

# CLIMATE CHANGE AND FOOD SECURITY



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**THIRD DR GOPALAN MEMORIAL WEBINAR**  
**11.10.2022**

**Food security: changing concepts and definitions**

**Climate change: causes and dimensions**

**Impact of climate change on food production and food security**

**Action plan to address the adverse impact of climate change on food security**



**DEFINITIONS**  
**FOOD SECURITY**  
**ACUTE AND CHRONIC FOOD INSECURITY**





# **EVOLUTION OF GLOBAL CONCEPTS OF FOOD SECURITY**

**Food is an important determinant of nutrition and health status.**

**Therefore food security of the population especially the vulnerable groups had received priority attention both globally and in India**

**In the 1950s and 1960s food security was defined as consuming sufficient protein and energy (food quantity).**

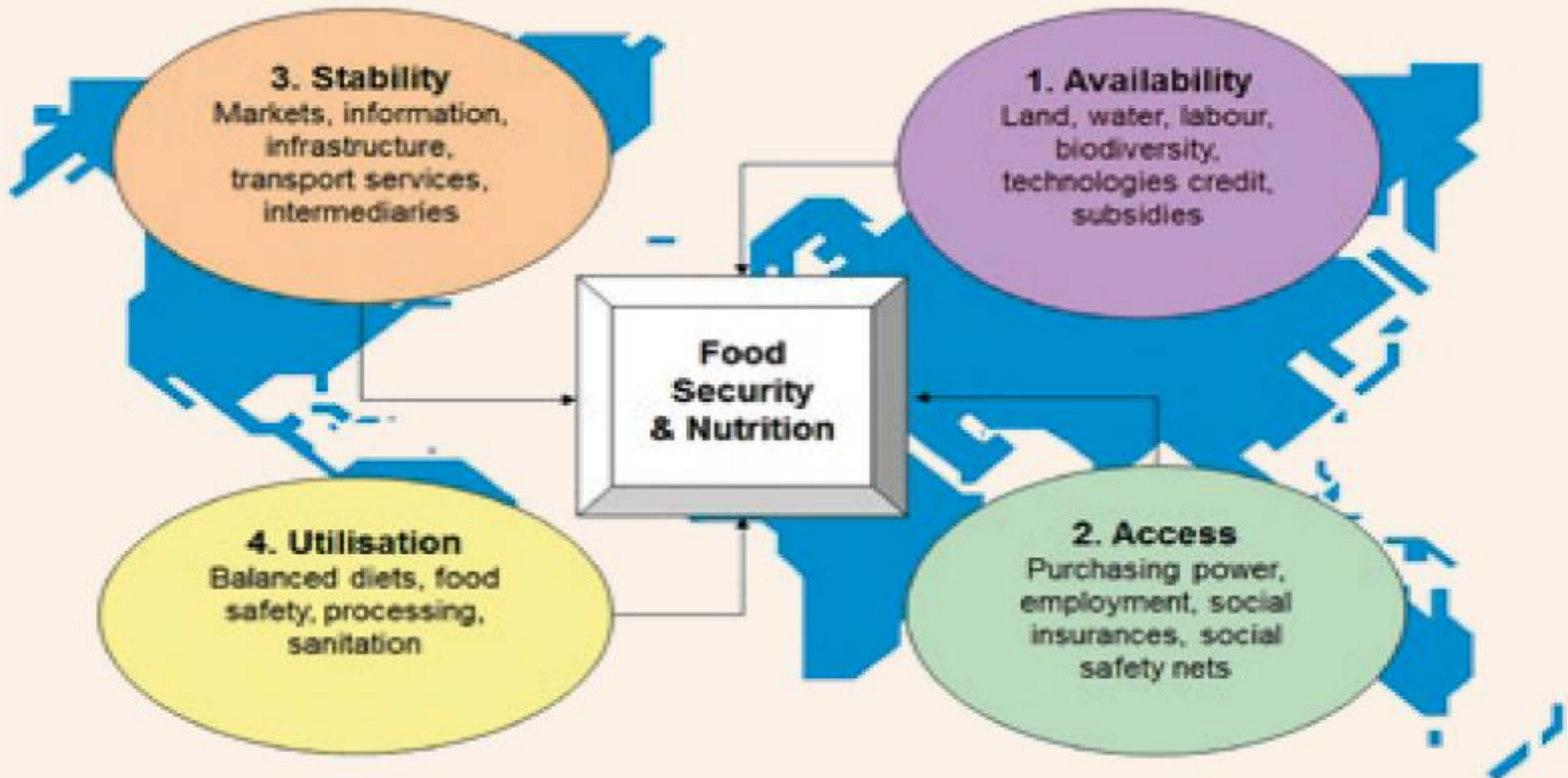
**In the 1980s the importance of micro-nutrients for a balanced and nutritious diet (food quality) was recognised.**

**Problems in absorption of nutrients (eg diarrhoea), or excessive loss of nutrients (eg respiratory infections) can adversely affect food utilization even if adequate amounts are consumed.**

**The third dimension - food utilization has become increasingly prominent in food security discussions since the 1990s.**

# WORLD FOOD SUMMIT 1996: REDEFINING FOOD SECURITY

Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life



# **ACUTE FOOD INSECURITY**

**Food insecurity may be Acute or Chronic**

**Acute food insecurity is usually associated with natural or man-made disasters.**

**Management of acute food insecurity is an important component of disaster management.**

**If disaster management is effective and the duration of food insecurity is short, impact of acute food insecurity on health and nutritional status is transient**

**Disasters do have an adverse long-term impact on livelihood and earning capacity  
Efforts have to be made to ensure that the post-disaster rehabilitation programmes are energetically implemented so that families do not slip into poverty and chronic food insecurity.**

**Severe and prolonged acute food insecurity (famine) is associated with severe acute under-nutrition.**

**Acute food insecurity results in acute weight loss and wasting (Low BMI)**

**Famine is life-threatening. Energetic and effective interventions for improving dietary intake and ready access to health care can reduce the adverse impact of famine on the nutrition and health status of the affected population.**

**Prolonged post-famine rehabilitation will be required.**

# **CHRONIC FOOD INSECURITY**

**Chronic food insecurity can be**

- **transient ie short term and temporary (eg during drought), or**
- **long term and persistent (eg poverty in marginalized population groups)**

**Chronic food insecurity leads to inadequate food consumption**

**Persistent chronic food insecurity and low food consumption results in under-nutrition and micro-nutrient deficiencies**

# **INDICATORS FOR MONITORING FOOD INSECURITY (FAO 2020)**

## **Prevalence of under-nutrition (POU)**

- Historically POU was assessed by dietary energy consumption <2100 Kcal/day; this parameter was used to monitor food insecurity at global, regional & national levels;
- Currently POU is calculated every year for every country on the basis of Minimum Dietary Energy Requirement (MDER);
- Adjustments to the series for each country are made as better information on these parameters are obtained
- FAO compiles the country reports and publishes the global State of Food Security and Nutrition

## **Food Insecurity Experience Scale (FIES)**

Realisation that mere energy adequacy does not imply food security has led to the development of Food Insecurity Experience Scale (FIES);

FIES is based on interviews regarding people's direct experiences in their lives;

FIES reports: Moderate and Severe food insecurity as perceived by the community;

## **Anthropometric indicators**

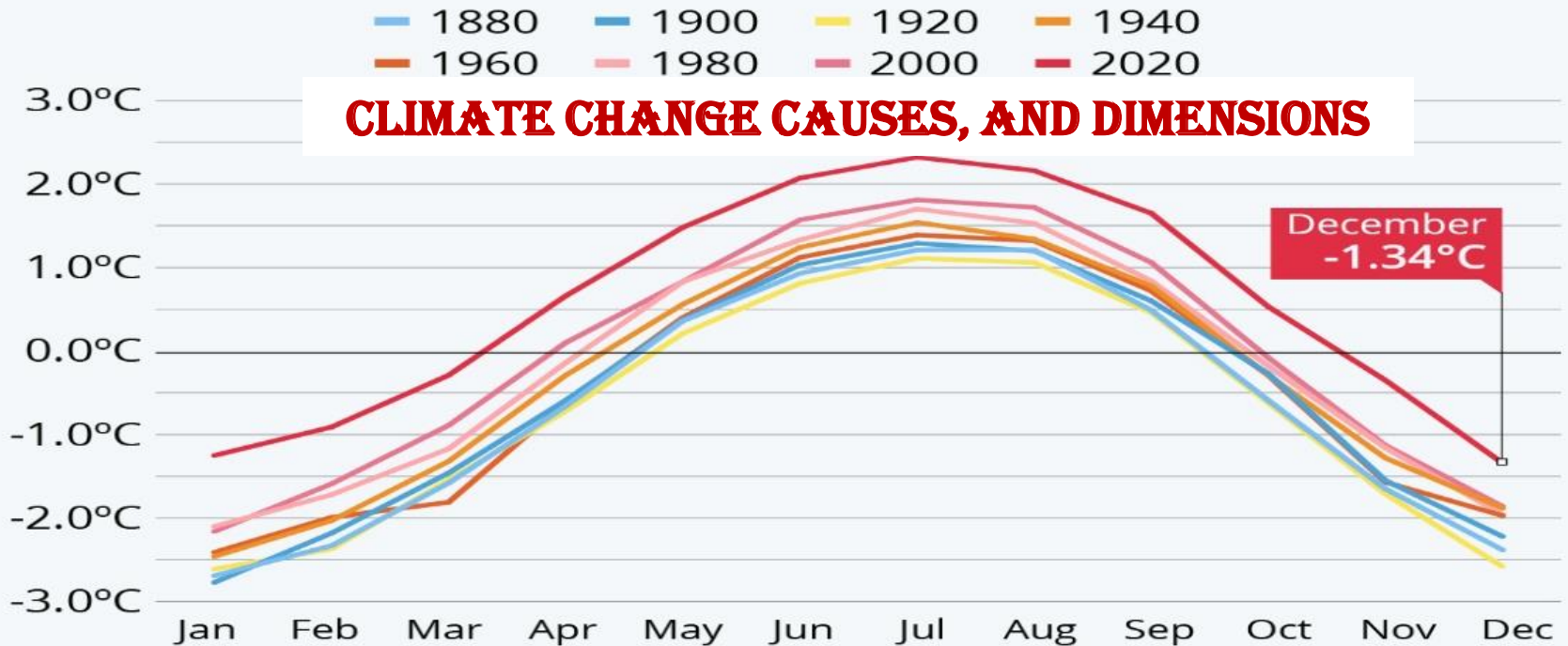
Chronic food insecurity: Stunting, chronic underweight and wasting

These indicators have to be used taking into account the food security status of the population



# Earth is Heating Up

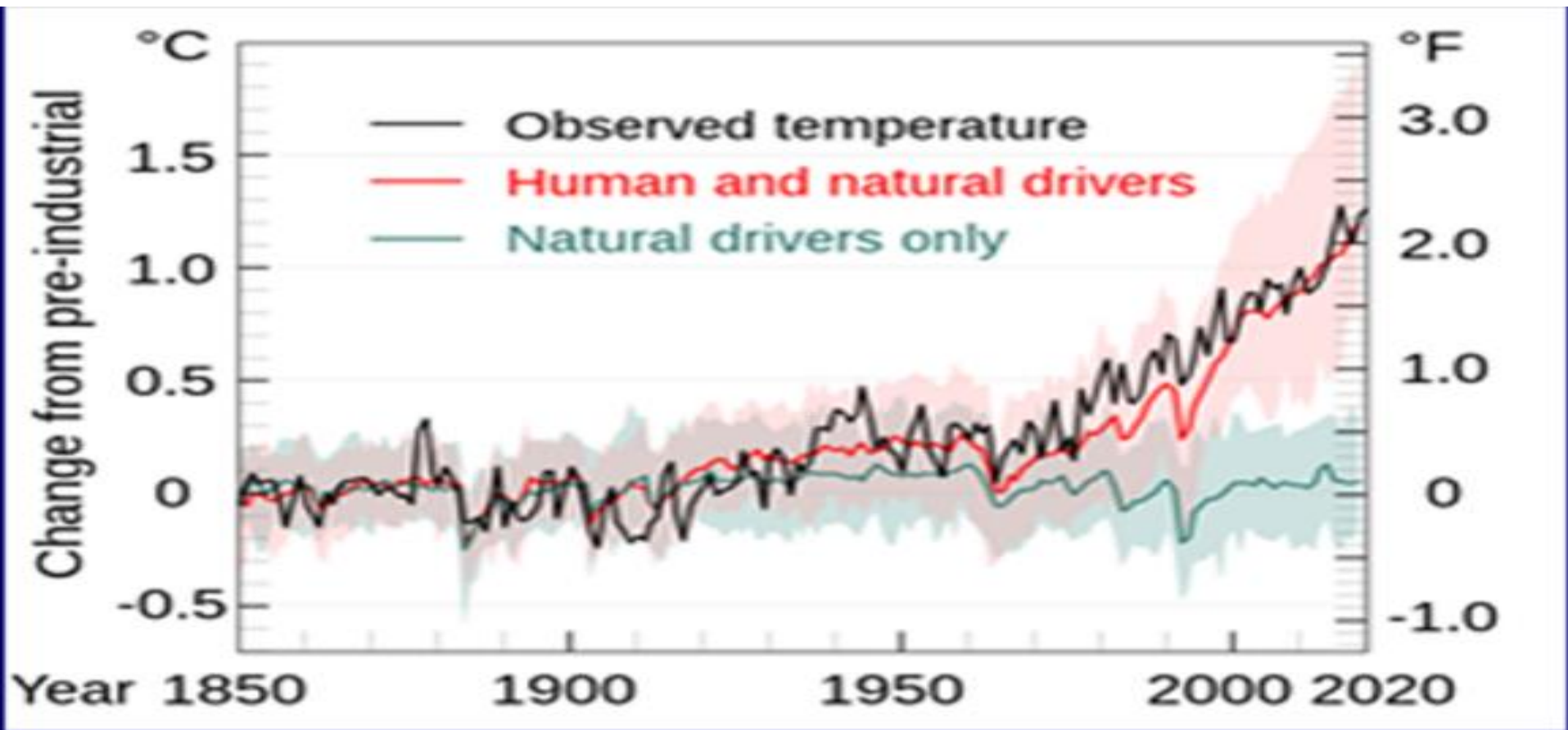
Monthly divergence from average temperature (calculated for 1880-2015) in selected years



Source: NASA



## GLOBAL WARMING – GLOBAL SURFACE TEMPERATURE 1850-2020



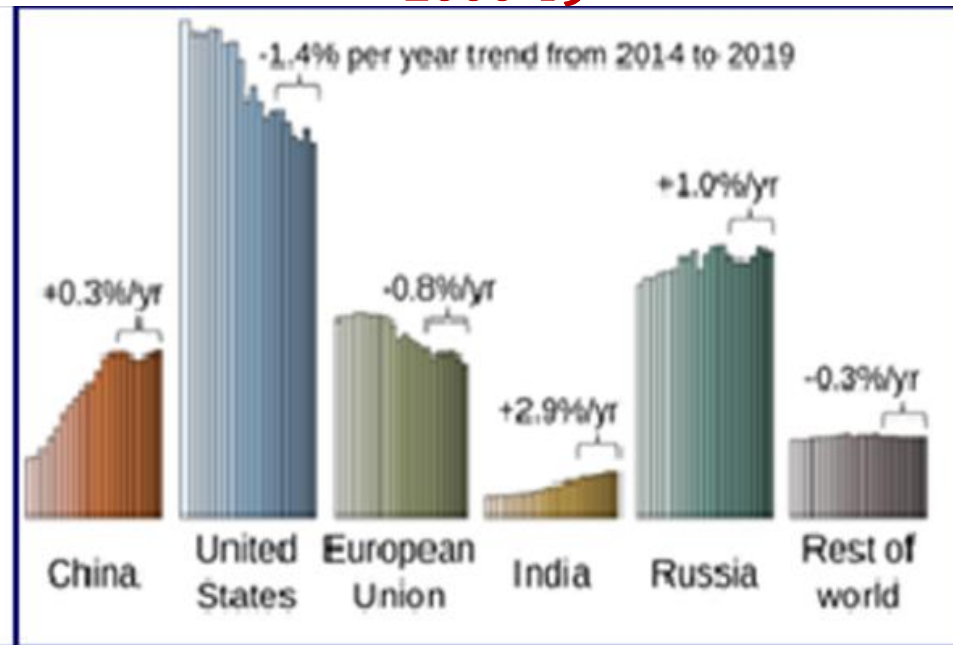
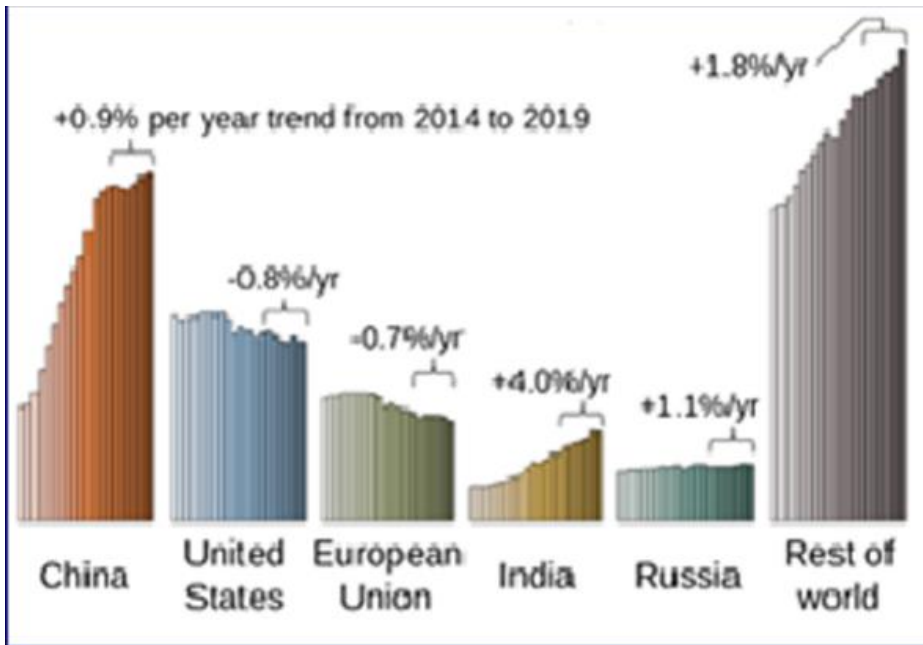
There has been a steep increase in the global surface temperature between 1850 and 2020

The rise in global temperature is driven by the rise in GHG emissions.

The contribution of the natural drivers of the global temperature have not changed between 1850 and 2020.

## FOSSIL FUEL CO<sub>2</sub> EMISSION 2000-2019

## PER CAPITA FOSSIL FUEL CO<sub>2</sub> EMISSION 2000-19



The GHG emissions occur in every country in the world.

Ten countries who were major contributors to GHG emission contribute 68% of GHG emissions.

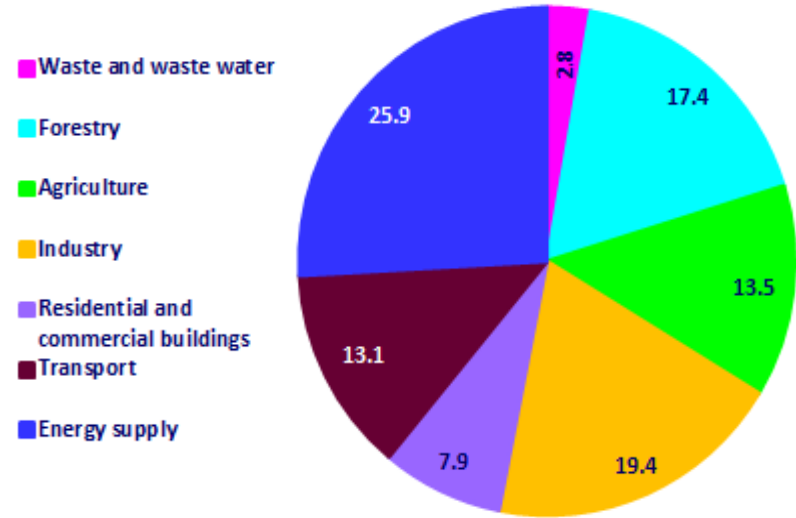
They have a greater responsibility to reduce their GHG emissions steeply and to assist developing countries in their attempts to limit GHG emissions

Between 1870 and 2019, India's contribution was 4% of the global total GHG

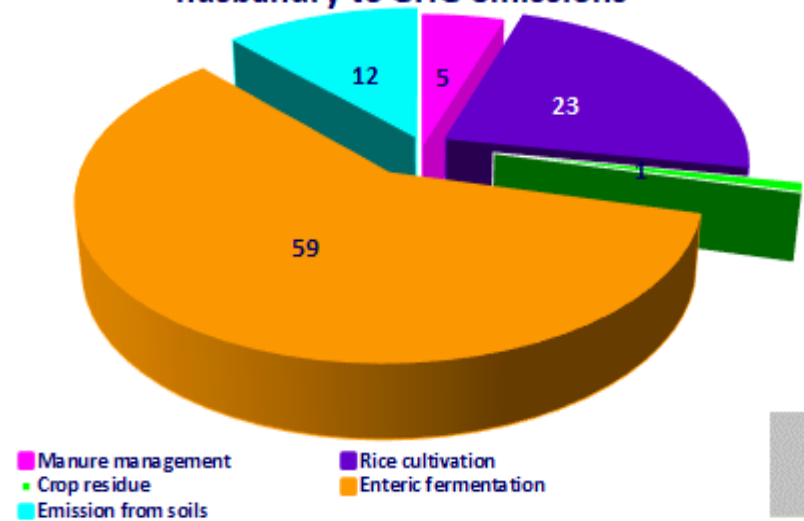
In 2019, India was the third in terms of global GHG emission but India's per capita CO<sub>2</sub> emissions is only 2.98 tonnes annually

India will to balance the need to accelerate the pace of development and economic growth with the global need to limit GHG emissions

**Contribution of different sectors to GHG emissions**



**Contribution of agriculture and animal husbandry to GHG emissions**



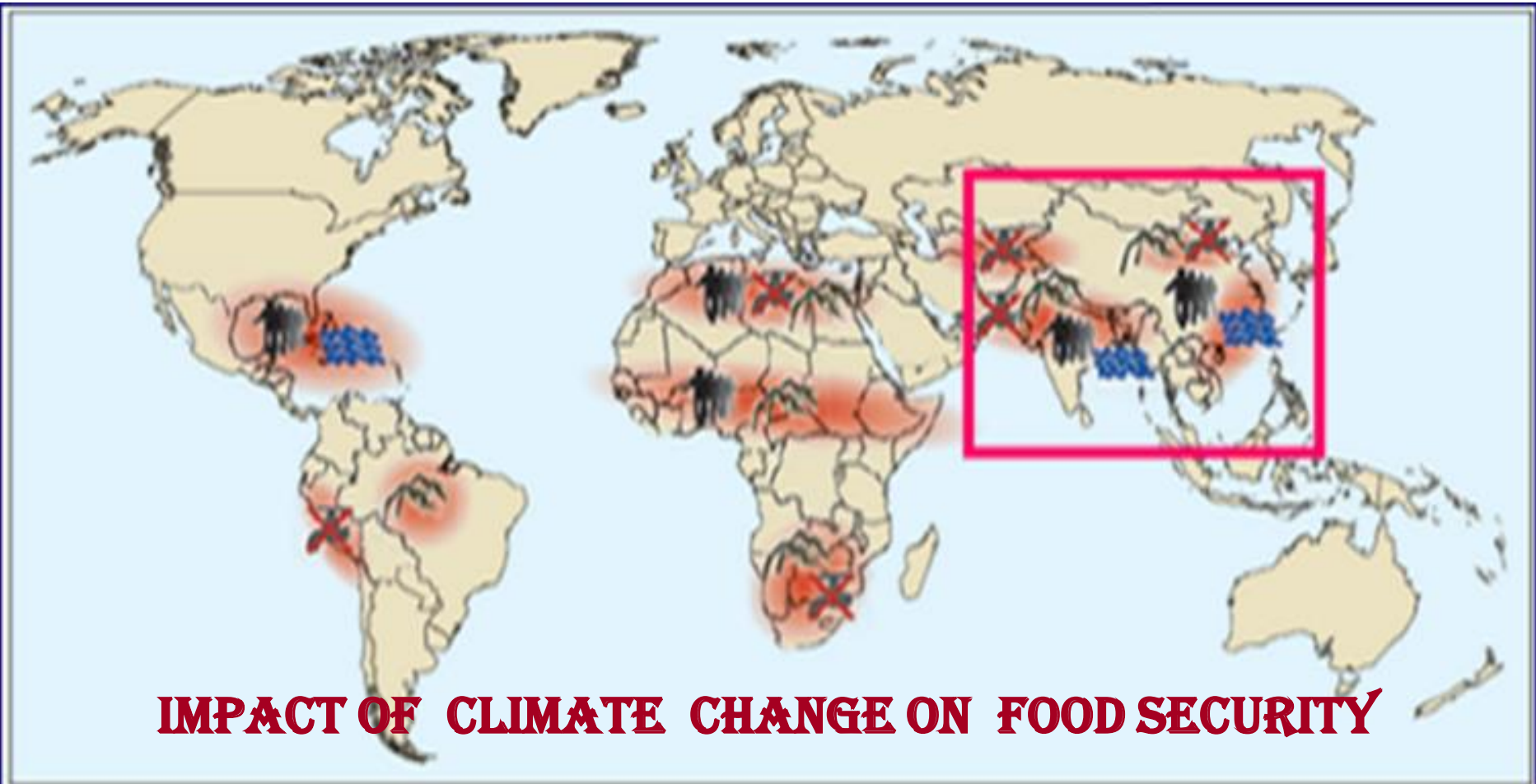
Over the last century there has been an unprecedented, steep and sustained increase in greenhouse gas emissions.

The major sectors contributing to increased greenhouse gas emissions are energy (25.9%), industrialization (19.4 %), and transport (13.1%).

However agriculture (13.5 %) and forestry (17.4%) also contribute to greenhouse gas emission; industrial level animal husbandry for dairy and meat production contributes nearly half of the agriculture associated greenhouse gas emission.

Improved agricultural technologies, better water management and use of appropriate technology in forestry and animal husbandry can substantially decrease the GHS emissions without adversely affecting food production.





## IMPACT OF CLIMATE CHANGE ON FOOD SECURITY

### Conflict constellations in selected hotspots



Climate-induced degradation of freshwater resources



Climate-induced decline in food production



Hotspot



Climate-induced increase in storm and flood disasters



Environmentally-induced migration

WBGU, 2007

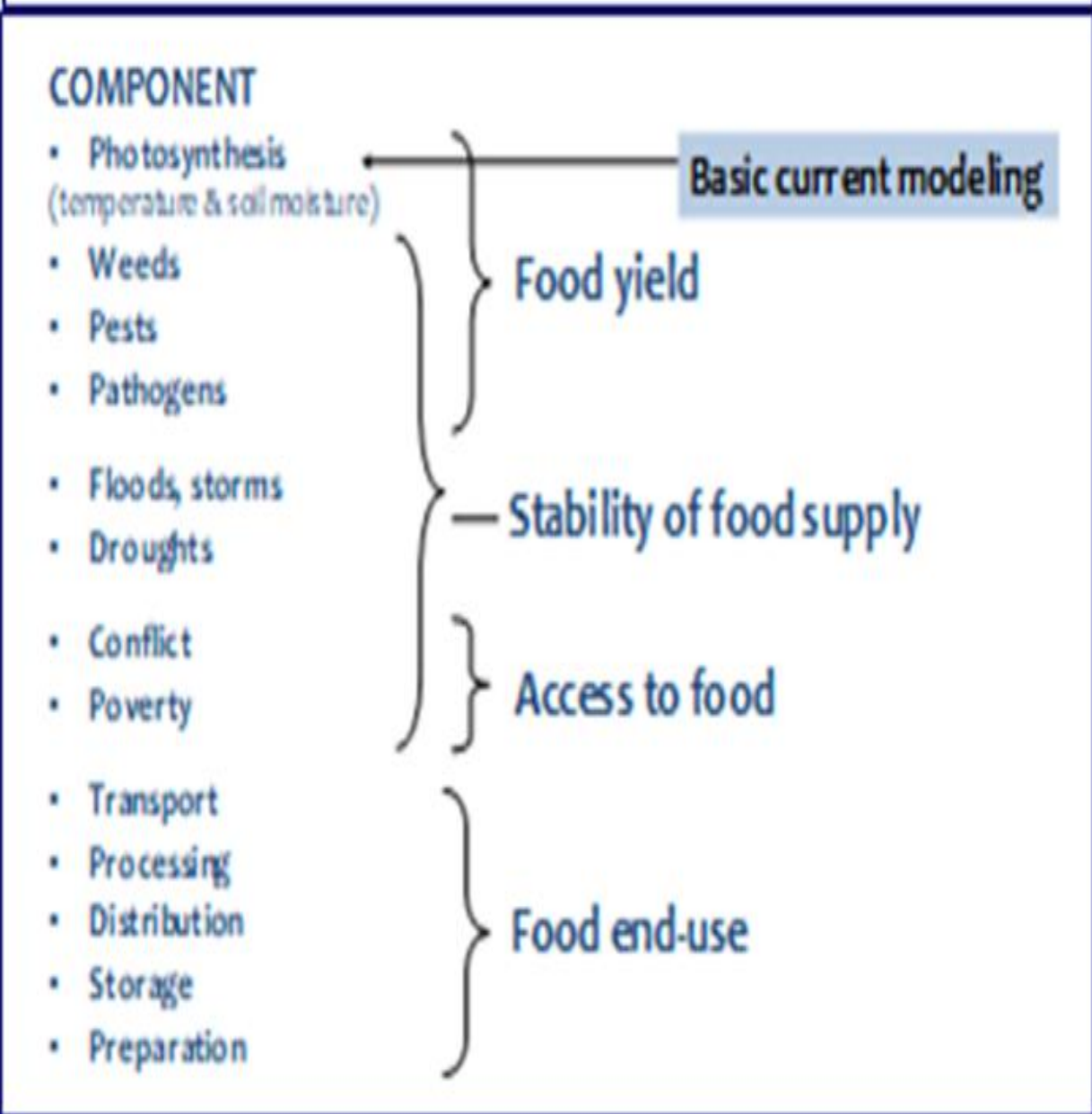
India is very vulnerable to adverse impact of climate change

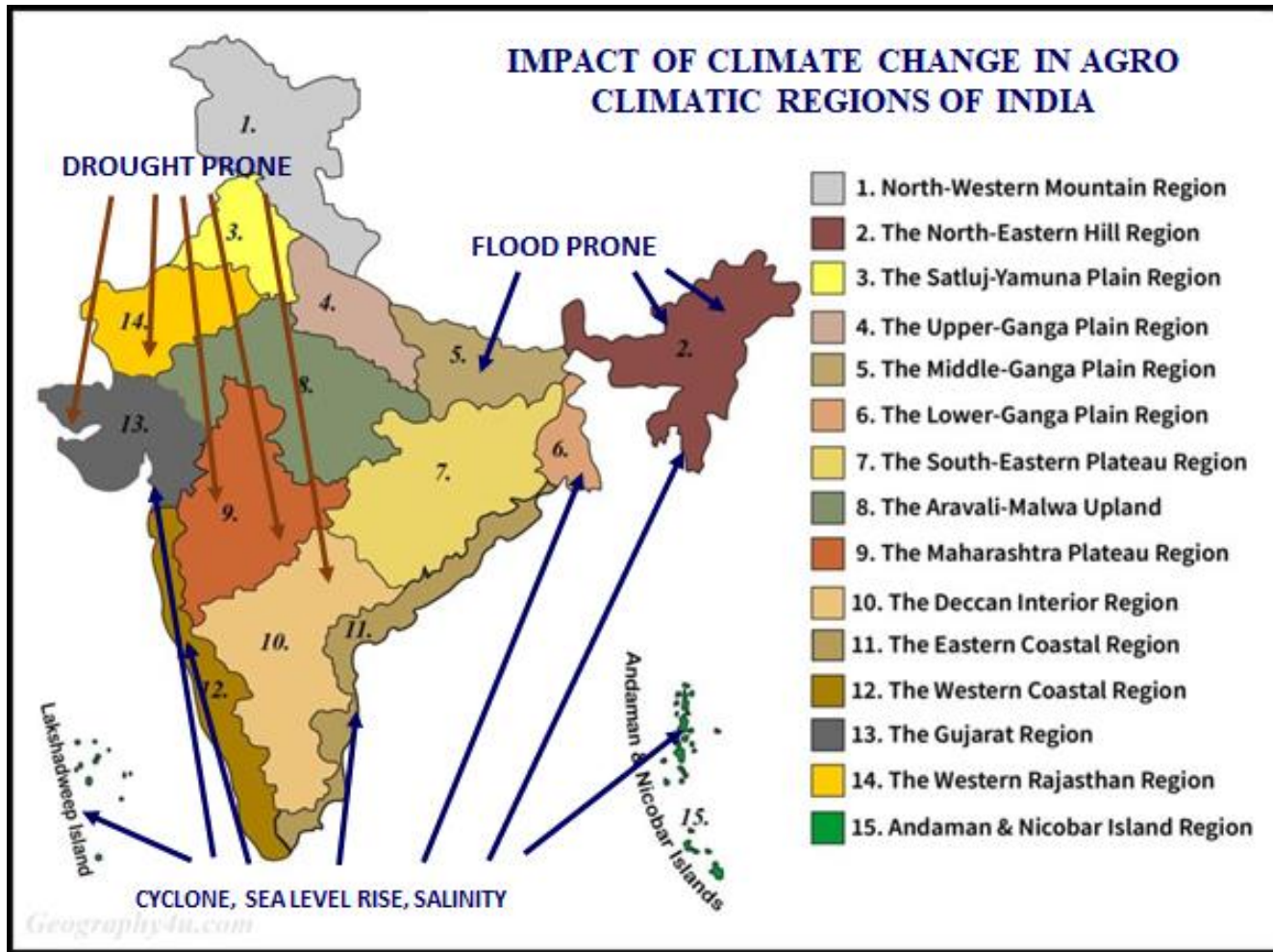


# IMPACT OF CLIMATE CHANGE ON AGRICULTURAL SYSTEM AND FOOD SECURITY

Global warming affects a whole range of systems that affect agriculture:

- melting polar ice, rising sea level and salinity of coastal soil
- water scarcity,
- changes in moisture, weeds, pests and pathogens which affect crop yield and food production,
- climate change-related disasters such as floods storms which cause acute food insecurity
- food insecurity is aggravated by drought, food contaminants, problems in transport, storage and distribution of food

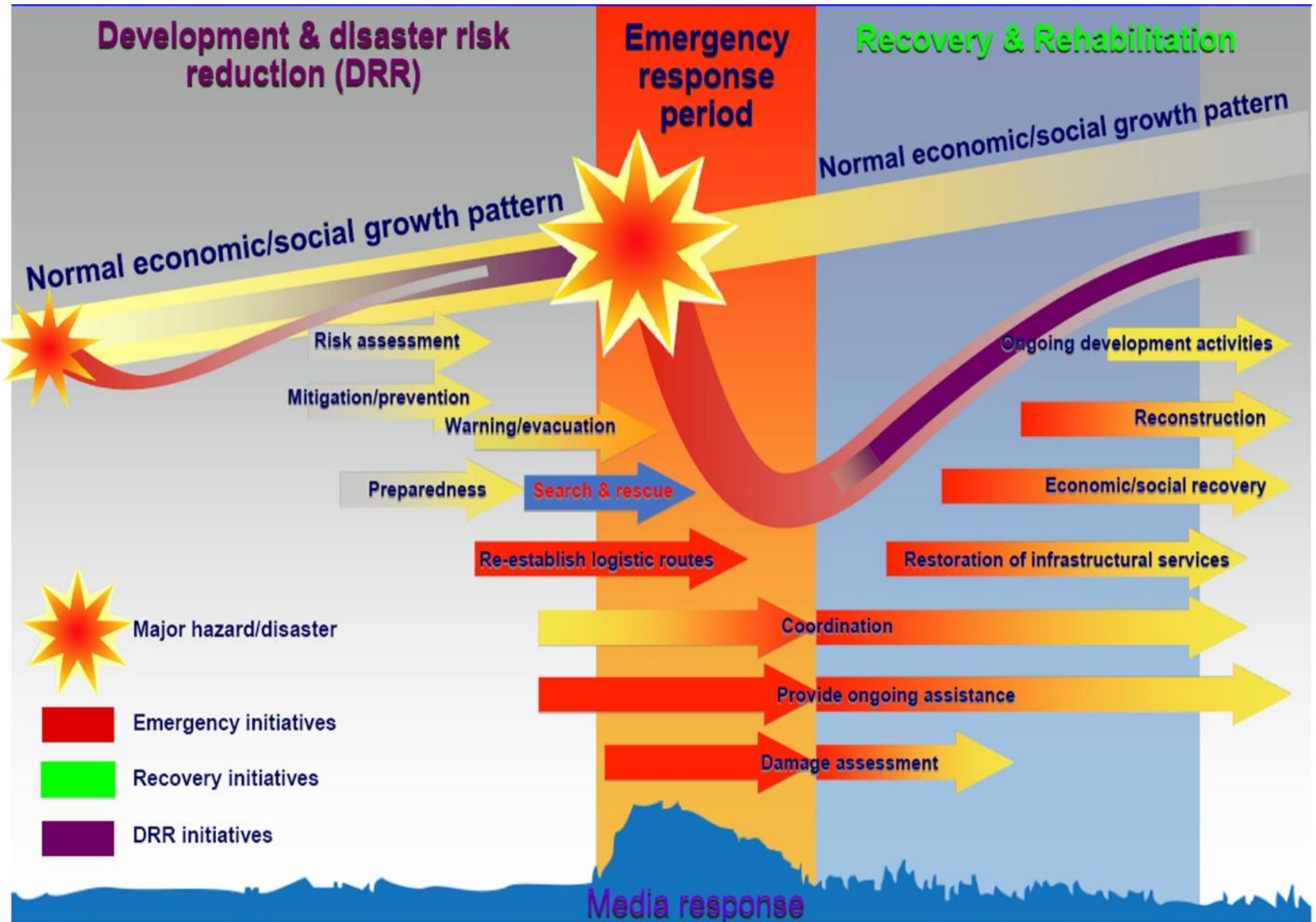




Climate change increases the frequency and severity of weather-related events such as floods and cyclones. Acute food insecurity during these events is dealt with as a part of the disaster management efforts

Severity and extent of the area affected by drought, soil erosion and salinity in coastal areas are increased due to climate change; these will adversely affect food production and food security.

# ACUTE FOOD INSECURITY: DISASTER RISK REDUCTION (DRR)



## **DISASTER RISK REDUCTION PERTAINING TO FOOD SECURITY IN INDIA**

Acute food insecurity associated with disasters - natural or man-made - do occur in India; the frequency and severity of the natural disasters are reported to be increasing due to climate change.

India has established and institutionalized Disaster Management so that the response is prompt and effective and losses are minimised.

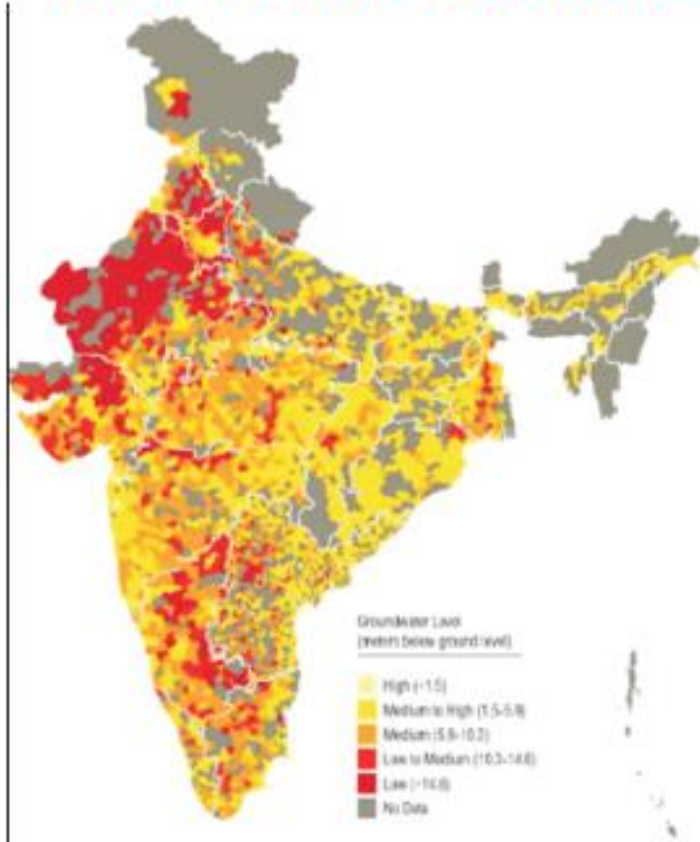
Taking care of the food needs of the affected population is always a part of the Disaster Management Plan

The country fares well in terms of immediate management during disaster including food security of the affected population

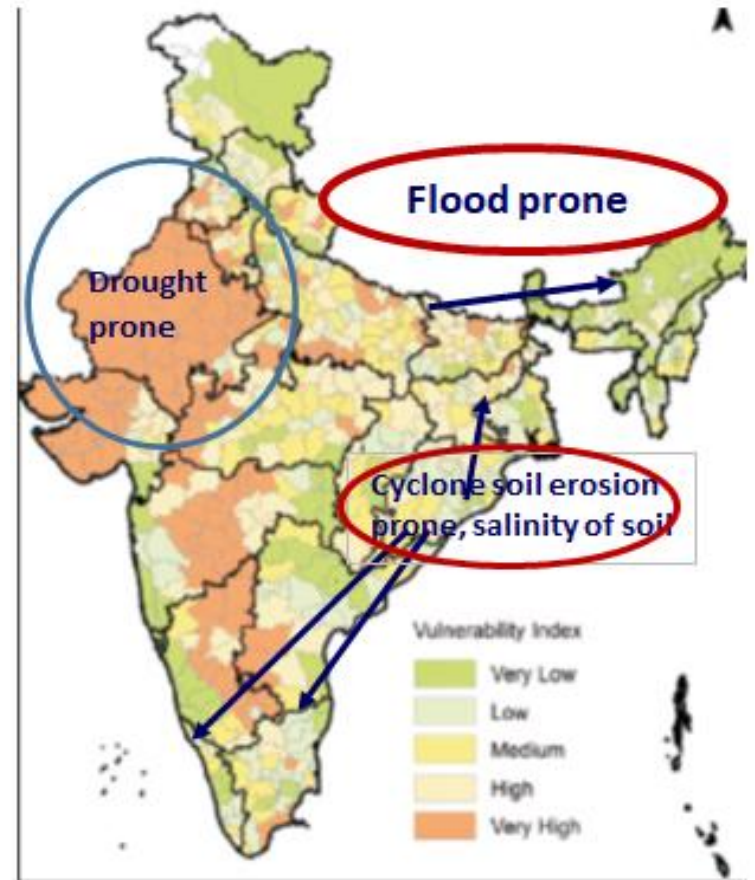
However performance in terms of rehabilitation - including restoration of shelter, long term livelihood and earning capacity of the affected population is suboptimal.



## GROUND WATER LEVEL IN DIFFERENT PARTS OF INDIA



## CLIMATE CHANGE AND AGRICULTURAL VULNERABILITY IN INDIA



Indian agriculture is heavily dependant on monsoon

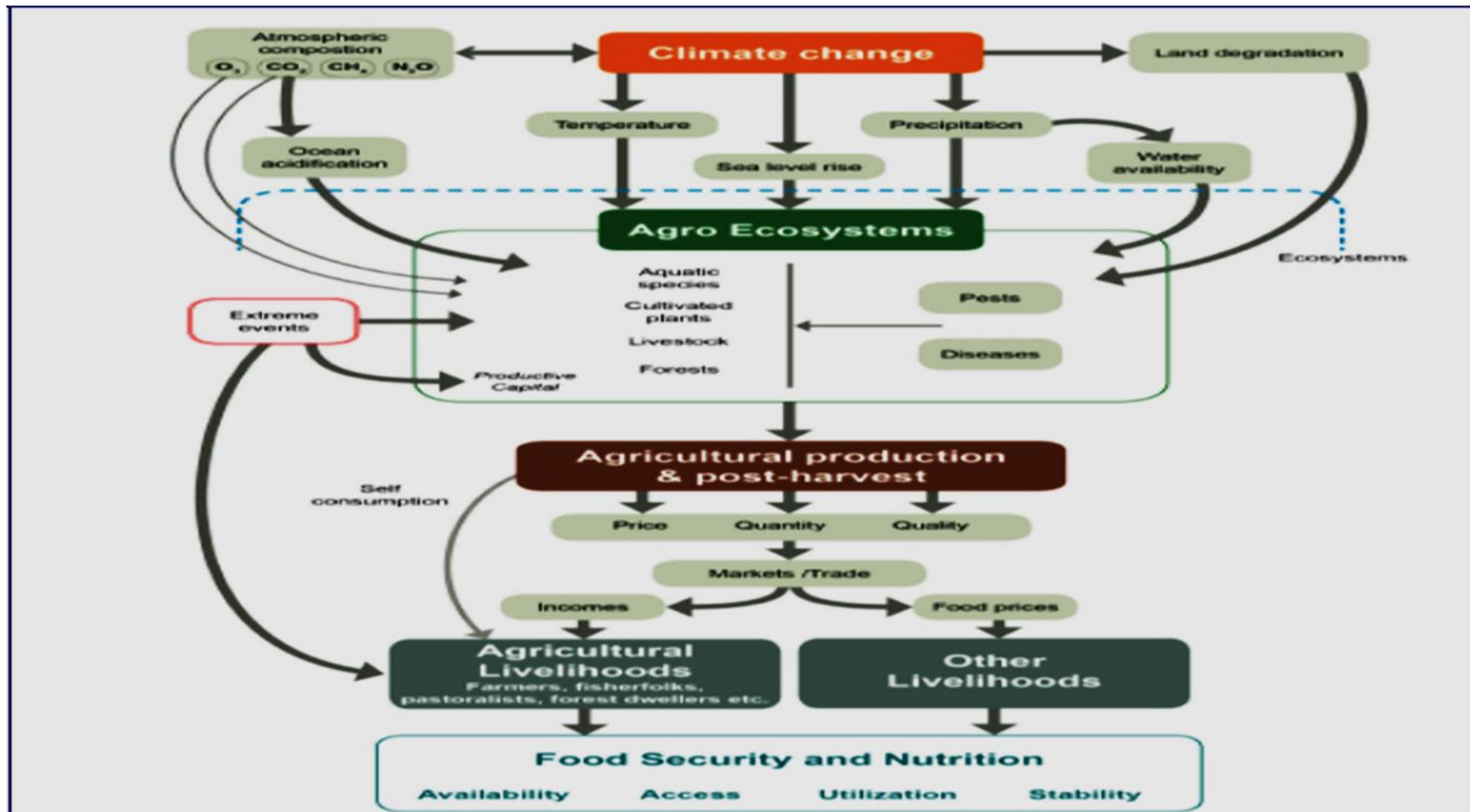
Scarcity of ground water in many parts of India can pose major threat to agriculture especially in drought prone areas western India and Deccan plateau - during monsoon failure

Gangetic plains and Assam are flood prone and face acute food insecurity due to floods

Coastal areas in Bay of Bengal and recently even Arabian sea, get hit by cyclones and people face acute food insecurity.



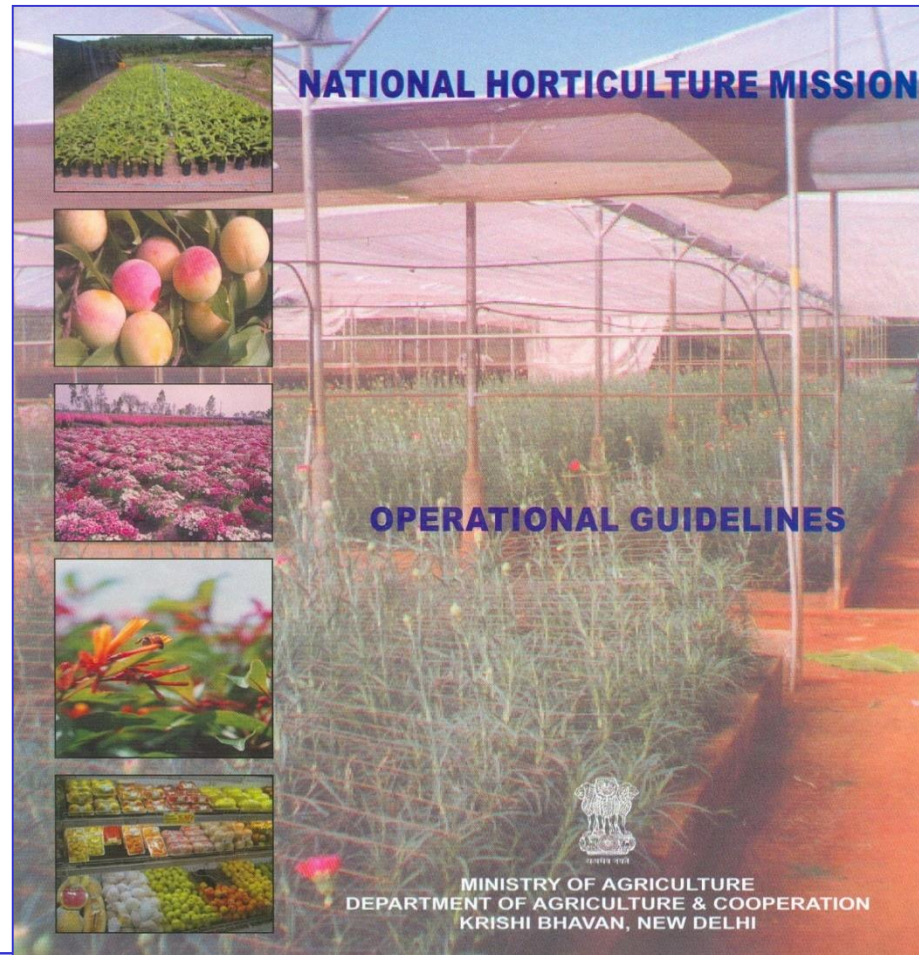
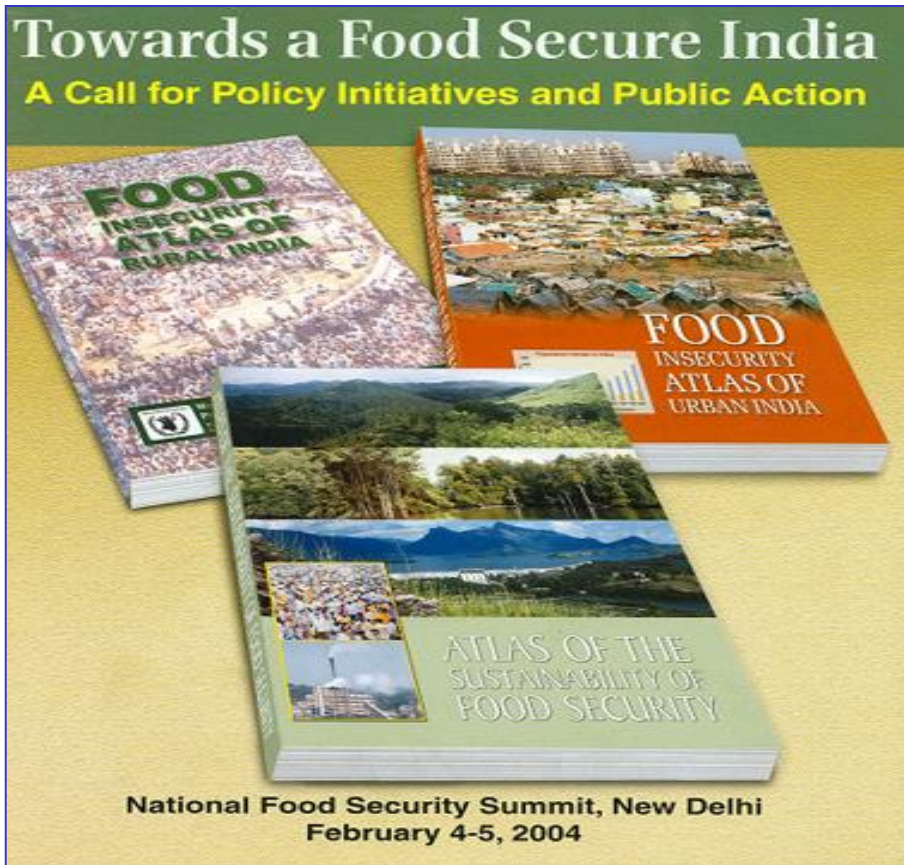
# CLIMATE CHANGE CHRONIC FOOD INSECURITY AND UNDER-NUTRITION



# INDIA'S EARLIER EFFORTS TO IMPROVE FOOD SECURITY



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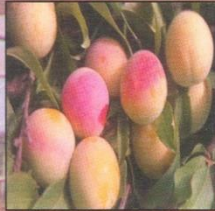


The National Food Security Mission and National Horticultural Mission were set up for ensuring that all food stuffs needed for household food security and optimal nutrition at individual level are made available, accessible and affordable



# NATIONAL HORTICULTURE MISSION

NATIONAL HORTICULTURE MISSION



OPERATIONAL GUIDELINES



MINISTRY OF AGRICULTURE  
DEPARTMENT OF AGRICULTURE & COOPERATION  
KRISHI BHAVAN, NEW DELHI

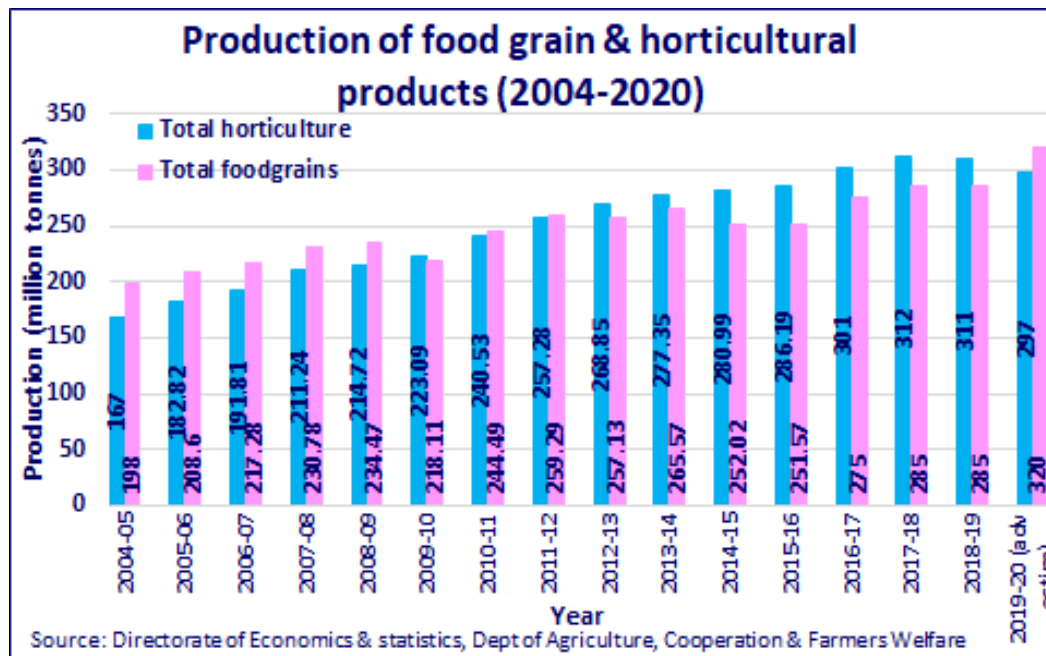
Horticulture can provide sustainable livelihood for small farmers if combined with food processing, storage and transport facilities are available.

Focus should shift to production of low cost micro-nutrient rich vegetables.

Increasing vegetable intake will bridge micro-nutrient gaps in Indian diets

It is a win situation for farmer and population

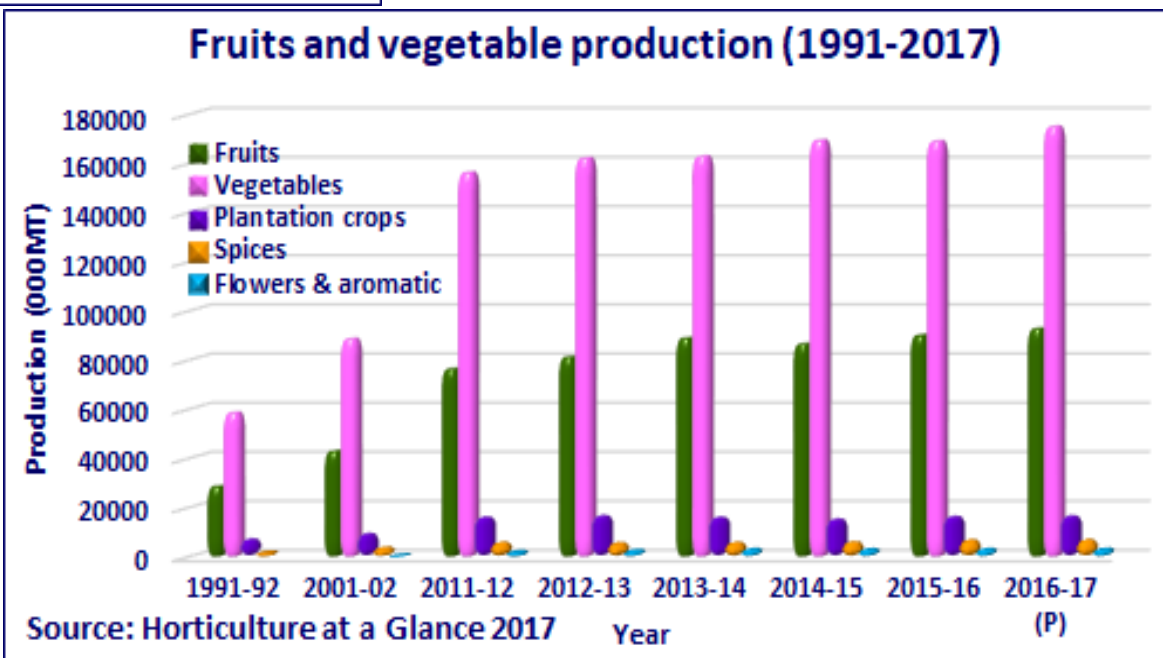
# IMPACT ON VEGETABLE AND FRUIT PRODUCTION



Since 2001 there has been an increase in the production of horticultural products. Currently total horticultural products exceed total food grain production.

The increase in horticultural products is mainly due to increase in production of vegetables.

There has been substantial increase in the production of fruits also.





# WASTAGE REDUCTION: PROCESSING OF VEGETABLES BY DRYING (INDIA)



**Sri Krishna**  
FOOD PRODUCTS

## Ponnagkanni Leaf

RICE POWDER

பொன்னாங்கன்னி கீரை சாதப் பொடி

Nutritional Information Each 100g contains	
Protein	17.14gm
Fibre	4.12gm
Fat	10.03gm
Gross Energy	423.90 kcal
Carbohydrate	52.95gm

**100g**

Ingredients: Ponnagkanni Leaf, Gram Dhal, Fried Gram, Asafoetida, Chilly, Urid Dhal and Salt

Recipe: Add small quantity of ghee or gingelly oil with required hot rice and then add required Krishna Ponnagkanni Leaf Rice Powder. Stir it for uniform blend with rice.

செய்முறை : குடான சாதத்தி  
கேவையான அளவுக்கி ருஷண  
பொன்னாங்கன்னி கீரை சாதப் பொடி  
சேர்த்து நெய் அல்லது நல்லெண்ணெய்  
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# **NATIONAL FOOD SECURITY ACT**

**India is the first country in the world to provide subsidised food grains as a legal entitlement to over 67% of its citizens**

**The National Food Security Act aims to improve household food security through this entitlement.**

**Priority households are entitled to 5 kgs of food grains/person/month.**

**The poorest of the poor (Antyodaya) households are entitled to 35 kgs/household/month.**

**The combined coverage of Priority and Antyodaya households (called “eligible households”) is up to 75% of the rural population and up to 50% of the urban population.**

**During the COVID epidemic provisions under NFSA was utilised to provide free food grains and two hot cooked meals to all persons who needed them and came to the facilities to access them between April 2020 and November 2020.**

**This measure prevented acute food insecurity especially among labourers who were left jobless during lockdown and subsequent slow improvement in employment and low emoluments**





**ACTION PLAN FOR ADDRESSING  
IMPACT OF CLIMATE CHANGE ON FOOD SECURITY**



# **ACTION PLAN TO ADDRESS FOOD INSECURITY DUE TO CLIMATE CHANGE**

**Three broad categories of action are required to combat climate change and its adverse consequences:**

- cut emissions,**
- adapt to climate change, and**
- evolve and implement programmes to mitigate adverse impact of climate change.**

**Each of these interventions require investments in technology, innovations, financial and human resources urgently**

**Global efforts are critical to slow down rise in greenhouse gas emissions and rise in global temperature.**

**Each country will have to evolve and implement interventions to improve the adaptation to climate change and mitigation of adverse consequences of climate change on nutrition and health status.**

# **ADAPTATION TO CLIMATE CHANGE**

Every year district-specific advice to the farmers on what crop to sow and when is provided by the Deptt of Agriculture based on the predictions regarding monsoons of the Met Deptt

Increase in drought prone areas will adversely affect cereal production and animal husbandry assets.

Increase in investment in pulse and millet cultivation in such areas can substantially mitigate the impact

Loss of livelihoods and purchasing power of rural poor due to climate change can adversely affect household food security and dietary intake; when persistent these may adversely affect nutritional status especially of the vulnerable groups.

In affected areas increasing non-farm employment, focussed efforts to improve employment under NREGA, improvement in supplementary feeding under ICDS and MDM can help in mitigating the adverse impact on food security and nutritional status.

Unseasonal rains and increased humidity may increase post-harvest losses and the chances of contaminations of produce such as aflatoxin in groundnut

Surveillance and monitoring for these are to be built up and used



**Action plans for early detection and effective management of adverse consequences of climate change on food security are conceptualized and implemented by 14 line ministries and institutions.**

**Ministry of Health currently implements two major programmes:**

- prevention and management of micronutrient deficiencies and**
- prevention and management of severe acute malnutrition.**

**To address the adverse impact of climate change on food security the Ministry of Health will have to assist the states by:**

- giving them criteria to use for identification of priority districts which may require action plan for improving food security;**
- template for developing action plans for:**
  - early detection and effective management of the acute food insecurity associated with climate change related extreme weather disasters;**
  - monitoring early warning signals for impending drought and associated chronic food insecurity and**
  - taking appropriate steps to prevent adverse consequences of drought on chronic food insecurity**

## **Ministry of Health and Family Welfare has the pivotal role of:**

- monitoring the food security and nutritional status of the population for early detection and effective management of climate change related food insecurity;**
- alerting other ministries as and when there is any increase in food insecurity so that they could initiate steps under their domain;**
- initiate timely interventions to combat any increase in food insecurity or under-nutrition; and**
- providing nutrition education regarding appropriate predominately plant based dietary intake for optimal health.**

## **ACTION PLAN FOR MITIGATION OF IMPACT OF CLIMATE CHANGE AT DISTRICT LEVEL**

If there is predictions by Met Deptt regarding drought or monsoon failure priority has to be accorded to improve food security.

Interventions to improve food security include interventions by Employment programmes, food grain provision under NFSA through PDS, ensuring that food supplementation programmes (MDM and ICDS) are fully operational.

NITI Aayog has put in their website the district wise mapping (for aspirational districts as well as all districts) of nutritional status of children and adults, prevalence of anaemia in children and adults

Each state/district will have to download the data and draw up priority interventions based on the POSHAN 2 targets.

Strengthening ongoing nutrition surveillance & monitoring is essential to assess:

- adverse impact of the climate change on nutritional status, and
- impact of interventions to minimise them.

**TO SUM UP**

# **CLIMATE CHANGE AND FOOD SECURITY IN INDIA**

**Climate change can affect all four dimensions of food security: food production, food availability, food accessibility, food utilization and food systems stability.**

**Food production can be affected due to:**

- Increase in maximum and minimum temperature in many regions of the country,**
- Increase drought in drought-prone regions,**
- Increase in seasonal rainfall in some regions - decrease in other regions,**
- Delay and unseasonal rainfall in some regions, and**
- Increase in extreme weather events - eg floods, cyclones.**

**Changes can be regional, seasonal or persistent.**

**Persistent effects have to be documented and efforts to mitigate adverse consequences have to be evolved, tested and implemented.**

**Seasonal changes are difficult to predict**

**Catastrophic events require disaster management preparations**

**Climate change can indirectly affect nutritional status through:**

- Low food production affecting availability and cost of food**
- These result in food insecurity of vulnerable population, households or vulnerable individuals**



# **CURRENT STATUS OF FOOD SECURITY IN INDIA**

**India currently fares well in terms of food security indicators**

**The country is self-sufficient in food production**

**One of the countries with the fastest GDP growth in the last decade.**

**MDG target for poverty reduction was achieved.**

**Under NFSA 2/3<sup>rd</sup> of Indians are entitled to get subsidized food grains**

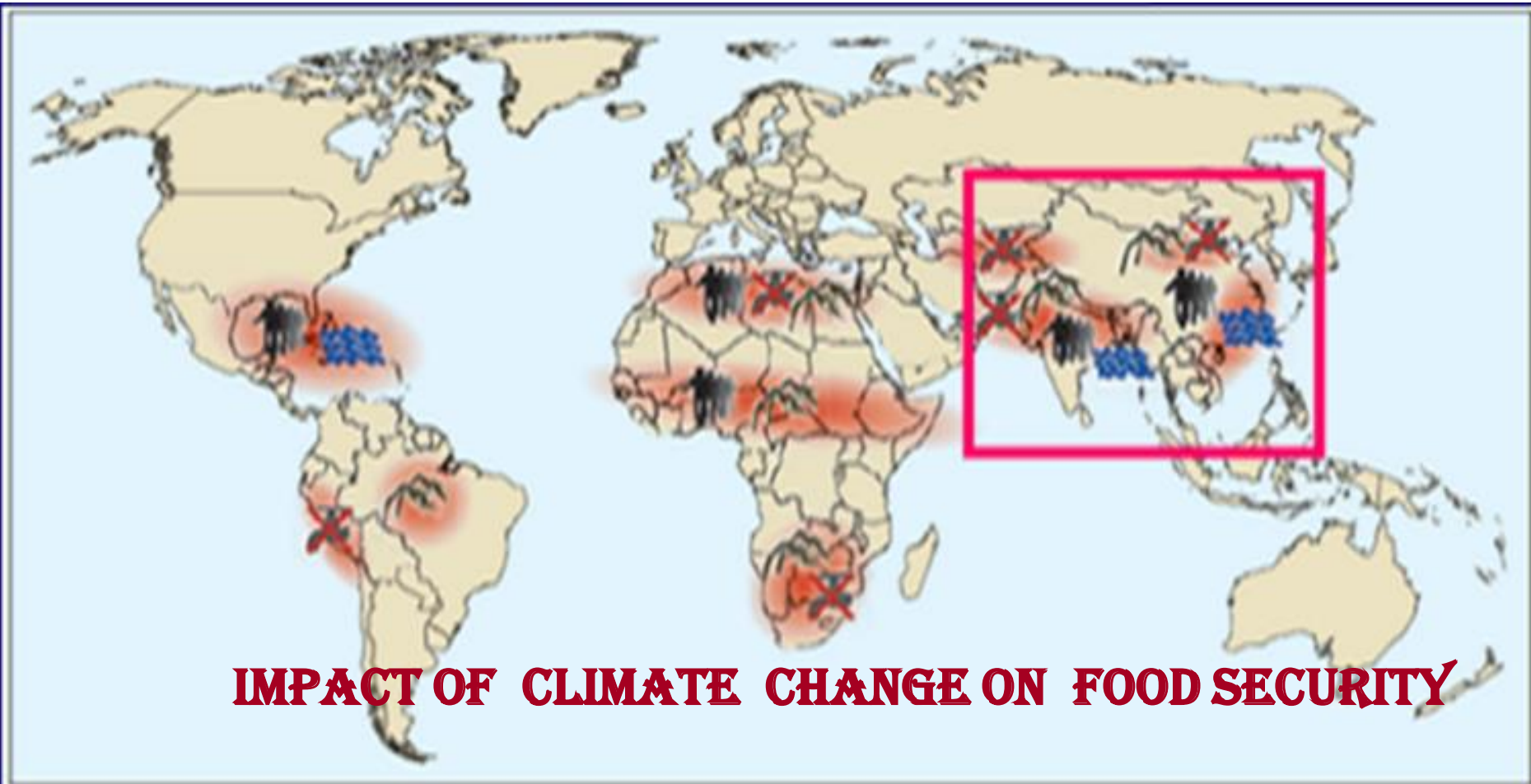
**During COVID 19 epidemic in India, free food grains and cooked meals twice a day were given to all those who needed food.**

**This prevented increase in food insecurity and under-nutrition during lockdown and COVID 19 waves.**

**Currently average energy intake of the population is sufficient to meet their energy requirements**

**As a result there has been some reduction in under-nutrition rates across the age groups.**

**Priority is being given to evolve and implement action plans to adapt to climate change and mitigate the impact of climate change on food security.**



## IMPACT OF CLIMATE CHANGE ON FOOD SECURITY

### Conflict constellations in selected hotspots



Climate-induced degradation of freshwater resources



Climate-induced decline in food production



Hotspot



Climate-induced increase in storm and flood disasters

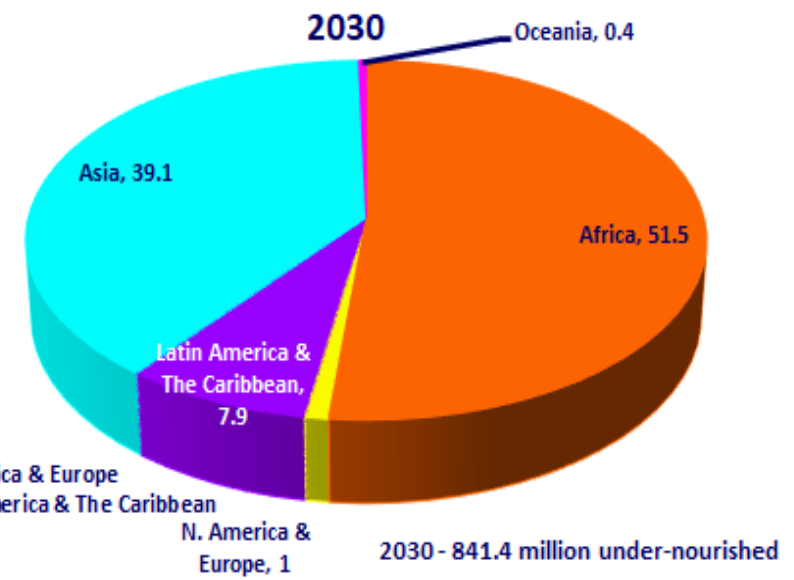
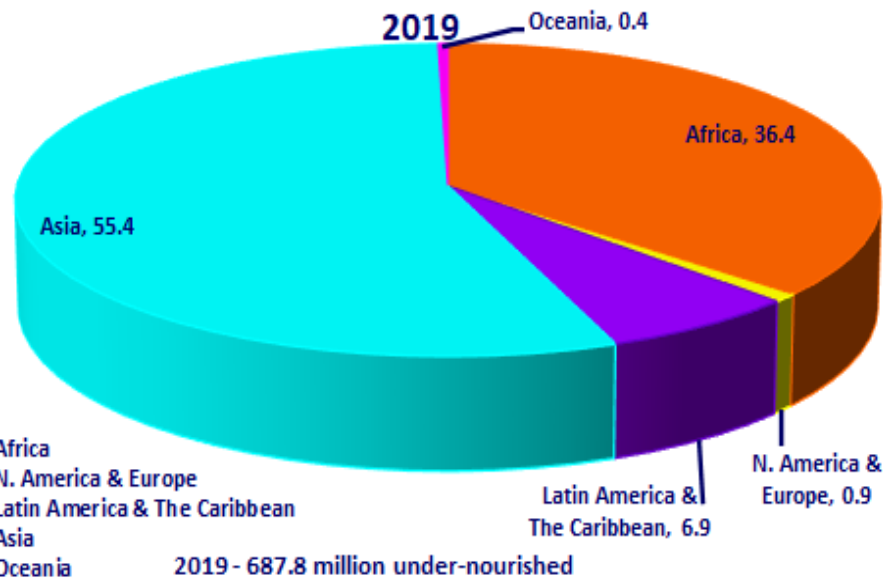


Environmentally-induced migration

WBGU, 2007

India is very vulnerable to adverse impact of climate change

# PROJECTIONS OF UNDER-NOURISHED PERSONS BY 2030 (FAO 2020)



It is expected that the recent trends in improvement in food security and reduction in undernourishment in India will be sustained till 2030

As a result, there will be substantial changes in the regional distribution of under-nourished persons over the next ten years

FAO predicts that despite being one of the worst affected regions by climate change, the share of Asia (and India) in under-nourished persons will come down from 55% in 2019 to 39% in 2030.

Thank You