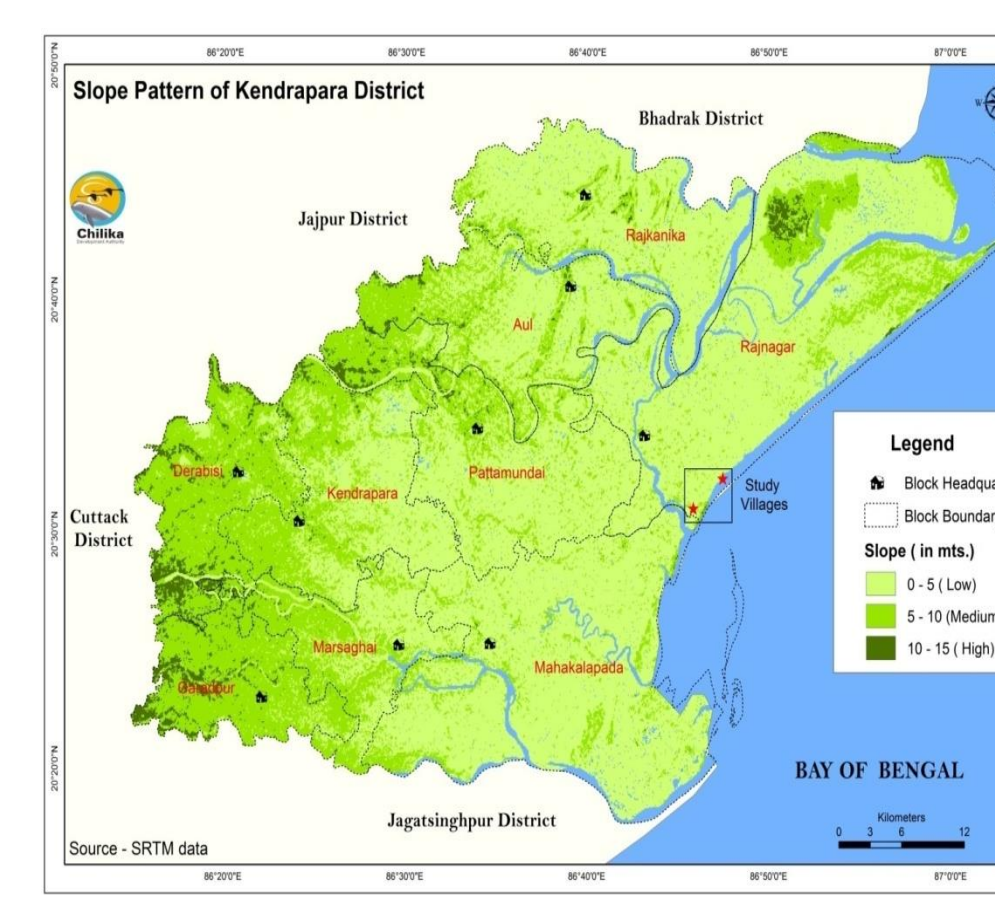


Source – Climatological data of Odisha

The graph shows the average annual rainfall trend during 1993 to 2015 in Kendrapada district . It is observed that the total volume of rainfall has decreased during the last 10 years. The irregular rainfall results in drought in some part of the district.

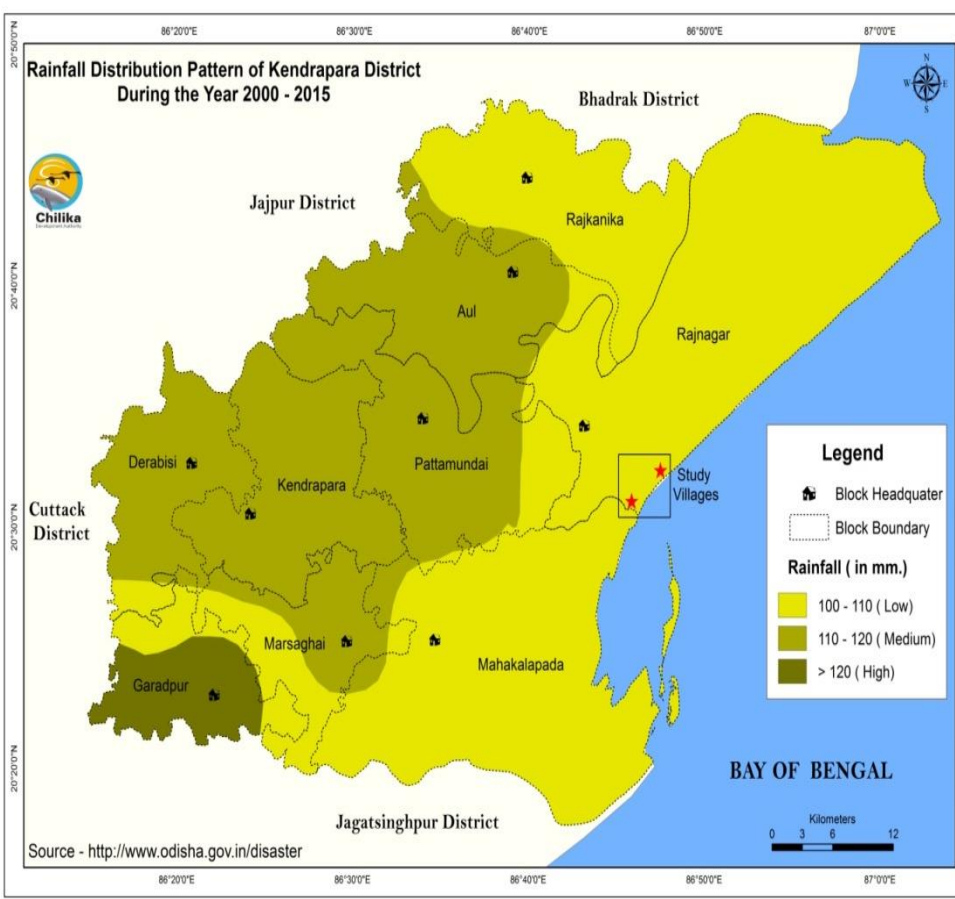
The graph shows the average annual temperature trend during 1987 to 2009 in Kendrapada district. It is observed that the temperature has increased during the last 10 years.

### Slope Pattern



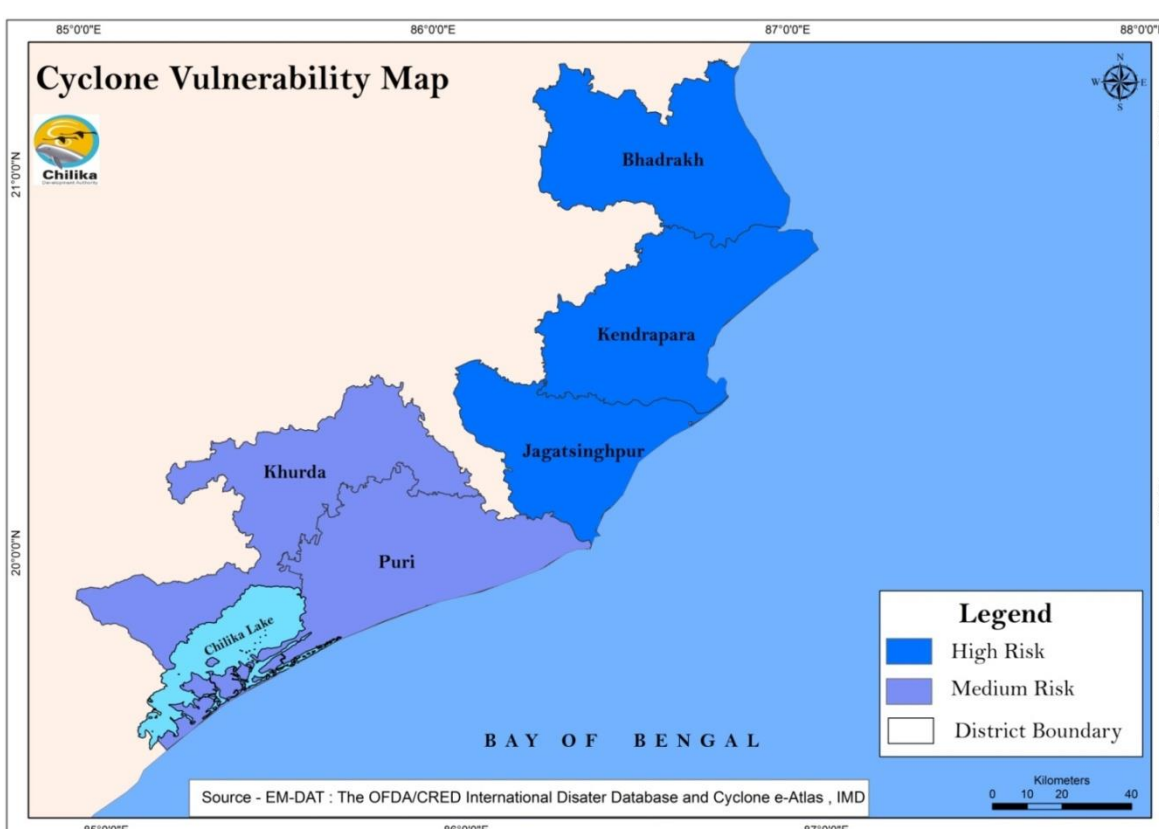
The map indicates slope distribution pattern of Kendrapada district extracted from SRTM data which shows that study villages are within 5 Mts. Contour height from Mean Sea Level. The study villages are situated in the lowland area of the district .

### Rainfall Distribution



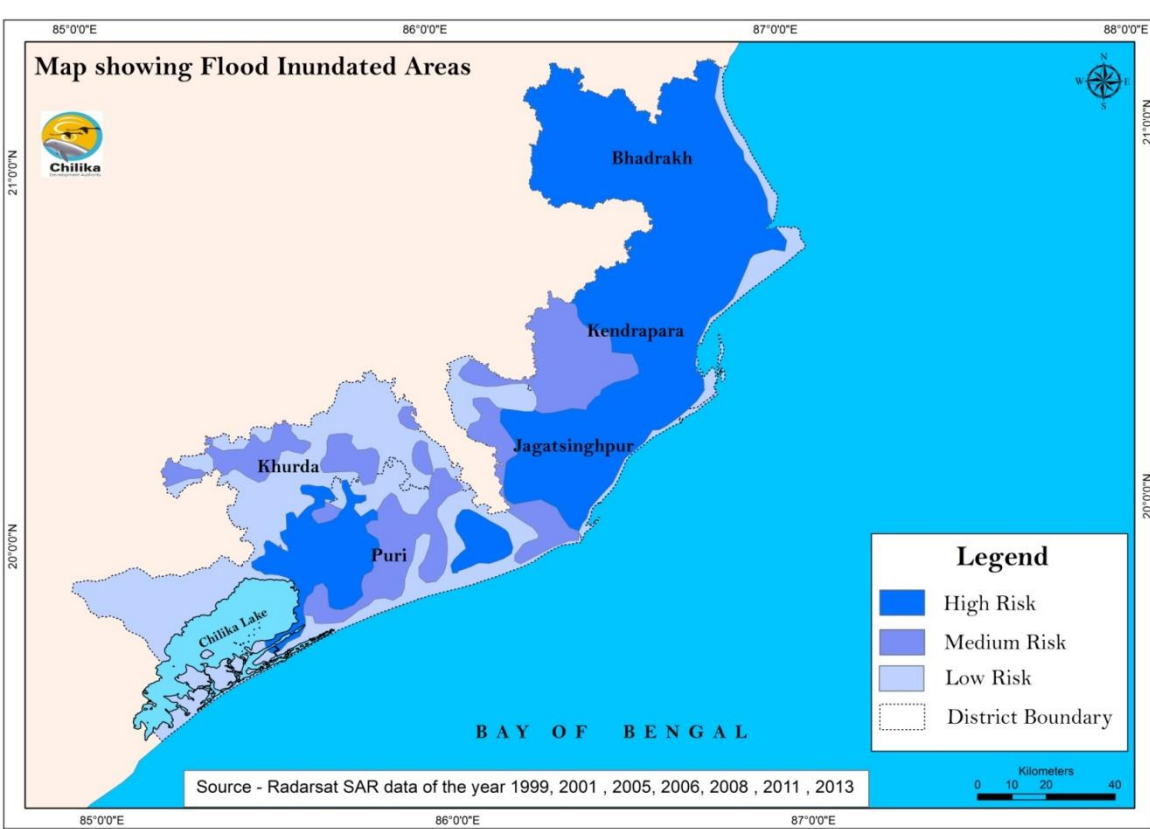
The map indicates block wise average rainfall distribution pattern of Kendrapada district where the data shows that the study villages are coming under low rainfall category whereas Pattamundai and Aul adjacent two block , have more rainfall than Rajnagar .

### Cyclone



The cyclone vulnerability map indicates that the study villages fall in very highly prone area. Jagatsinghpur, Kendrapada and Bhadrak districts of Odisha are very highly prone district in east coast of India.

### Flood



The map indicates the flood inundated areas of coastal area. The study villages fall in the category of very highly prone area. The study villages are situated in the river bank of Hansua river which is the distributary river of Brahmani. The mouth of the Hansua river fall into the Bay of Bengal. 21 number of floods inundated this area since 1967-2015.

## Climate Variability Perception timelines of Local Communities

Climate Variables	Trends	1960	1970	1980	1990	2000	2010-15
Rainfall Pattern	Erratic						
Rainfall Volume	Decrease						
Flood/waterlogging	Increase						
Drought	Increase						
Temperature	Increase						
Frequency of the Calamity	Increase						
Sea Erosion	Increase						

Source: FGD and key Informant Interview in study villages, 2016

## Current Status of Key Resources (Perception of Local Communities)

Key Resources	30 Years Ago	20 years Ago	10 Years Ago	Now
Agriculture (and its cropping pattern)	Paddy, some varieties of Pulses (based on Indigenous Knowledge system and varieties)	Paddy (HYV Varieties), some varieties of Pulses.	Only Paddy (HYV Varieties and Indigenous crop varieties )	Paddy (Back to Indigenous crop varieties such as Kartik,Sola,Bhundi,Hadagara,Patani, Baula)
Status of High Income generating Marine Fish Species (Local Name)				
Kanga	Was Available	Was Available	Declined Considerably	Hardly Seen
Bada kantia	Was Available	Was Available	Declined Considerably	Hardly seen
Telia	Was Available	Was Available	Declined Considerably	Hardly Seen
Ilisha	Was Available	Was Available	Declined Considerably	Declined Considerably
Pomfret (Both black and white)	Was Available	Was Available	Declined Considerably	Declined Considerably
Firka	Was Available	Was Available	Declined Considerably	Hardly Seen
White Chingri	Was Available	Was Available	Declined Considerably	Declined Considerably
Tiger prawn	Was Available	Was Available	Declined Considerably	Hardly Seen

Source: FGD and Key Informant Interview, 2016

## Impact on Asset Base- (Key Findings)

<b>Natural Capital</b> <ul style="list-style-type: none"> <li>Decline in fish catches.</li> <li>Decline in Economically Valuable Species.</li> <li>Deforestation in Mangroves.</li> </ul>	<b>Physical Capital</b> <ul style="list-style-type: none"> <li>Household lacks ownership of sufficient productive assets to make living.</li> <li>When owned, productive assets are traditional, low-cost and indigenous, catering to local markets and vulnerable to competition from new technology and market forces.</li> <li>Lacks ownership of Homestead land and Housing. The villagers pay encroachment fine to the administration.</li> <li>Family resides in thatched hut / kutcha house.</li> </ul>
<b>Financial Capital</b> <ul style="list-style-type: none"> <li>Family regularly depends on credit for investment and consumption purposes during some parts of year.</li> <li>Inadequate savings and institutionalized sources of credit.</li> </ul>	<b>Social &amp; Human Capital</b> <ul style="list-style-type: none"> <li>Lack of active Community Based Organizations/producer organizations.</li> <li>Members of family undertake seasonal or occupational migration to meet subsistence needs.</li> </ul>

Source: FGD and Key Informant Interview, 2016

## Status of Mangroves Forest

1972



The base map is extracted from Survey of India Toposheet (1972). The map is showing the Mangrove forest was highly distributed from Hansua river to Pentha village. The spread of mangrove forest was upto 5Km. range and the width of the beach was 300 m.

2015



The Satellite Image of the year 2015 indicates the mangrove forest and beach has degraded from Pentha to Sundaripal village. The Aquaculture area has increased in the river bank of Hansua. But one positive development in terms of adaptation is evident from the image i.e construction of Geo Synthetic Tube in the shore of Pentha beach.

## Policies, Institutions and Processes

### Act and Policies

State Agricultural Policy, 2015  
Coastal Regulation Zone Notification and Aquaculture Authority of India- Bill and Odisha Marine Fishery Regulation Act (OMERA)  
Comprehensive Marine Fisheries Policy (2004)  
Alternative Livelihood Diversification Schemes  
Collection of Reliable Statistics on Marine Fisheries  
Enforcement of OMERA Act  
Monitoring, Control and Surveillance Systems  
Post-Harvest Infrastructure, Support and Marketing

### Outcome of Policy Analysis: (in the context of fisheries and agriculture sector)

- Policy Implementation need to be strengthened
- Problem of open Access
- Policy Coherence need to be strengthened
- Diversifying cropping pattern
- Bringing latest technology to farmers
- Improving the efficiency of Investments

### Institutions

#### At the National Level

- Ministry of Agriculture (Department of Animal Husbandry, Dairying and Fisheries), along with national fisheries research institution
- Ministry of Food Processing Industries and Marine Products Export Development Authority, MPEDA
- Ministry of Commerce and Industry
- Ministry of Environment and Forest
- Ministry of water resources
- Department of Ocean Development, Ministry of Earth Sciences

#### At the State Level

- Department of Fisheries
- Department of Forest
- Department of Ports

#### Processes

- Introduction of Mechanized fishing vessels and modern gear material
- Increase in the use of synthetic gear material
- Motorization of artisanal fishing craft

## Livelihood Outcomes

- Declined Crop productivity, increased instances of crop failure due to frequent natural calamities and salination. The decline in fish catch and economically valuable species, also results in declining income.
- Changes in cropping pattern and it has been found that there has been a significant shift in the crop mix during last five decades. Thus change towards mono-cropping also makes farmers vulnerable to change in climatic conditions and resultant crop failure.
- The reduced income leads to less expenditure on food and other basic needs.
- These changes are also accompanied by changes in occupational pattern in study villages. There have been increased instances of out migration in these villages as people move to cities within the states as well as for away cities in other states for employment and often they are exploited in terms of non-payment of wages in their working place. The migration ranges from seasonal to all months of the year.

## Adaptation Strategies

- Cyclone Shelter constructed by OSDMA
- Geo-tube embankment to prevent coastal erosion
- Migration and diversification into agricultural activities is seen as an adaptation strategy in the context of Marine fisher folk community
- Promotion of Kitchen Garden at household level in the monsoon season is viewed as a coping mechanism in the context of Marine fisheries.



Thatched Hut / Kutcha House



Kitchen garden



Monocropping - the only way of Agriculture



Condition of Fishing gear



FGD in Study Village



Geo – Synthetic Tube at Pentha village in Kendrapada District



Multi-purpose Cyclone Shelter



Awareness campaign by local NGO

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## Reference

- Nayak, Bibhu Prasad;Maharjan, Keshav Lal;"Climate Change, Local Environmental Changes and Rural Livelihood Systems: A case study of three coastal villages in Journal Of international development and Cooperation,Vol.19, No.4, 2013,pp:69-87
- Roy, B.C; Mruthyunjaya;Selvaranjan, S; "Vulnerability to climate Induced Natural Disasters with special emphasis on coping strategies of the rural poor in coastal Orissa,India", Paper prepared for the UNFCC COP8 Conference organised by the Government of India, United Nations Environment Programmes,and ICICI during October 23-November 1, 2002, Vigyan Bhavan, New Delhi, India\* Scientist, Director, and Principal Scientist, National Centre for Agricultural Economics and Policy Research (ICAR), Library Avenue,Pusa, New Delhi-110 012
- DFID (2000): Sustainable Livelihood Guidance Sheet. Department for International Development. [http://www.livelihood.org/info/info\\_guidancesheet.html](http://www.livelihood.org/info/info_guidancesheet.html)

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