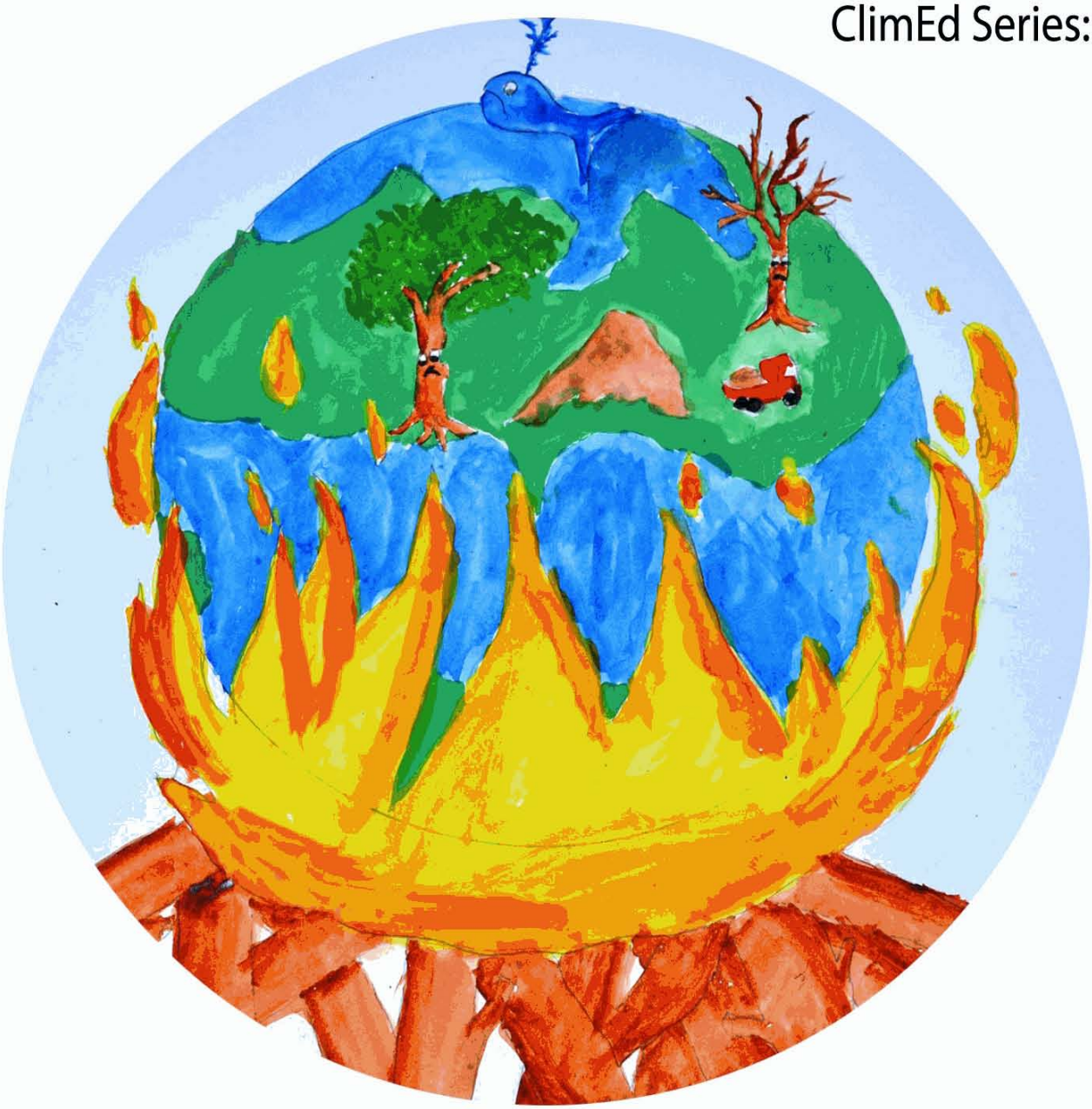
ClimEd Series: I



Know Your Warming Planet

ICAR - CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
Indian Council of Agricultural Research
Ernakulam North P.O 1603
Ernakulam 682 018
Website: cmfri.org.in

ClimEd Series - I

This instructional material "Know Your Warming Planet" has been developed as a part of the Belmont funded project titled "Global Understanding and Learning for Local solutions: Reducing Vulnerability of marine dependent coastal communities" as a means to create awareness and impart climate change knowledge across the target populace.

Published by

Director
ICAR - Central Marine Fisheries Research Institute

Published

July, 2015

Developed by

Dr. Shyam S Salim
Ms. Manjusha U

Designs

Mr. Anish Varghese

Cover Citation

Excerpts from the painting competition related to climate change themes held at Kochi during 2015.

Disclaimer

ClimEd Series: I

Know Your Warming Planet

ICAR - CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
Indian Council of Agricultural Research
Ernakulam North P.O 1603
Ernakulam 682 018
Website: cmfri.org.in

Climate Change: Concept

- Climate change is a substantial change in a regions average weather patterns including average temperature, precipitation, and wind. This may be limited to a specific region, or may occur across the whole Earth.

- Climate change is a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years.

- Climate change may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average, for example, greater or fewer extreme weather events.

Key Terms

- Climate Variability – The way climate fluctuates yearly above or below a long-term average value.
- Climate Change – Long-term continuous change (increase or decrease) to average weather conditions or the range of weather.
- Climatological Normal – 30 year average of a weather variable.

Causes of Climate Change

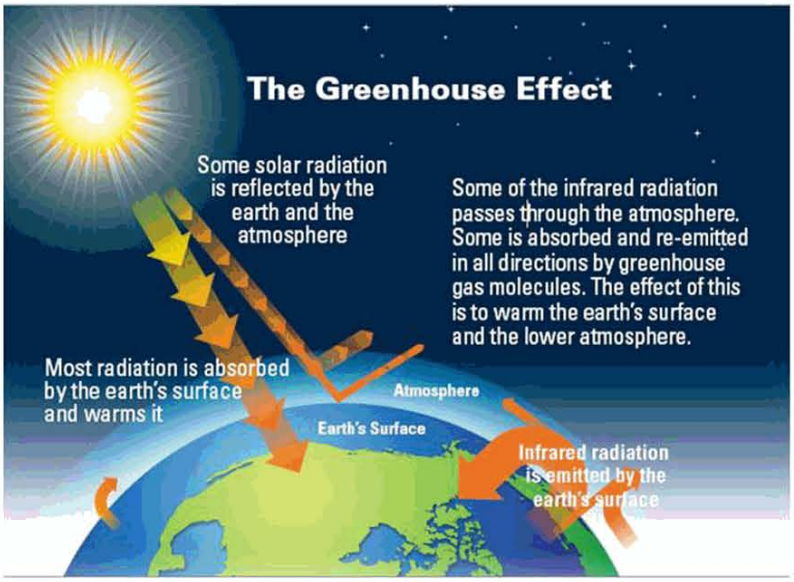
- Natural factors, such as changes in the sun's energy or slow changes in the earth's orbit around the sun, continental drift, volcanoes, ocean currents, the earth's tilt, and comets and meteorites.

- Human activities that change the atmosphere's make-up include burning fossil fuels, livestock and paddy farming, land use and wetland changes, pipeline losses and covered vented landfill emissions, agricultural activities, including the use of fertilizers, cutting down forests, building developments in cities and suburbs, etc.

The Greenhouse Effect

The Earth's greenhouse effect is a natural occurrence that helps to regulate the temperature of our planet. When the Sun heats the Earth, some of this heat escapes back to space. The rest of the heat, also known as infrared radiation, is trapped in the atmosphere by clouds and greenhouse gases, such as water vapor and carbon dioxide, methane and ozone. If all of these greenhouse gases were to suddenly disappear, our planet would be 60°F colder and would not support life as we know it.

Many human activities release "greenhouse gases" into the atmosphere. The levels of these gases are increasing at a faster rate than at any time in hundreds of thousands of years. However, human activities, primarily the burning of fossil fuels, land use and wetland changes. and clearing of forests, have intensified the natural greenhouse effect, causing global warming.



IPCC scientists believe that there is a greater than 90% chance that most of the warming we have experienced since the 1950s is due to the increase in greenhouse gas emissions from human activities.

According to the National Oceanic and Atmospheric Administration (NOAA), there are seven indicators (oceanic heat content, temperature over land, sea level, sea surface temperature, temperature over oceans, humidity, troposphere temperature) that would be expected to increase in a warming world and three indicators (sea ice, snow cover, glacier) that would be expected to decrease.

Consequences of Climate Change

- Global warming leads to rise in average temperatures all over the world leading to more evaporation and precipitation.
- A stronger greenhouse effect will warm the oceans and partially melt glaciers and other ice, leading to increasing sea levels which have a negative impact not only on coastal property and economy but also on our fresh water supply. Low-lying countries are particularly vulnerable and entire communities may become the first climate refugees.

- Climate change is likely to cause stronger storms and more floods, drought which can damage crops and reduced agricultural yields. Higher temperatures, shifting climate patterns affect the makeup of natural plant communities and the spread of weeds and pests to spread to new areas. Global climate change will also affect agriculture and food supply.

- As the temperature of the atmosphere rises, oceans absorb heat and become warmerand trigger several changes in ocean bio-geochemistry.

- Climate change is modifying fish distribution and the productivity of marine and freshwater species through different ways like changes in phenology and distribution, species composition, reduction in fish catch and loss in fishery inventory.

- Increasing ocean acidity pose major threats for marine organisms such as shrimps, oysters, or corals in the formation of their shells.

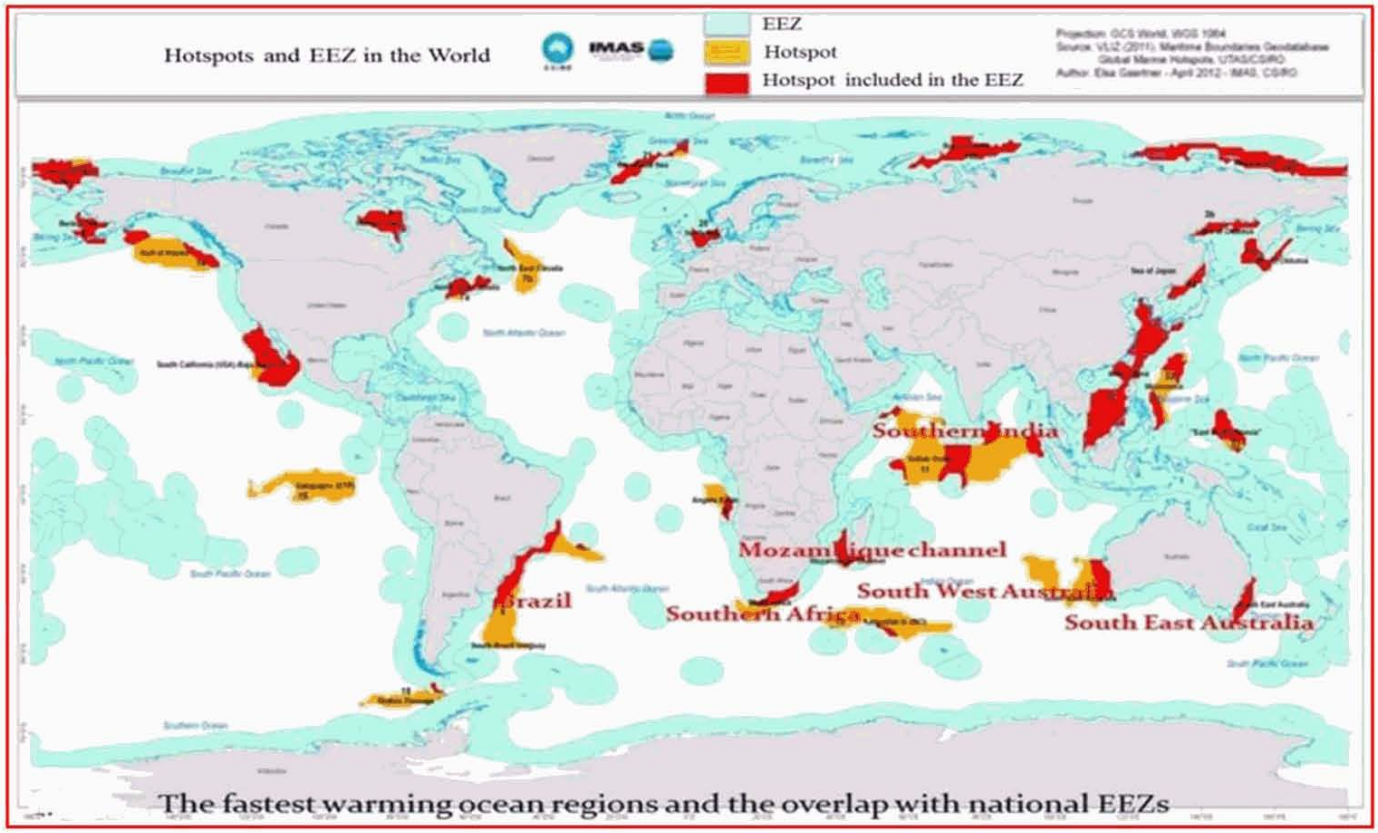
- The fisher communities are emotionally attached to their living environment as their livelihood is heavily dependent on sea. The impact of climate change in marine resource users includes, displacement of family members, food security issues, Migration of fisher folk, fall in income level, seasonal employment, change in employment pattern, increased fishing cost, reduction of fishing days etc.

Marine Hotspots

The regions warming faster than the global average. Climate change hotspots can be defined as the "live labs" where the manifestations of the climate change impacts are observed "first". Each of these has a unique suite of species which inhabit them, and all are important to the countries surrounding them in supporting fisheries, tourism and in hosting important ecosystems. In many regards, these rapidly warming regions of the world can act as 'early warning laboratories' to help provide the knowledge and tools to enable us to adapt wisely, efficiently and effectively to meet the challenges of a warming environment. The identification of the climate change hotspots will help policy makers in priority setting and in planning adaptation and conservation measures.

Climate Change Research - A Belmont Initiative - Global Understanding and Learning for Local Solutions : Reducing Vulnerability of Marine - Dependent Coastal Communities

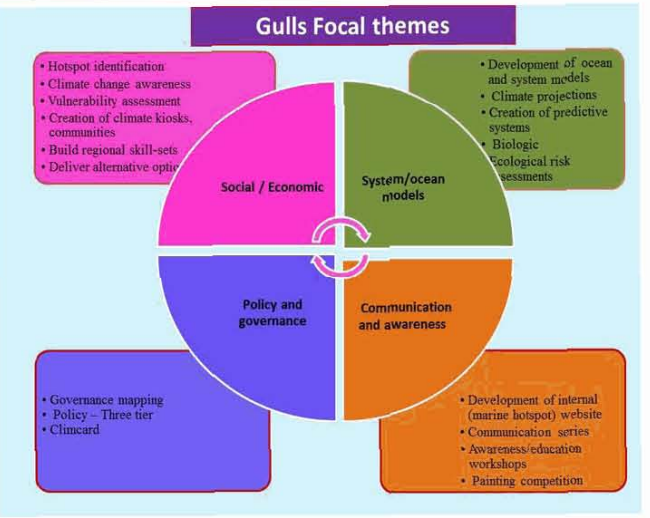
Southern hemisphere hotspots ocean regions experiencing fast warming and those with heightened social tensions as a result of change (Southern Africa, Southern Australia, Western Australia, Mozambique Channel, Southern India, Brazil)



The fastest warming ocean regions and the overlap with national EEZs

Rationale for the Selection of Study Area

- Impacts are likely to be observed early,
- Incentives to initiate adaptive strategies will be strong
- Models developed for prediction can be validated early
- Adaptation options can be developed, implemented and tested allowing for challenges to be met efficiently and effectively



The project will address the coastal vulnerability – specifically the challenges that arise in food security and sustaining coastal livelihoods as a result of global warming. It will contribute to improving community adaptation efforts by characterizing, assessing and predicting the future of coastal-marine food resources and identification of suitable adaptation options.

Objectives

- Build regional skill-sets that can reduce coastal vulnerability by evaluating and characterizing likely impacts
- Create predictive systems that will inform decision makers about the expected consequences of coastal changes
- Deliver alternative options in terms of adaptation and transformation within coastal communities

Sl.No	Consortium partners	Country
1.	Central Marine Fisheries Research Institute, Cochin	India
2.	Rhodes University, Grahamstown	South Africa
3.	CSIRO Marine and Atmospheric Research, Hobart	Australia
4.	University of São Paulo, São Paulo	Brazil
5.	National Oceanography Centre, Southampton	United Kingdom
6.	University of California Santa Cruz, Santa Cruz	United States
7.	Service D'Appui A le Gestion De L'Environnement (SAGE-Fampandrosoanamaharitra)	Madagascar
8.	University of Otago, Dunedin	New Zealand
9.	University of Victoria, Victoria	Canada
10.	Eduardo Mondlane University, Maputo	Mozambique
11.	Aberystwyth University, Aberystwyth	UK
12	University of Southampton, Southampton	UK

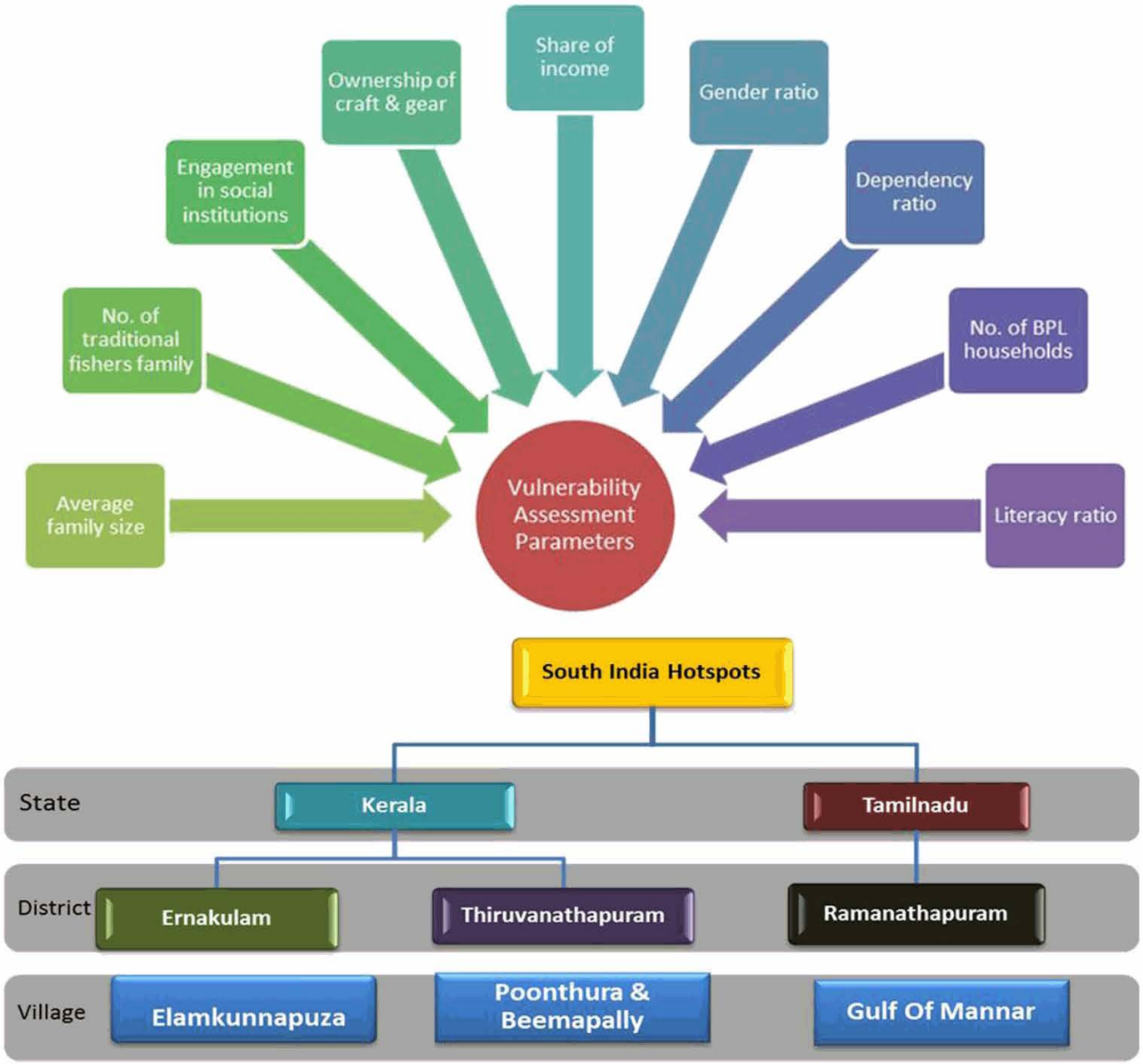
GULLS - CMFRI Initiatives

The coastal vulnerability assessment in GULLS project underlines, a demarcation between fishery hotspots (based on fish abundance, phenology, distribution, range shifts, recruitment success etc.) and social hotspots (determining vulnerability, displacement, marginalization of traditional community) would be a novel in representing diverse biotic and abiotic factors.

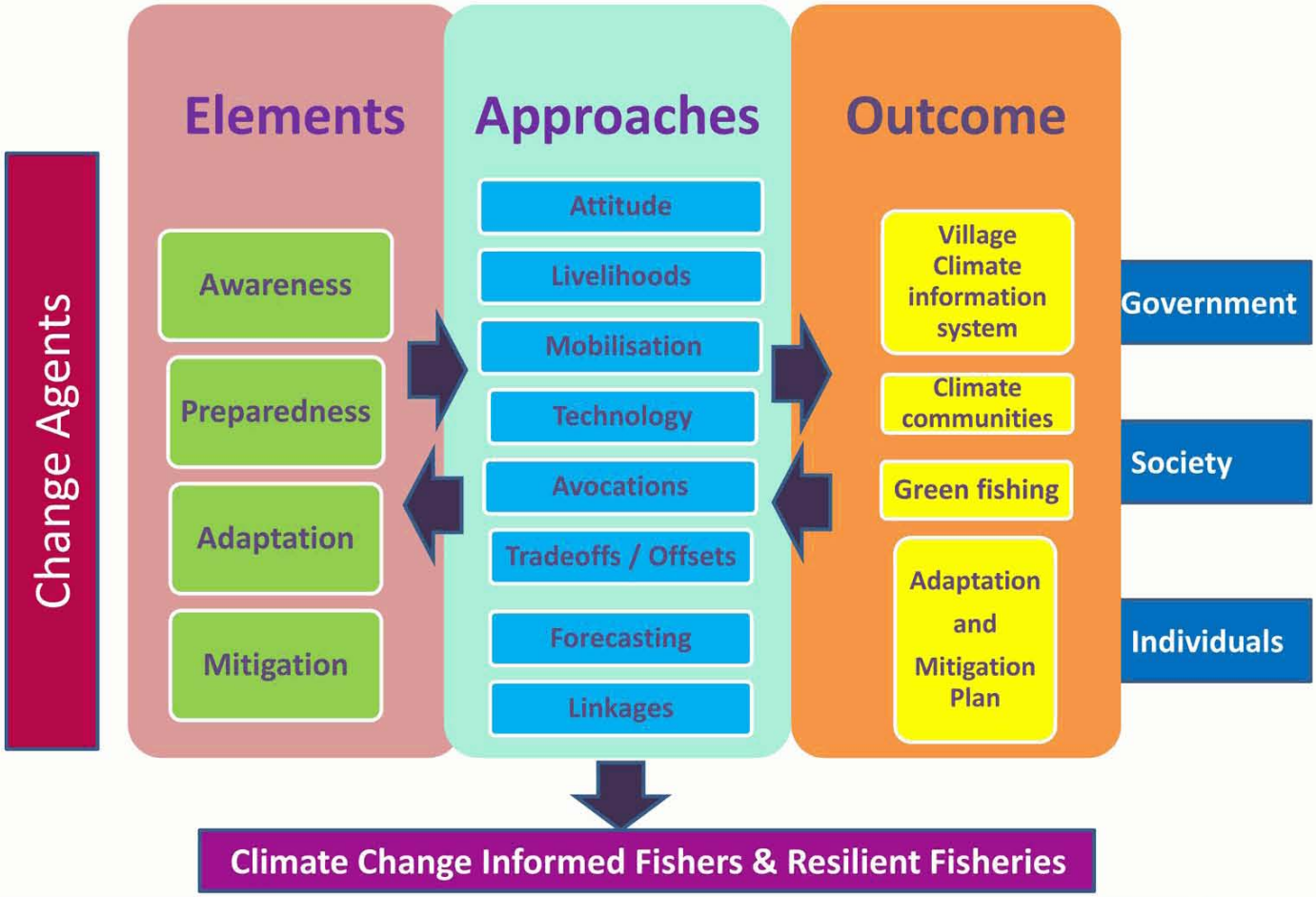
CMFRI Team

Dr. A. Gopalakrishnan (Lead PI)
Dr. Shyam S. Salim (Co PI & Research Co-ordinator)
Dr. P.U. Zacharia
Dr. T.V. Sathianandan
Dr. Prathiba Rohit
Dr. R. Narayankumar
Dr. Swathilakshmi P.S.

Identification of Hotspot areas/districts/villages and Linkages with DoF and LSGs



CReVAMP Model - Climate Resilient Village Adaptation and Mitigation Plan



Phases of CReVAMP

- **Phase 1.** • Identification of hot spot areas /Districts
- **Phase 2** • Identification of the villages / Linkages with DoF ,LSG
- **Phase 3** • Baseline and Vulnerability survey
- **Phase 4** • Reports / Awareness workshops / Engagement of fishers in climate change activities
- **Phase 5** • Creation of Climate Information Kiosks
- **Phase 6** • Formation of climate change communities
- **Phase 7** • Planning and implementation of Adaptation and Mitigation plans
- **Phase 8** • Climate resilient village adaptation and mitigation plan (CReVAMP) with Climate change Informed fishers

Linkages with Local Self Governments and Dept. of Fisheries

Vulnerability Survey