Region Level Climate Change Vulnerability Assessment for U.T. of Puducherry

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Introduction

- The impacts of climate change are increasingly being felt. For preparing communities and people to meet the challenges arising out of climate change, vulnerability information at state level or even district level is needed.

- To meet this need, **Climate Vulnerability Map of India** is being developed under a joint project of the **Department of Science and Technology (DST)** under the Union Ministry of Science and Technology and **Swiss Agency for Development and Cooperation (SDC).**

- This research programme of DST is being implemented as part of the **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)** and **National Mission on Strategic Knowledge for Climate Change (NMSKCC).**

- Climate vulnerability atlas has already been developed by DST for 12 states in the Indian Himalayan Region, using a common framework.

Introduction

- Now this methodology has been extended to non-Himalayan states in order to have a national level climate vulnerability profile for India.

- DST organised National Level Capacity Building workshop during February 2020 for all the State Climate Change Cells followed by regular consultations, to develop a uniform understanding of vulnerability, assess vulnerability based on a common methodological framework and map the same.

- Subsequently the States were asked to prepare the **District Level CCVA r**eports which is to be compiled and published by DST at National Level.

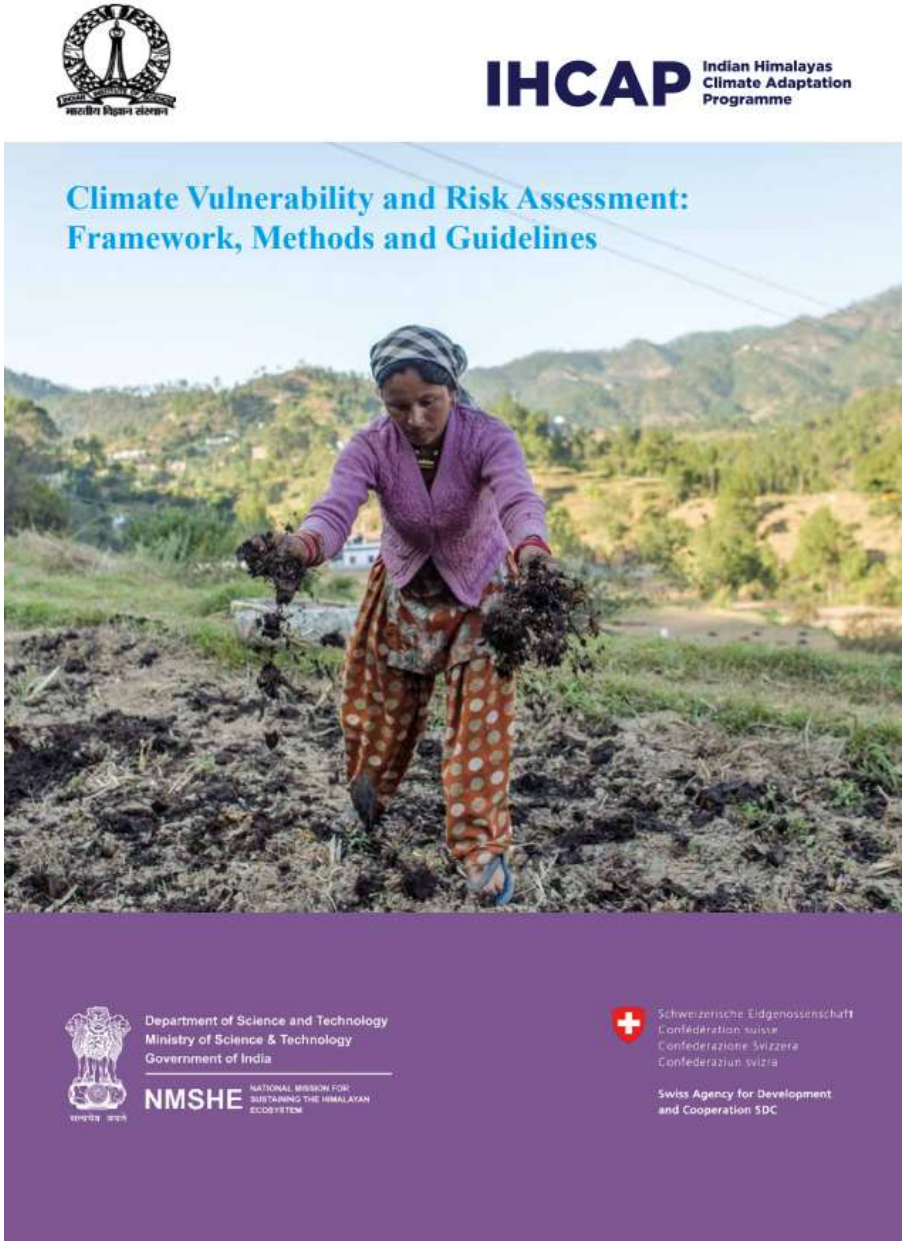
- Considering the unique geographical setting of Puducherry Union Territory, Puducherry Climate Change Cell has carried out the **Regional Level CCVA**.

Objective of the study

- ✓ Climate Change Vulnerability in Puducherry Union Territory has been assessed at the regional level for defining the risks posed by climate change at regional level and identify the measures to adapt to climate change impacts.
- ✓ It will enable the practitioners and decision makers to identify the most vulnerable areas, sectors and social groups, to develop targeted climate change adaptation options for specific contexts.

Methodology

- The study has been conducted based on the Common Framework and Methodology prepared by IISc Bangalore for the DST supported IHCAP project.
- Study was conducted using Indicator based approach.
- Indicators were selected based on discussion in the National Level Capacity Building Workshop organized by DST.
- Integrated Vulnerability Assessment was conducted by choosing 18 Indicators under following categories:
    - Socio-economic
    - Bio-physical
    - Institutional + Infrastructure
    - Health
- Top down approach using secondary data collected from Census and concerned Departments



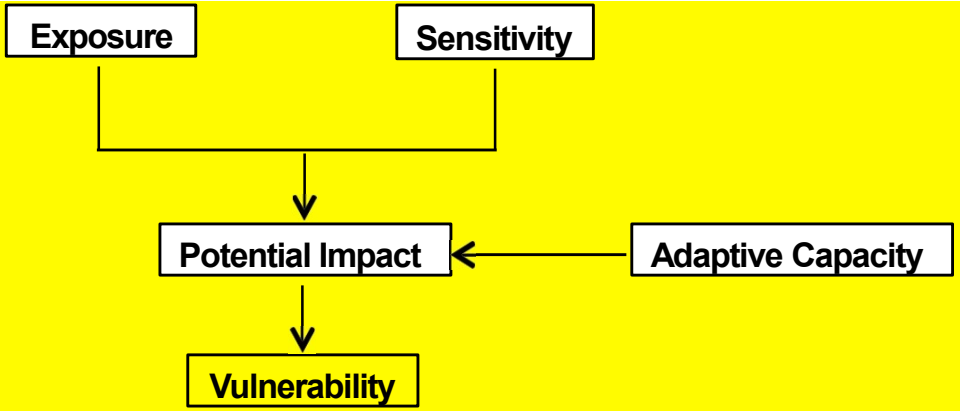
What is Vulnerability?

Definition of Vulnerability

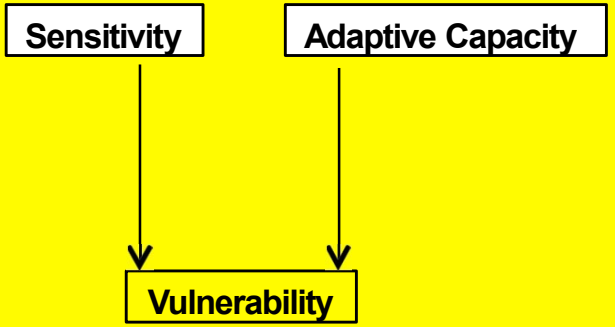
[as per the Intergovernmental Panel on Climate change (IPCC)]

2007 Report: ***… degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes.***

2014 Report: The propensity or predisposition to be adversely affected.



IPCC 2007 Paradigm



IPCC 2014 Paradigm

VULNERABILITY

The propensity or predisposition to be adversely affected

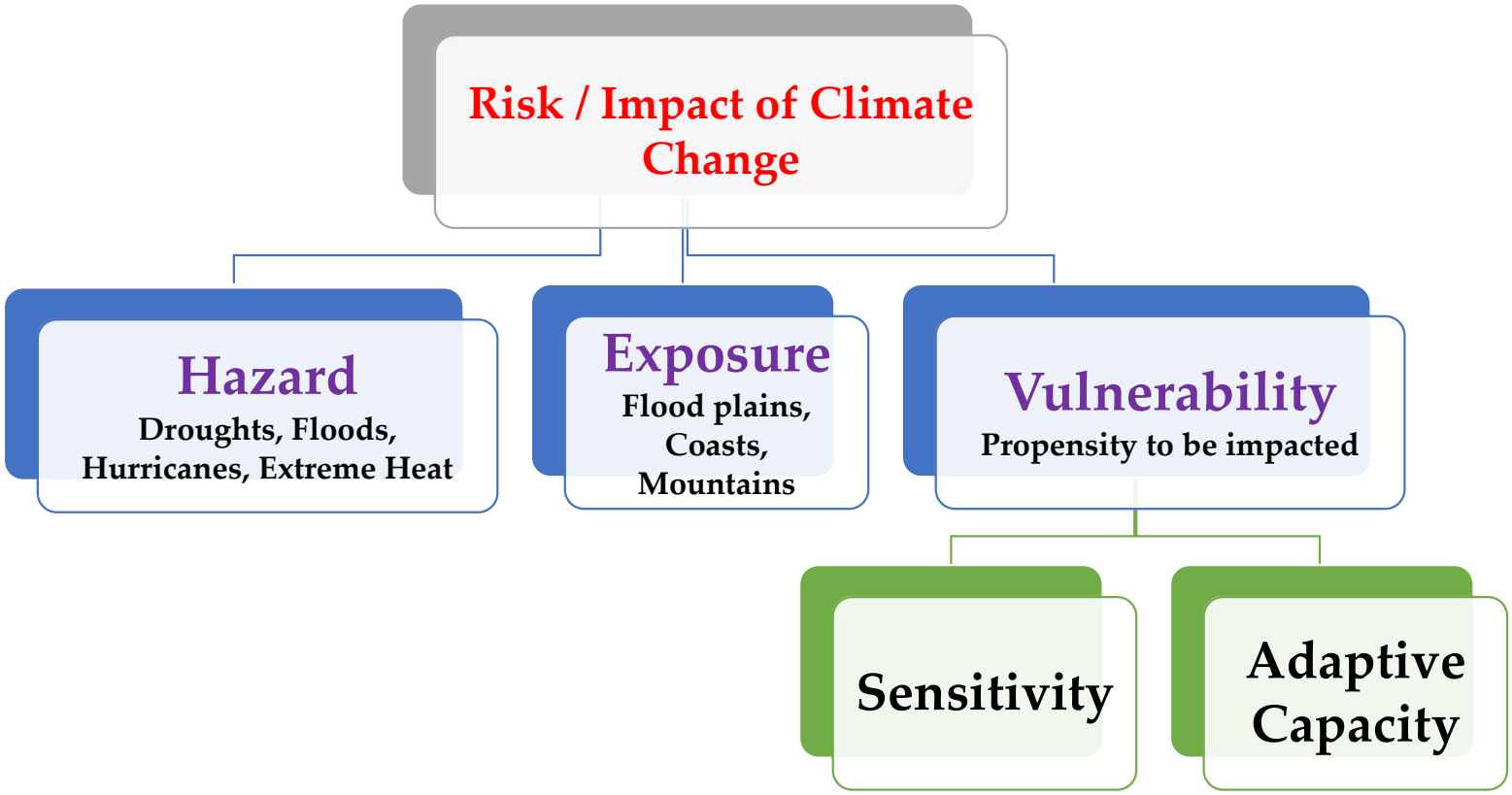
SENSITIVITY

The degree to which a system is affected, either adversely or beneficially, by climate variability or change.

ADAPTIVE CAPACITY

The ability of a system to adjust to *climate change* to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

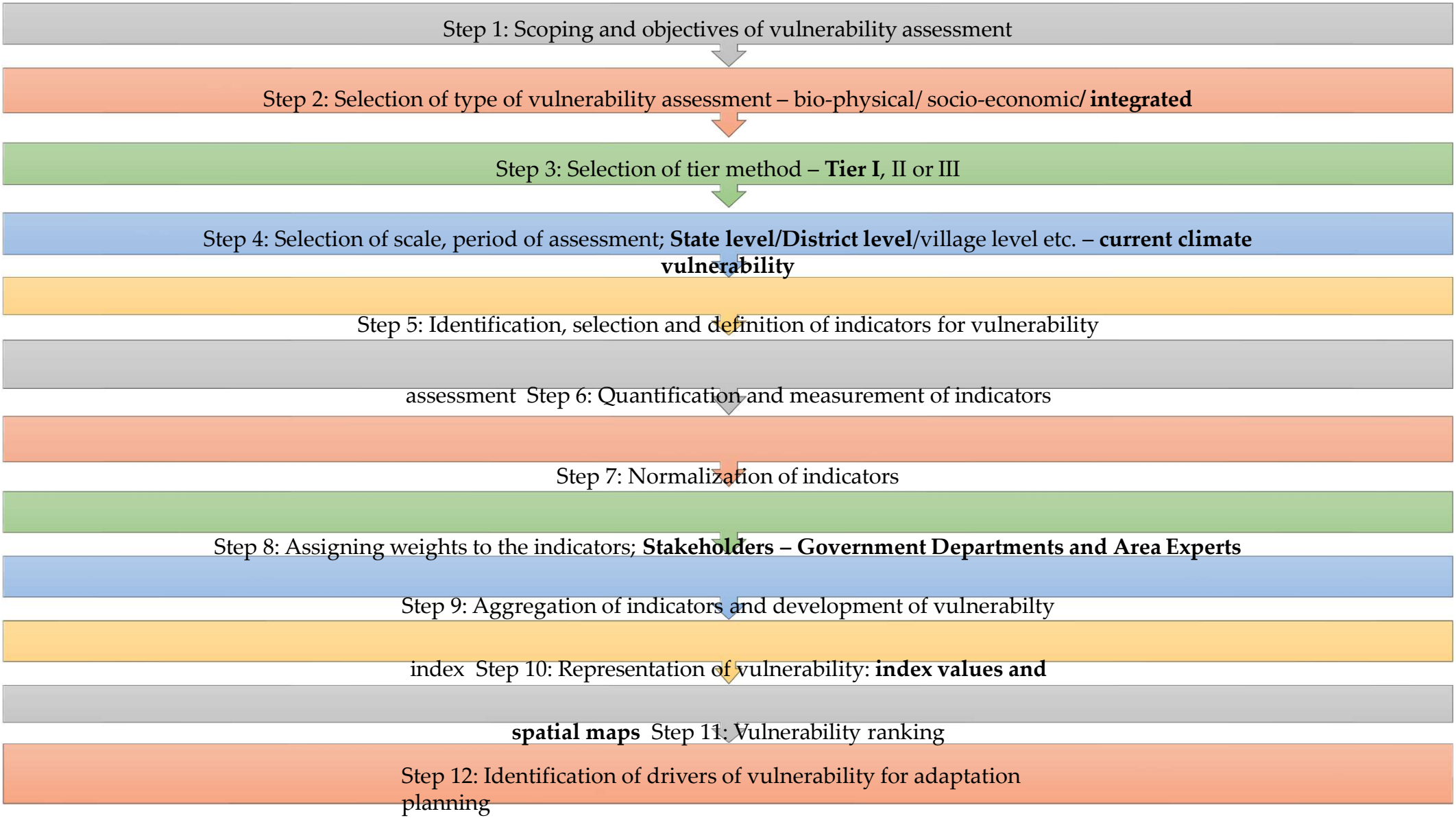
Definitions as per IPCC WG II 2014



Risk arises from interaction of hazard, exposure and vulnerability. Vulnerability is endogenous characteristic of a system and is determined by its sensitivity and adaptive capacity.

Steps in CCVA?

Vulnerability
Assessment


Step 1: Scoping and objectives of vulnerability assessment
Step 2: Selection of type of vulnerability assessment – bio-physical/ socio-economic/ **integrated**
Step 3: Selection of tier method – **Tier I**, II or III
Step 4: Selection of scale, period of assessment; **State level/District level**/village level etc. – **current climate vulnerability**
Step 5: Identification, selection and definition of indicators for vulnerability
assessment Step 6: Quantification and measurement of indicators
Step 7: Normalization of indicators
Step 8: Assigning weights to the indicators; **Stakeholders – Government Departments and Area Experts**
Step 9: Aggregation of indicators and development of vulnerabilty
index Step 10: Representation of vulnerability: **index values and**
spatial maps Step 11: Vulnerability ranking
Step 12: Identification of drivers of vulnerability for adaptation planning

Normalization

- **Indicators have different units – so need to make them unit free.**
- **Normalized values will lie between 0 and 1.**

- Positive: Vulnerability increases as the value increases

$$Normalized\ value = \frac{(Actual\ indicator\ value - Min\ indicator\ value)}{(Max\ indicator\ value - Min\ indicator\ value)}$$

- Negative: Vulnerability declines as the value increases

$$Normalized\ value = \frac{(Max\ indicator\ value - Actual\ indicator\ value)}{(Max\ indicator\ value - Min\ indicator\ value)}$$

Indicators used for Regional Level Analysis

Category	Indicators	Construction	Dimension
Socio-economic	% BPL households (as per BPL card)	Higher percentage of BPL indicates lesser adaptive capacity; Date from - Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Adaptive Capacity (Positive)
	% Rural Population	Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Sensitivity (Positive)
	Tourist Footfall / 1000 population	Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Sensitivity (Positive)
	Primary sector production (Agriculture, Fisheries & Animal Husbandry) per 1000 population	Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry; Primary Sector productivity is more sensitive to climate variability as opposed to industries and service sectors.	Sensitivity (Positive)
	Total Number of Livestock per 1000 population	Total number of livestock (equivalence applied)/human population; data from http://dahd.nic.in/documents/statistics/livestock-census	Adaptive capacity (Positive)
	% of marginal and small farmers (land <5 acre)	(Number of marginal and small operational holders/Total number of operational land holders)*100 2017 data from http://inputsurvey.dacnet.nic.in/	Sensitivity (Positive)
	Women participation in labour force	Percentage of women in the overall workforce	Adaptive Capacity (Negative)

Indicators used for Regional Level Analysis

Category	Indicators	Construction	Dimension
Bio-physical	Forest area (in ha)/1000 rural population	India State Forest Report, 2019	Adaptive Capacity (Negative)
	% of net irrigated area to net sown area	Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Adaptive Capacity (Negative)
	Variability in food grain crop yield (3 years - 2016-17 to 2018-19)	This is coefficient of variation of the yield of food grains. It is direct reflection of climate variability like variability in rainfall and could also capture the impact of flood and cyclone. Data from - Statistics Handbook 2017 - 2018 & 2018-19, Directorate of Economics & Statistics, Puducherry	Sensitivity (Positive)
	Stage of Ground Water Development (Draft of groundwater in relation to availability) %	Sensitivity indicator which impacts various sectors like agriculture, forest, livestock, industry and potable water needs. Data from - District Ground Water Brochure, CGWB, 2013 & 2014	Sensitivity (Positive)

Indicators used for Regional Level Analysis

Category	Indicators	Construction	Dimension
Institution + Infrastructure	Road density (road length/geographical area)	Sum of the length of surface road (in Km)/ Total geographical area (in sq. Km). Data from - Statistics Handbook 2017 - 2018, Govt. of Puducherry	Adaptive Capacity (Negative)
	No. of Banks / 1000 Population	Financial institutions enhances adaptive capacity of the community. Data from - Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Adaptive Capacity (Negative)
	Average person days/household employed under MGNREGA over last 5 years (2015-16 -2019-20)	Average days of employment provided per household under MGNREGA in a year Data from – MNREGA website	Adaptive Capacity (Negative)

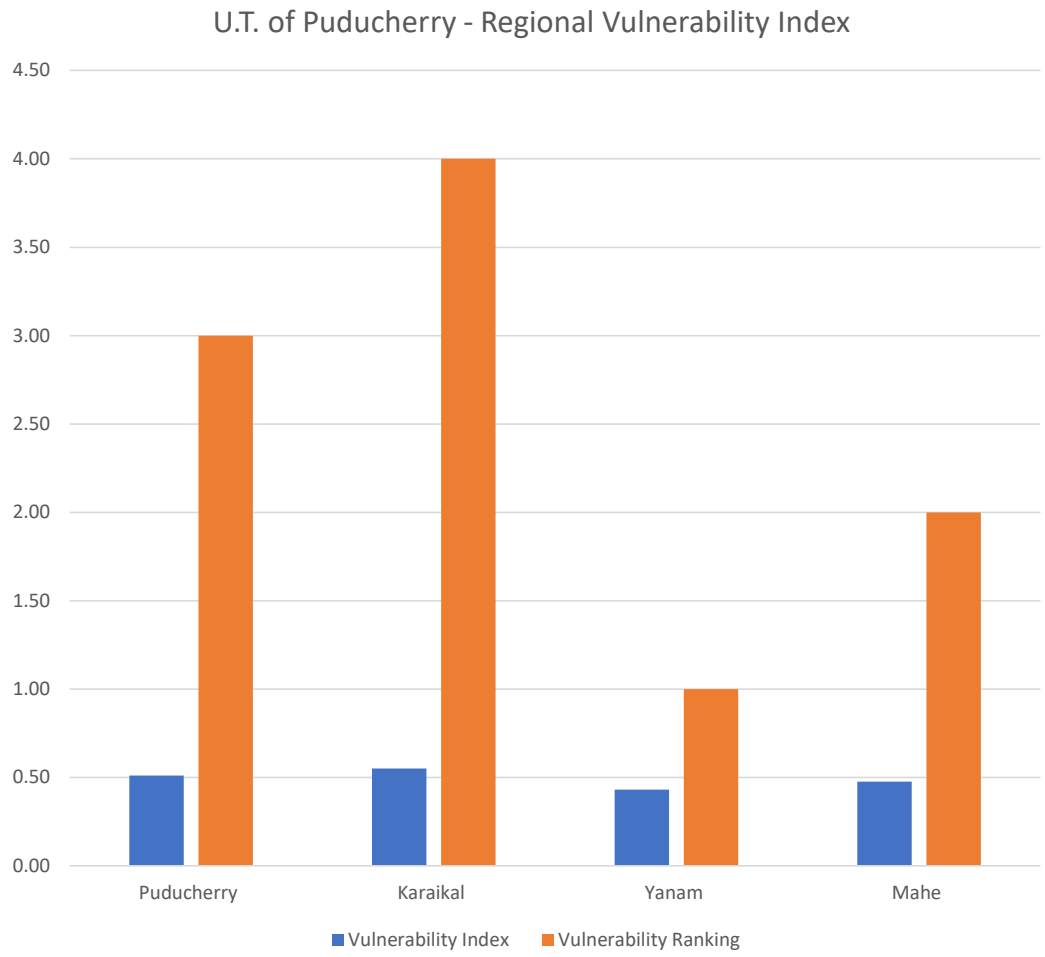
Indicators used for Regional Level Analysis

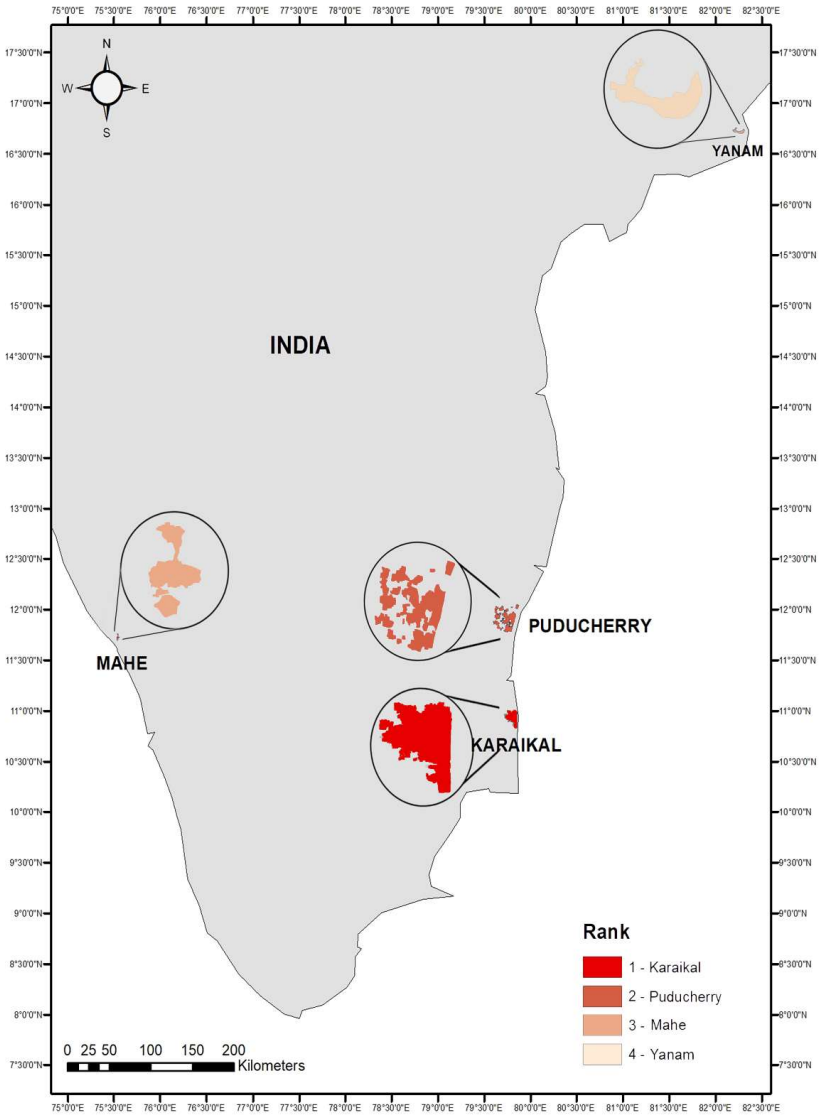
Category	Indicators	Construction	Dimension
Health	Cases of vector borne diseases/1000 Population (Dengue & Malaria)	High number of Vector Born Disease implies poor quality of living and health infrastructure; can be fostered by temperature and rainfall variations. Data from - NVBDCP, Health Department, Puducherry, Avg of 2015-19	Sensitivity (Positive)
	Cases of Water Borne Diseases /1000 of population (Hepatitis & Diarrhea)	High number of Water Born Disease implies poor quality of living and health infrastructure; can be fostered by temperature and rainfall variations. Data from - NVBDCP, Health Department, Puducherry, Avg of 2015-19	Sensitivity (Positive)
	No of doctors, specialists, health assistants & health Workers per 1000 population	Availability of doctors and health specialist reduces vulnerability of peoples health. Data from - District census hand books 2011.	Adaptive Capacity (Negative)
	Infant Mortality Rate	Infant Mortality per 1000 births; Infant mortality rate is an important marker of the overall state of public health, access to clean water, sanitation and medical infrastructure; Data from - Puducherry at Glance 2020, Directorate of Economics & Statistics, Puducherry	Sensitivity (Positive)

Vulnerability Index Work Sheet

Vulnerability Ranking of Regions of U.T. of Puducherry

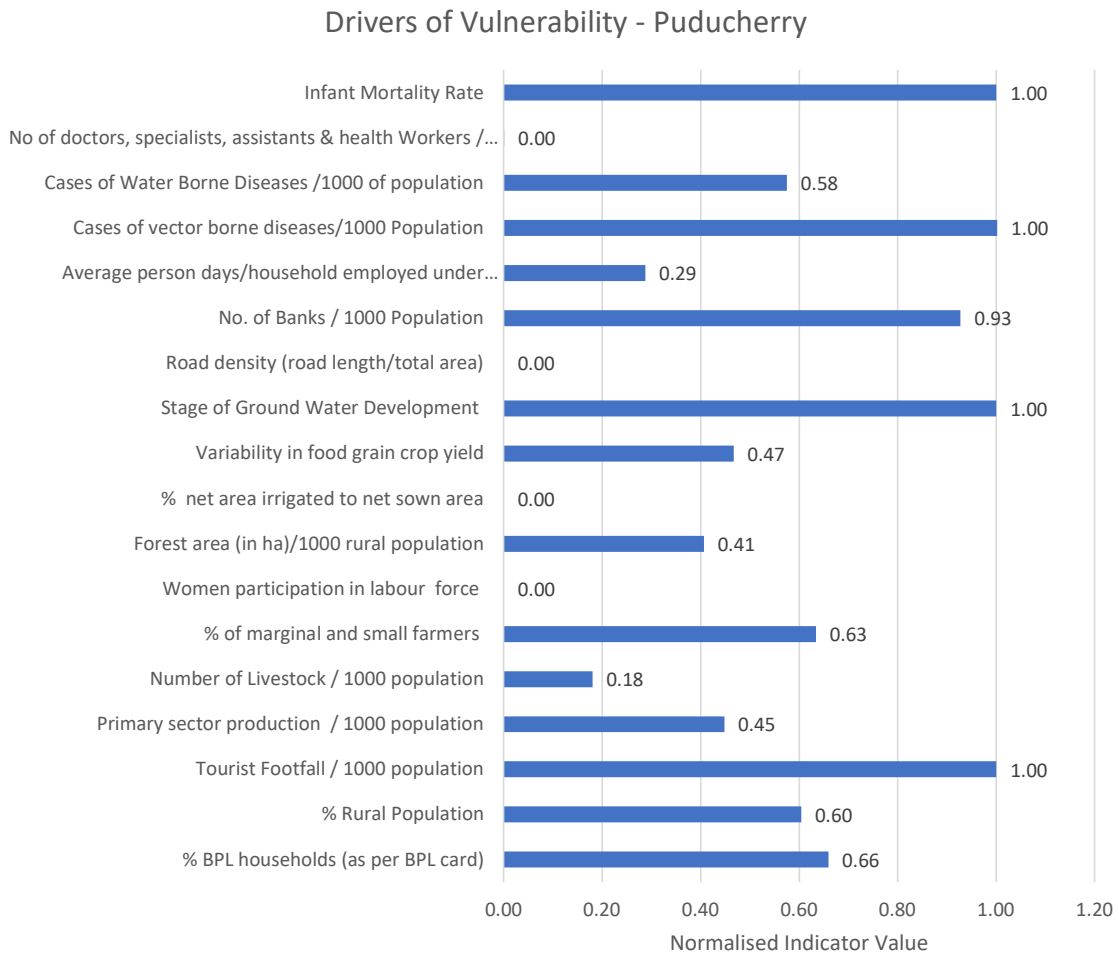
Region	Vulnerability Index	Vulnerability Ranking
Puducherry	0.51	2
Karaikal	0.55	1
Yanam	0.43	4
Mahe	0.48	3





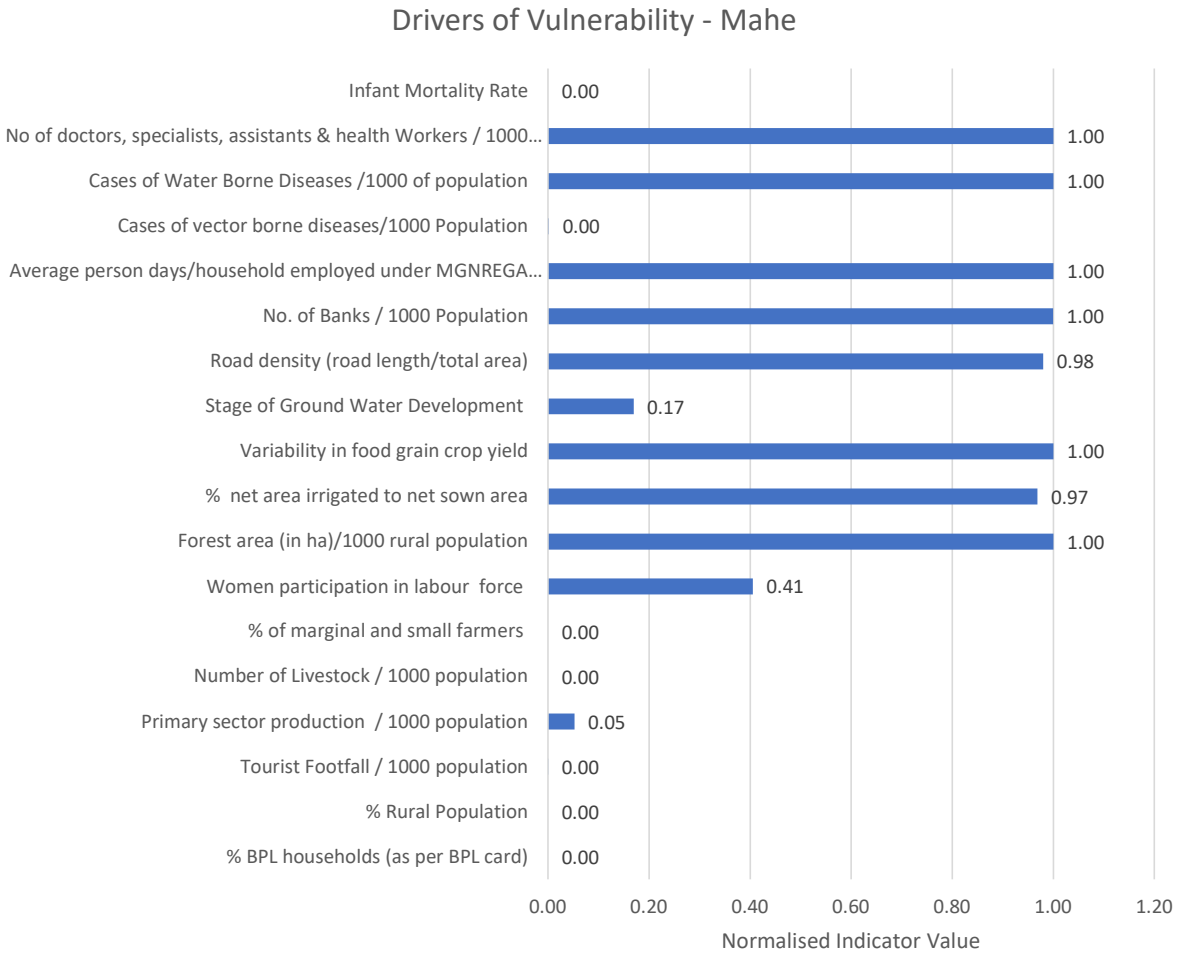
Regions of U.T of Puducherry ranked based on Vulnerability Index

Drivers of Vulnerability - Puducherry



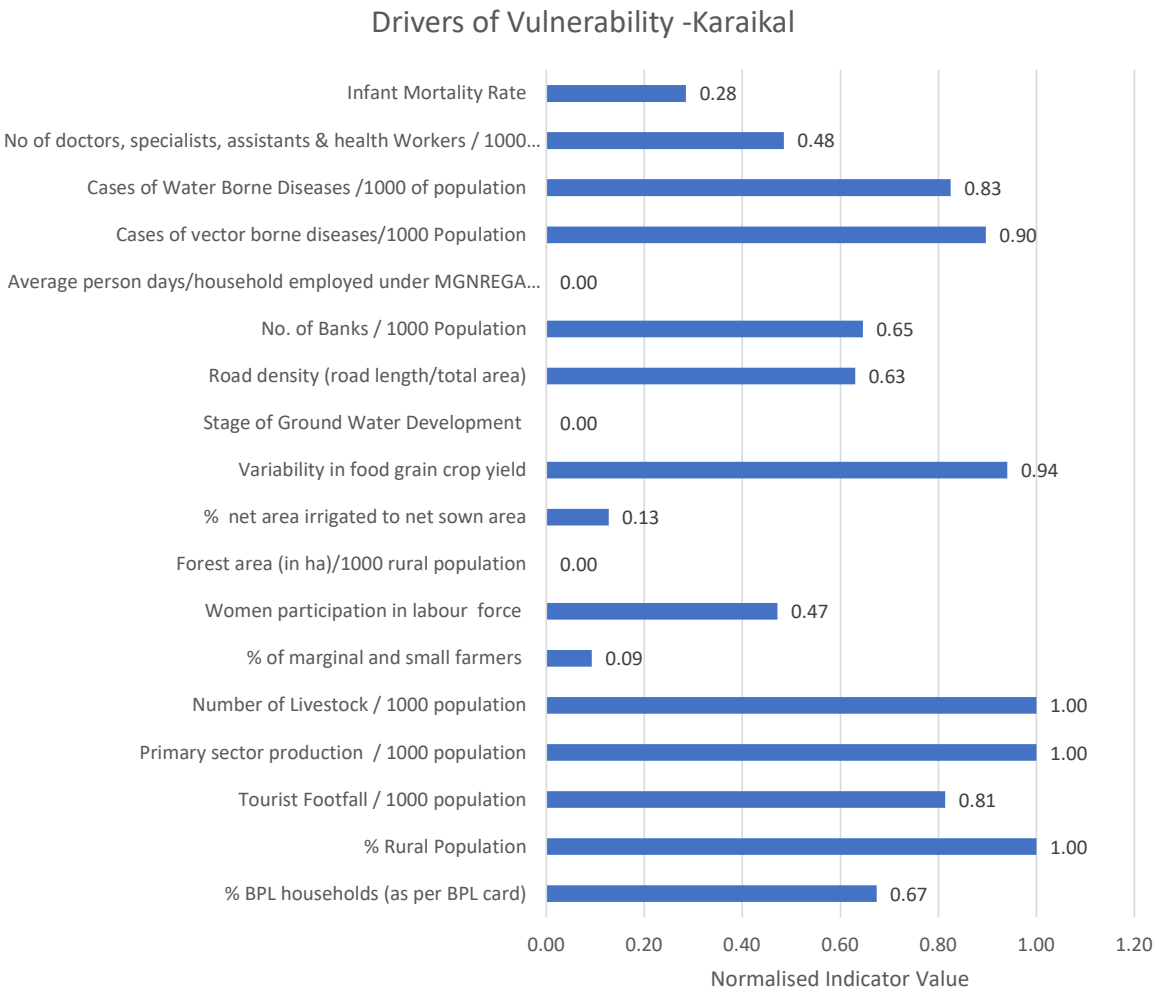
- Infant Mortality Rate and cases of Vector Born Diseases
- No. of banks to population low
- High ground water drawdown to availability
- High Tourist Footfall

Drivers of Vulnerability - Mahe



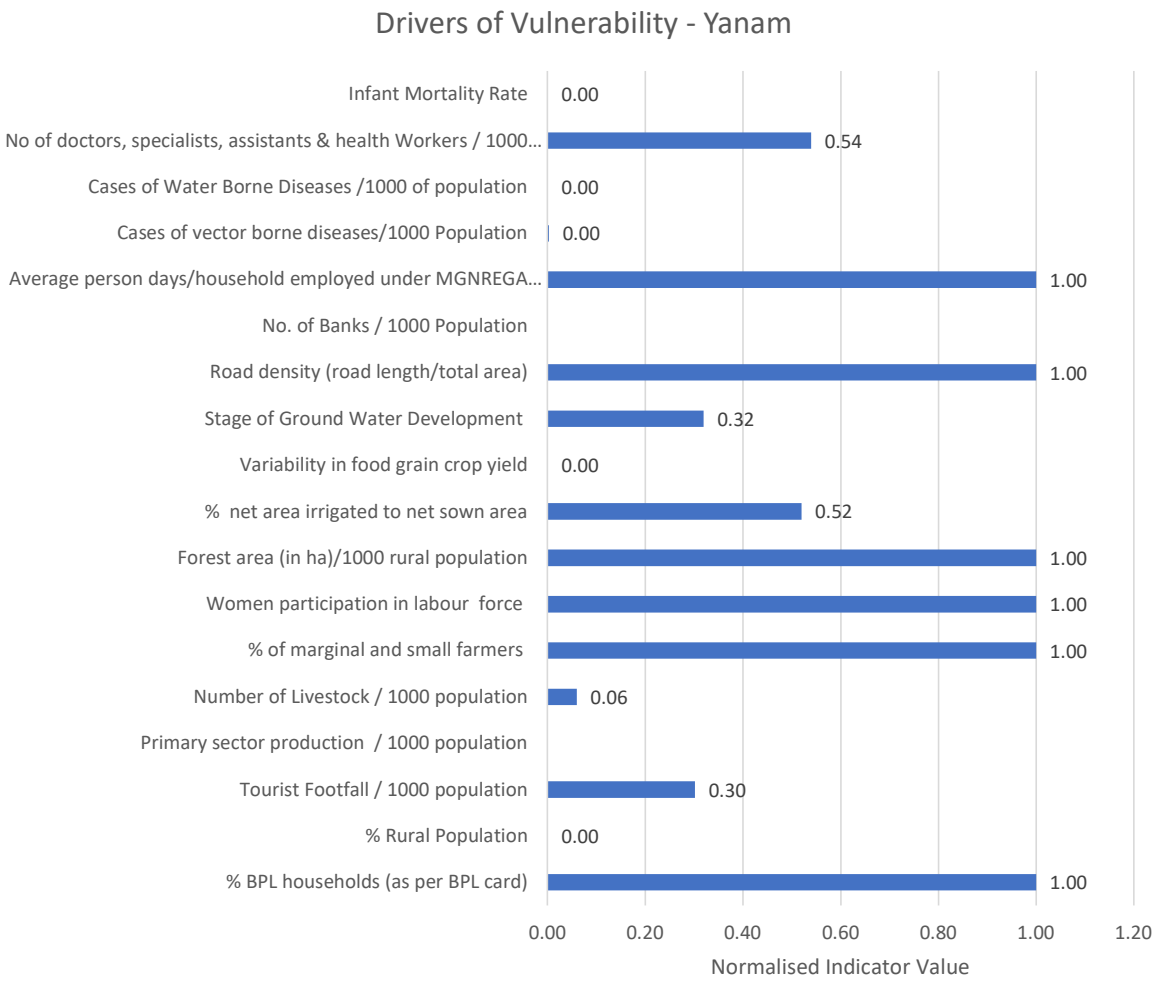
- No. of doctors and health workers low
- Cases of water born diseases high
- Low Employment under MGNREGA – Not significant as Yanam is wholly urban area
- Low banks to population ratio
- Low road density
- High variability in food grain crop yield
- % Net irrigated area to Net sown area less
- Less forest area to rural population – not significant as there is no rural population in Mahe

Drivers of Vulnerability - Karaikal



- Cases of vector born diseases high
- High Primary sector production indicates dependency on natural resource based income
- High Variability in food grain
- Low livestock

Drivers of Vulnerability - Yanam



- Low Employment under MGNREGA – Not significant as Yanam is wholly urban area
- Low road density
- Low forest cover to population
- Women participation in labour force is low
- High % of marginal and small farmers
- High percent BPL households

Thank you !

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