IIHMR UNIVERSITY

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Dr. Nitish Dogra
Associate Professor
IIHMR Delhi

Faculty Development Program for IIHMR Group of Institutions

Environmental Health

Date: September 12, 2020

Dr. Nitish Dogra has done his MBBS and MD from University of Delhi. He has also received a Master of Public Health degree from the world renowned Johns Hopkins University (JHU), United States. Subsequently he has worked in several coveted institutions including JHU, INCLEN and TERI. He had earlier served as Assistant Professor at IIHMR, Delhi from 2009-2014. In addition he was selected for a Fulbright-Nehru Environmental Leadership Program Fellowship for 2013-14 by the United States Department of State and the Government of India. During this period he was based at JHU as a Visiting Faculty. He convened the Understanding Climate and Health Associations in India (UCHAI) training workshop in 2015 which was partially supported by the National Institutes of Health (NIH), US Government. He has brought out the edited volume Climate Change and Disease Dynamics in India, the first such book on the topic with 28 authors across India, United States, Belgium and New Zealand. Dr. Dogra has also worked with the World Health Organization (WHO) as consultant, temporary adviser and project principal investigator at different points of time. In August 2014, he delivered on request, an invited commentary at the Conference on Health & Climate at WHO Headquarters, Geneva. This was the first global ministerial level meeting on the subject where he was one of three delegates from India. Besides, his innovation linking a community based air quality monitoring system with social media has been featured on BBC and Times of India, amongst other places.

Environmental Health

FDP

12th September 2020

DR. NITISH DOGRA, MD, MPH (JOHNS HOPKINS)

ASSOCIATE PROFESSOR

CONVENOR, CENTRE FOR CLIMATE, ENVIRONMENT AND HEALTH

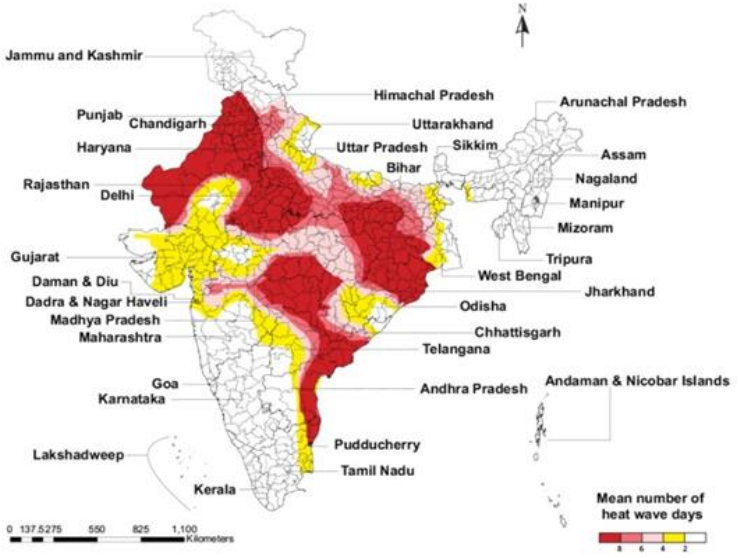
(RECOGNIZED BY NATIONAL CENTRE FOR DISEASE CONTROL, GOVT. OF INDIA AS A CENTRE OF EXCELLENCE UNDER NATIONAL PROGRAMME ON CLIMATE CHANGE AND HUMAN HEALTH)

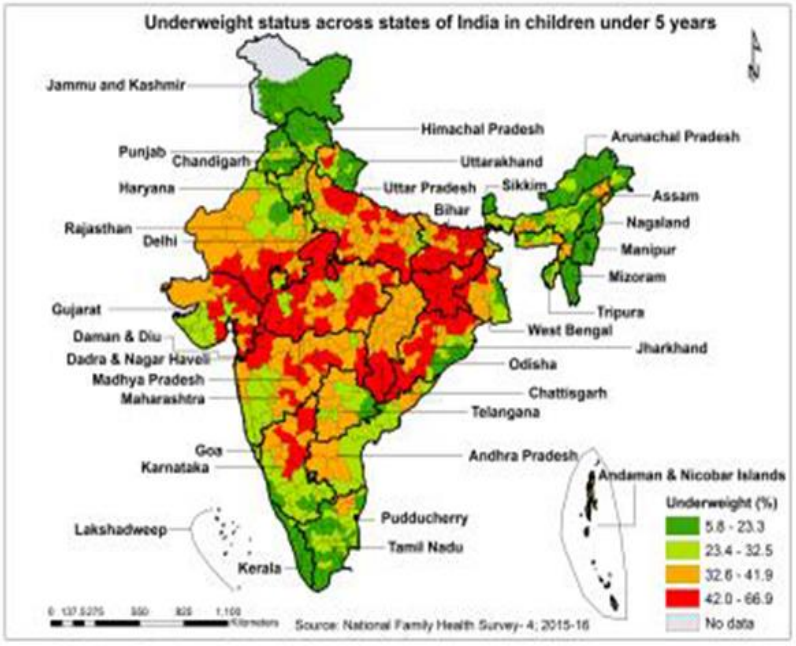
INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

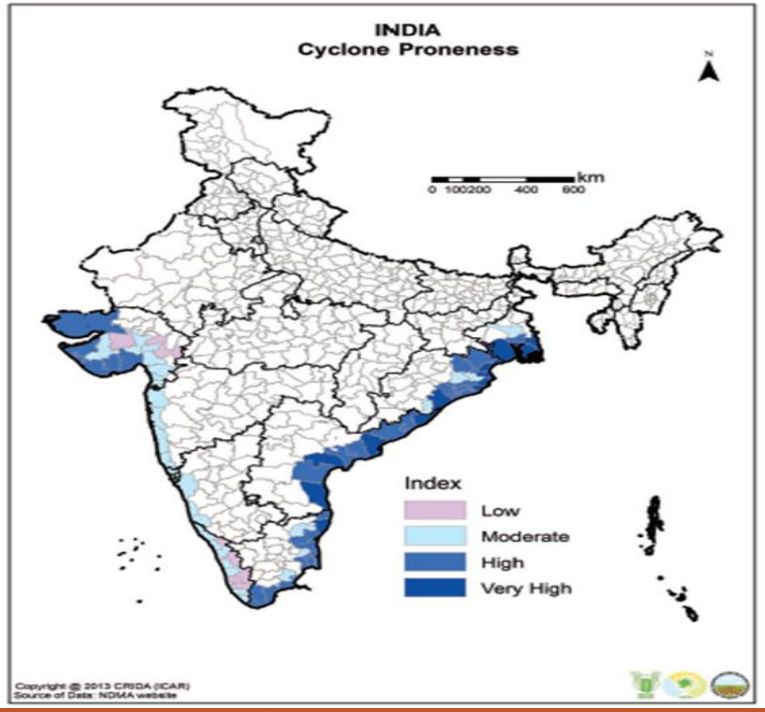
Components

- Climate Change
- Air Pollution
- Disaster
- Water and Sanitation
- Waste
- Built Environment

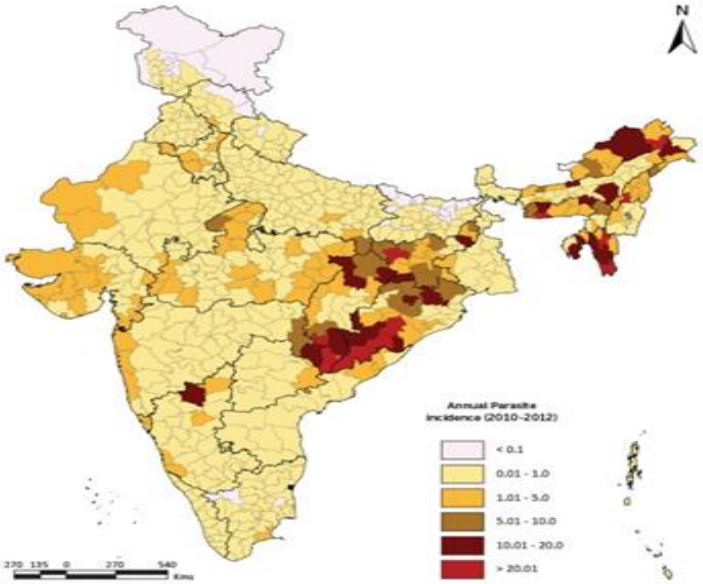
HEAT WAVES

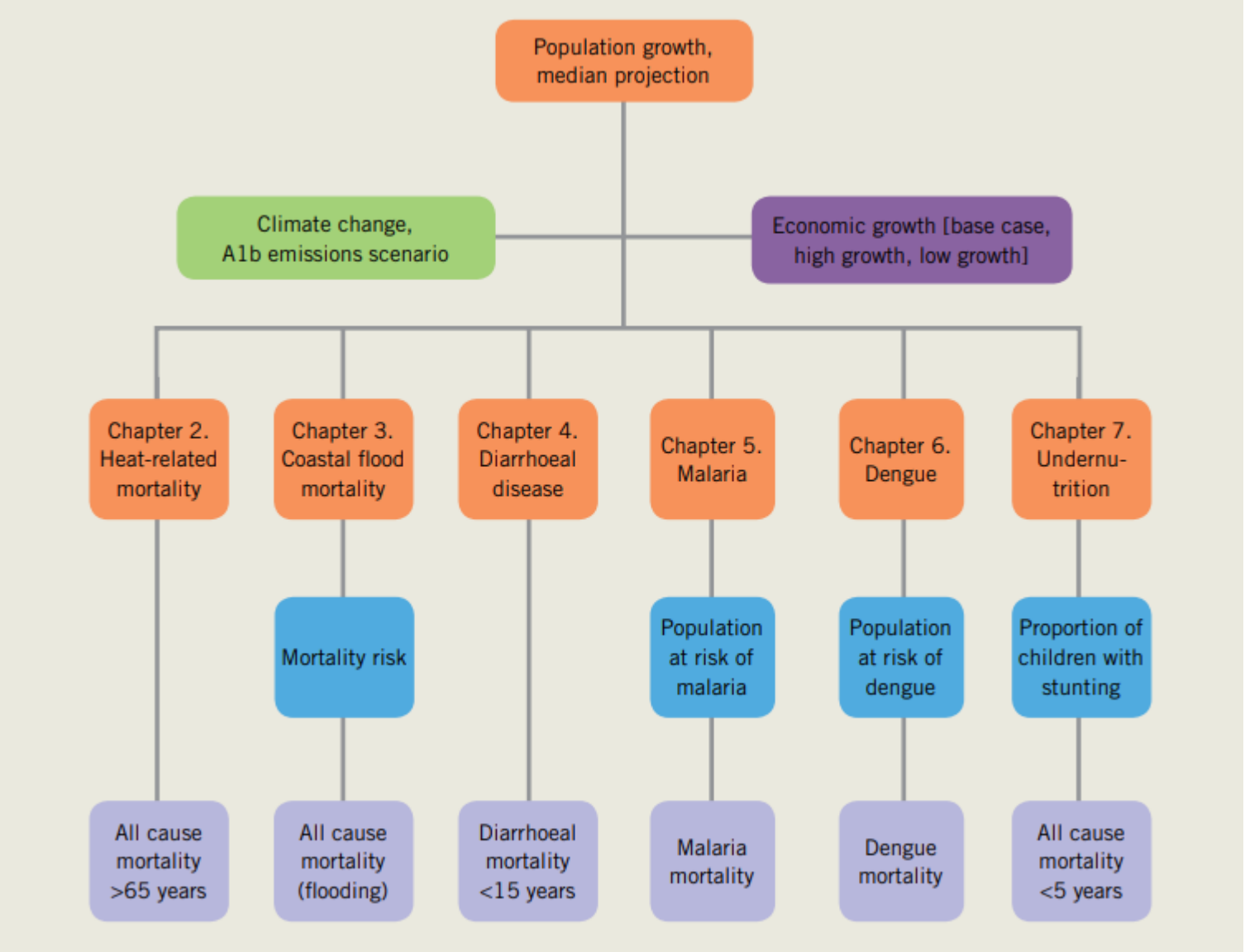






MALARIA





WHO Climate Change attributable Mortality Framework

Table 1.2 Additional deaths attributable to climate change,[a] under A1b emissions and the base case socioeconomic scenario, in 2030

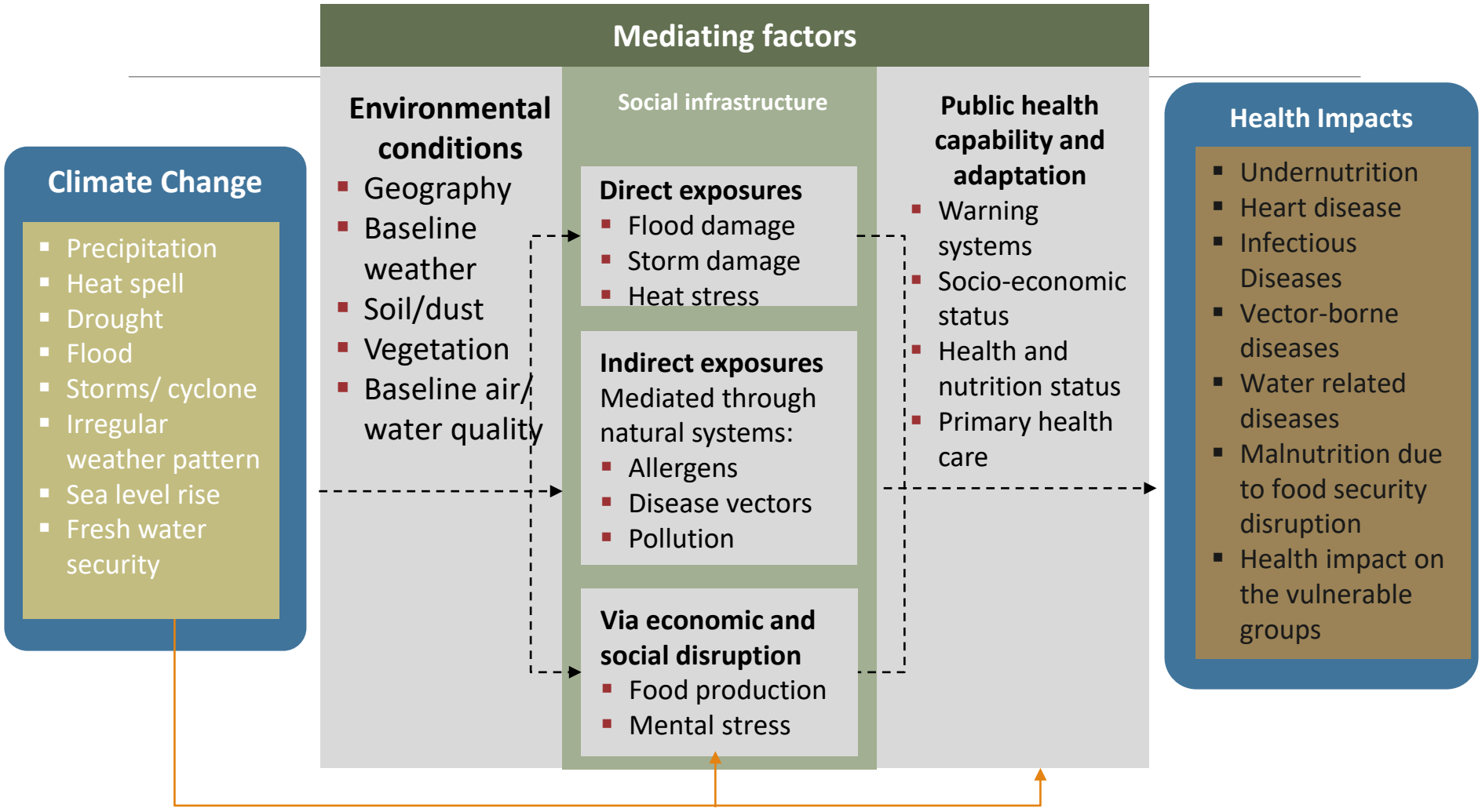
Region	Undernutrition[b]	Malaria	Dengue	Diarrhoeal disease[c]	Heat[d]
Asia Pacific, high income		0 (0 to 0)	0 (0 to 0)	1 (0 to 2)	1488 (1208 to 1739)
Asia, central	473 (–215 to 1161)	0 (0 to 0)	0 (0 to 0)	111 (49 to 150)	740 (364 to 990)
Asia, east	1155 (–5313 to 7622)	0 (0 to 0)	39 (23 to 48)	216 (95 to 298)	8010 (5710 to 9733)
Asia, south	20 692 (–39 019 to 80 404)	1875 (1368 to 2495)	197 (101 to 254)	14 870 (6533 to 20 561)	9176 (7330 to 10 620)
Asia, south-east	3348	550	0	765	2408

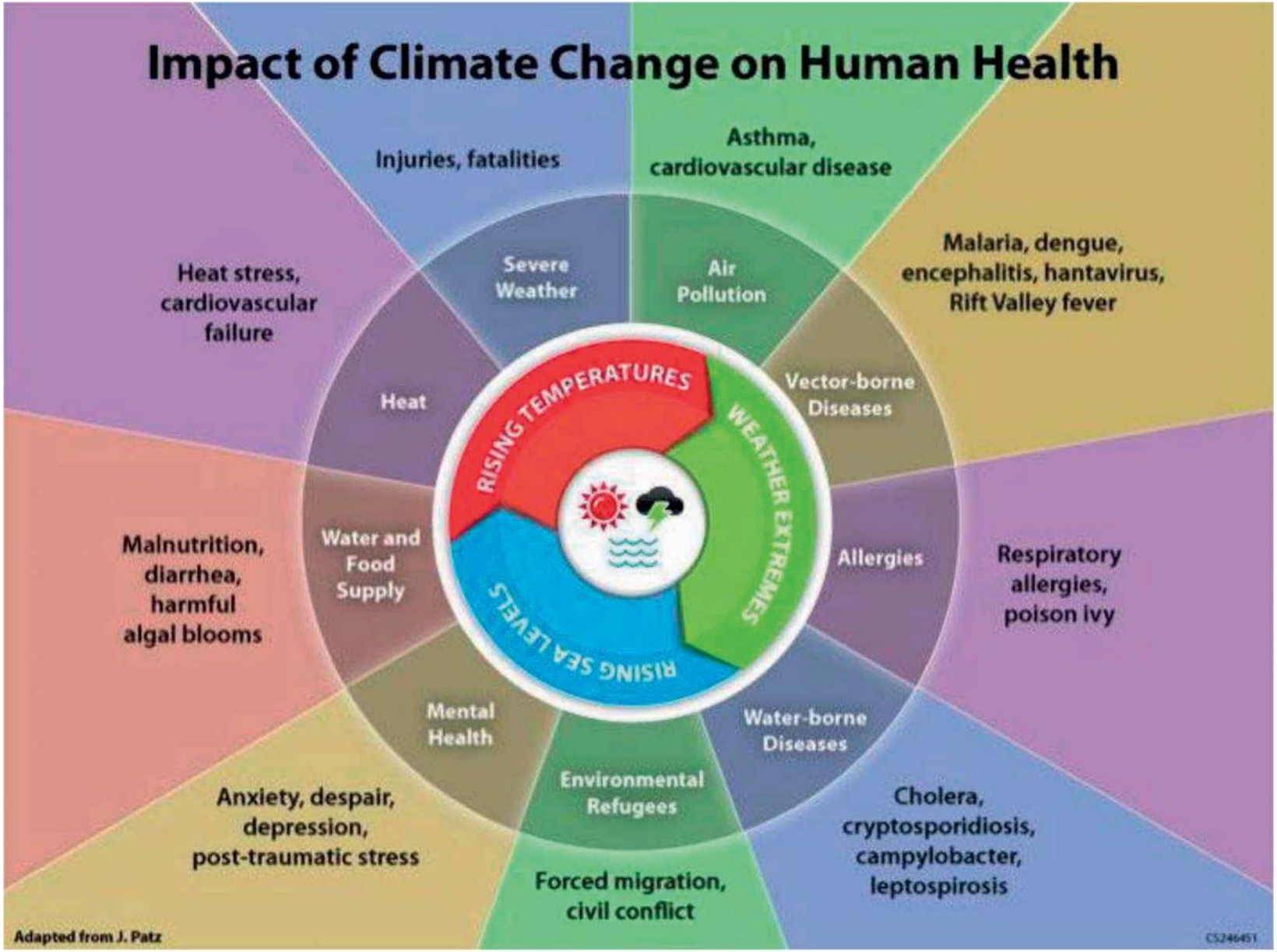
Table 1.3 Additional deaths attributable to climate change,[a] under A1b emissions and the base case socioeconomic scenarios, in 2050

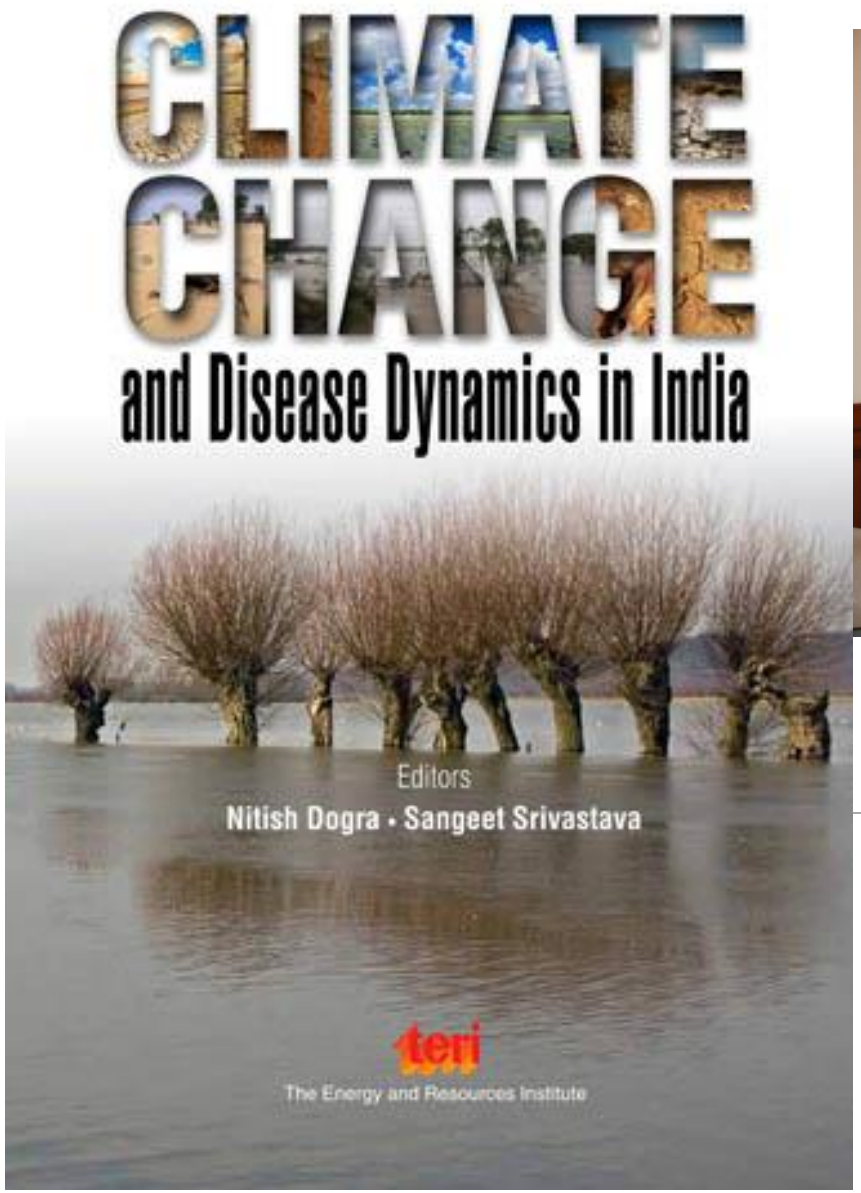
Region	Undernutrition[a]	Malaria	Dengue	Diarrhoeal disease[c]	Heat[d]
Asia Pacific, high income		0 (0 to 0)	0 (0 to 0)	1 (0 to 1)	2504 (1868 to 3046)
Asia, central	314 (66 to 563)	0 (0 to 0)	0 (0 to 0)	26 (12 to 38)	1889 (1077 to 2173)
Asia, east	700 (–427 to 1828)	0 (0 to 0)	31 (25 to 42)	72 (33 to 107)	17 882 (11 562 to 24 576)
Asia, south	16 530 (–1582 to 34 642)	9343 (2998 to 13 488)	209 (140 to 246)	7717 (3522 to 11 421)	24 632 (20 095 to 31 239)
Asia, south-east	3049 (605 to 5494)	287 (265 to 334)	0 (0 to 0)	383 (172 to 575)	7240 (5883 to 10 290)

Source: WHO

How climate change impacts health




Impact of Climate Change on Human Health
Injuries, fatalities
Asthma, cardiovascular disease
Heat stress, cardiovascular failure
Malaria, dengue, encephalitis, hantavirus, Rift Valley fever
Severe Weather
Air Pollution
Heat
Vector-borne Diseases
RISING TEMPERATURES
WEATHER EXTREMES
RISING SEA LEVELS
Water and Food Supply
Allergies
Malnutrition, diarrhea, harmful algal blooms
Respiratory allergies, poison ivy
Mental Health
Water-borne Diseases
Environmental Refugees
Anxiety, despair, depression, post-traumatic stress
Cholera, cryptosporidiosis, campylobacter, leptospirosis
Forced migration, civil conflict
Adapted from J. Patz
CS246451



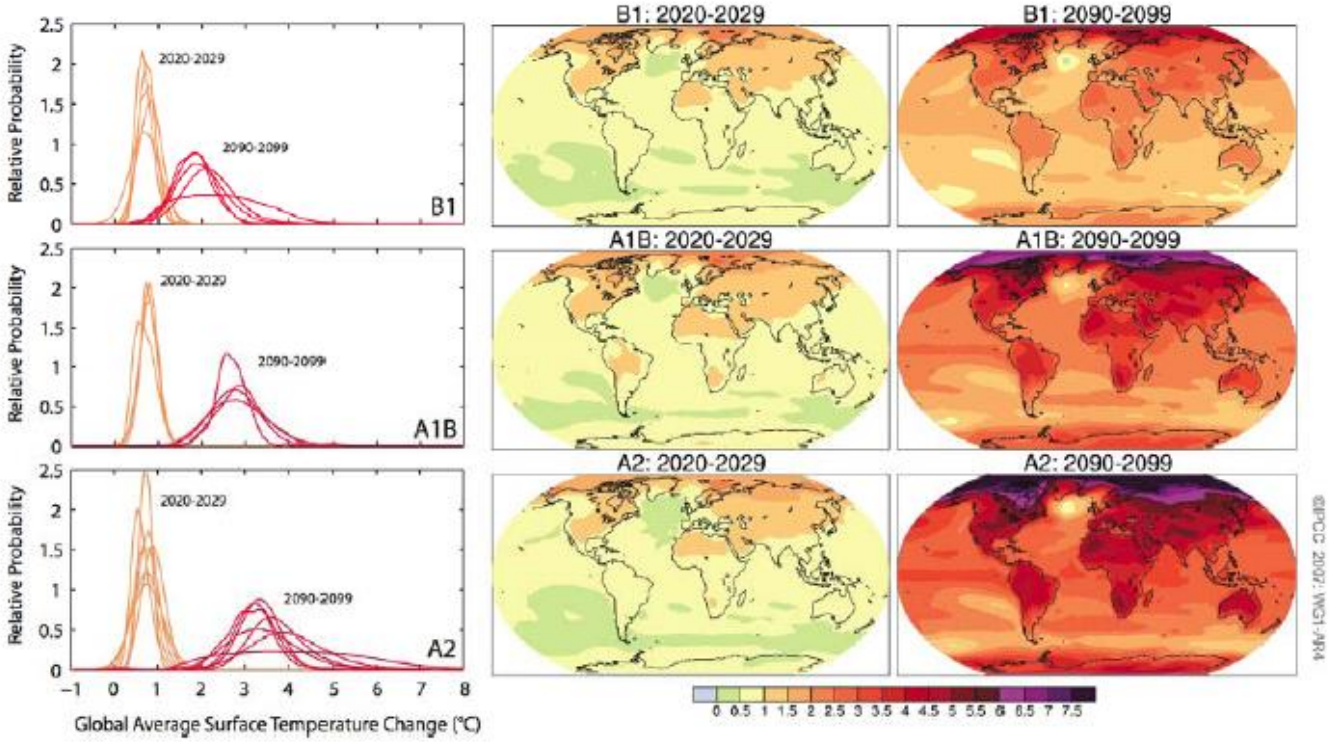
IIHMR CONTRIBUTION

Editorial support
Faculty and staff contribution
In kind support
Promotion

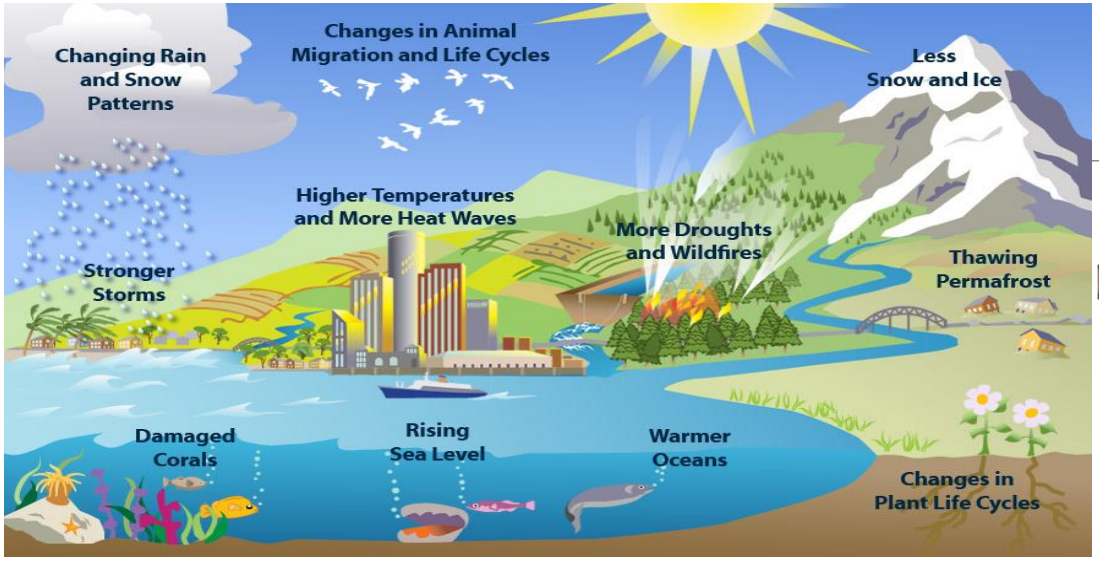
Overview of key Activities

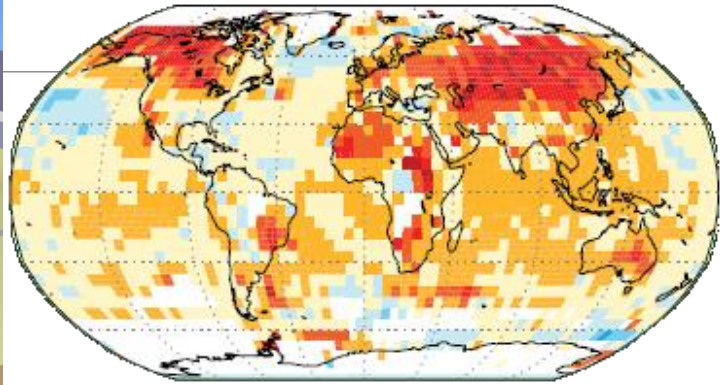
CENTRE FOR ENVIRONMENTAL & OCCUPATIONAL HEALTH CLIMATE CHANGE AND HEALTH

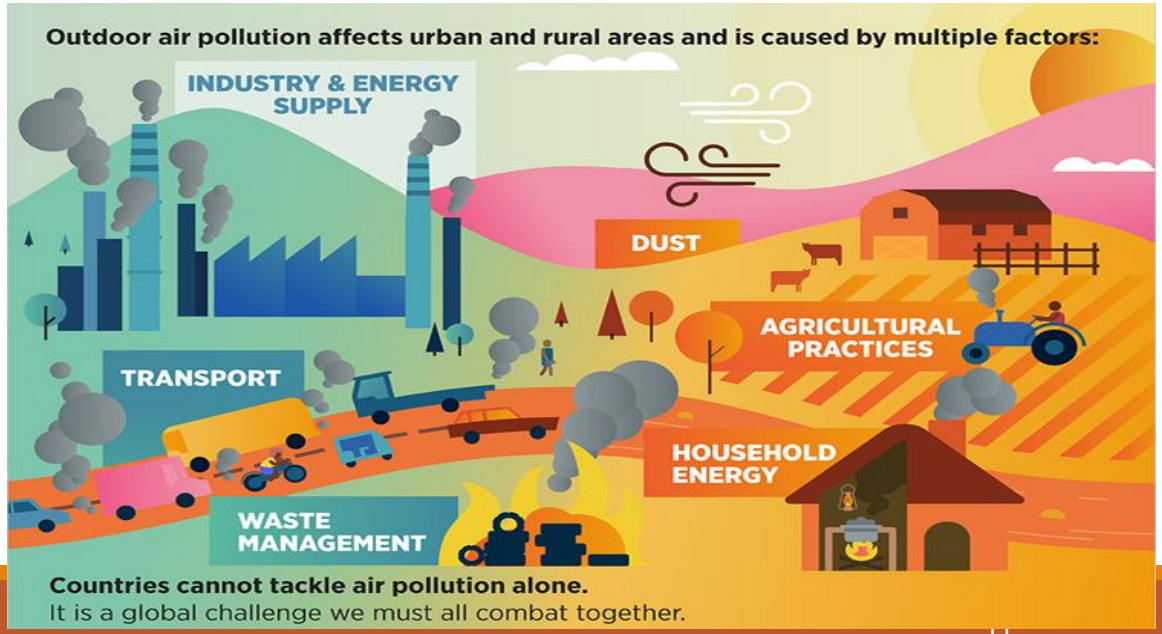
Climate is Changing



Consequences of change and variation in weather and climate







Prime Minister Council on Climate Change

The hon'ble Prime Minister of India office had released a National Action Plan on Climate Change in June 2008. It had eight missions

1. National Mission on Sustainable habitat
2. National Mission for Sustaining the Himalayan Ecosystem
3. National Mission for Sustainable Agriculture
4. National Solar Mission
5. National Mission for Enhanced Energy Efficiency
6. National Water Mission
7. National Mission on Strategic Knowledge for Climate Change
8. National Mission for "Green India"

The reconstituted Prime Minister Council on Climate Change reviewed the progress of eight national missions on ***19th January 2015*** and suggested formulation of four new missions on Climate Change viz.

1. **Health Mission**
2. National Mission on "Waste to Energy Generation"
3. National Mission on India's Coastal areas
4. National Wind Mission

Climate Change and Human Health

For Climate Change, the Ministry of Environment Forest & Climate Change, is the Coordinating agency under the Prime Minister Council on Climate Change in India.

Health Mission Identified on 19th Jan 2015, by reconstituted Prime Minister Council on Climate Change.

For Climate Change and its impact on Human Health

- Ministry of Health & Family Welfare is nodal ministry
- *National Centre for Disease Control* is the nodal technical agency for coordination with multi-sectors experts and preparation of National Action Plan on Climate Change and Human Health

India became signatory to **Male' Declaration in Sep 2017**

Climate Change and Human Health

- National Action Plan for Climate Change and Human Health prepared by Expert Group

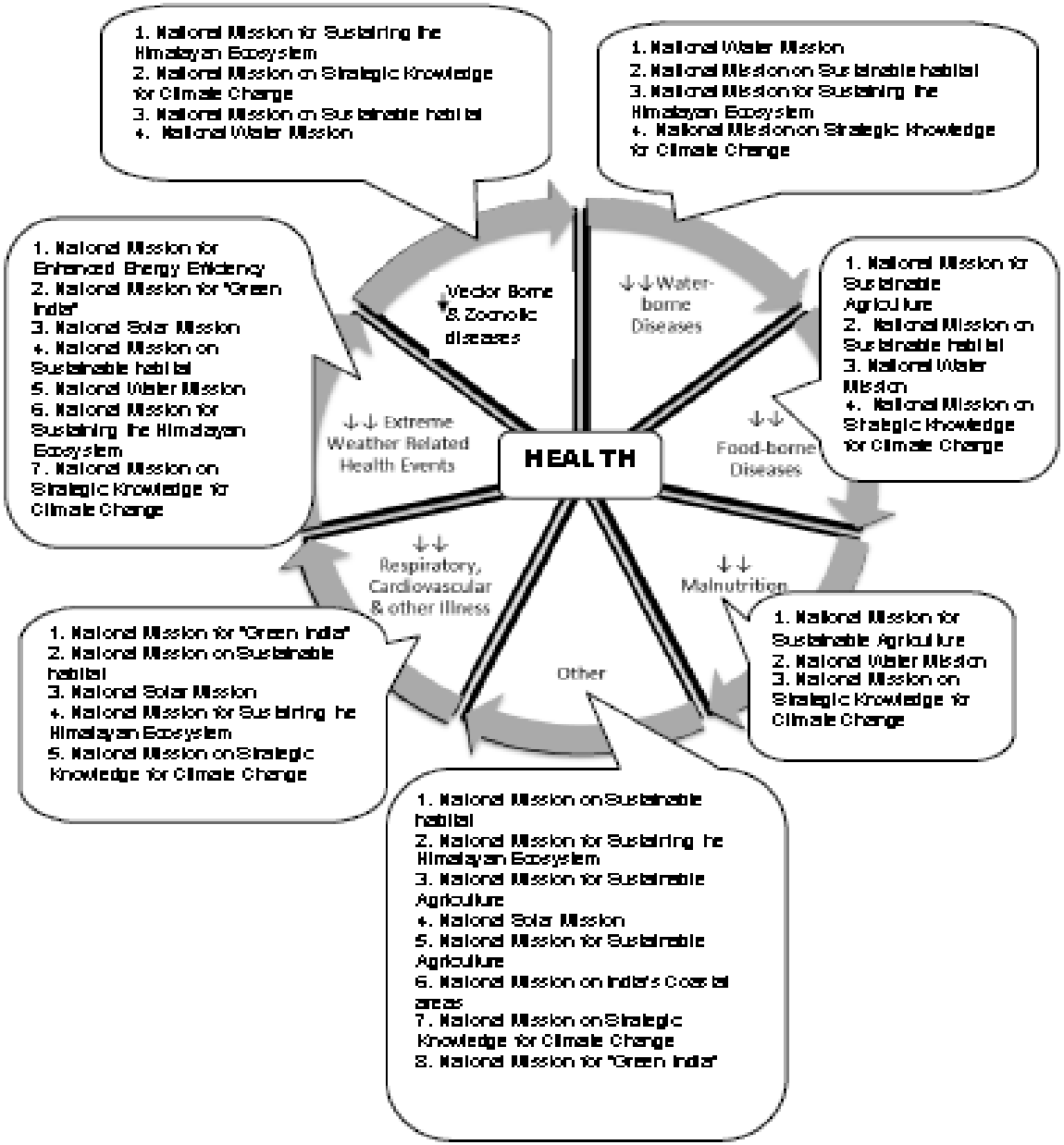
i. For strengthening of:

- Health of citizens against climate sensitive illnesses.
- Existing national health programs from climate sensitive perspective

ii. Key recommendations:

- Climate resilient healthcare system
- Capacity building for vulnerability assessment and preparation of health adaptation plan
- Awareness generation for health impacts of climate variability
- Health sector preparedness and response- Early Warning System/ Alerts.
- Research & Development of models, techniques, technologies and collaboration with other sectors and missions

Inter-sectoral coordination and collaboration



Centres of Excellence

Institutions	Climate sensitive Diseases
AIIMS Delhi	Cardio Pulmonary Diseases
NICED	Water Borne Diseases
PGIMER	Illnesses due to Air Pollution
VP Chest Institute	Allergic Diseases
NIMR	Vector Borne Diseases
NIN	Nutrition related illnesses
JIPMER	Coastal CSDs
NEIGRIHMS	Hilly region CSDs
NIOH	Occupational Health
NIMHANS	Mental Health
NIDM	Health Impacts- Post Disaster
IIPH, Gujarat	Heat Stress
PHFI	Green Health system
NFI	Food Borne Illnesses
IIHMR	Vulnerability Assessment
TERI	VA & Health Information Systems

EXPECTATIONS

- Develop subject specific Health Adaptation Plan.
- Develop Guideline and Standard Operating Protocol in subject area.
- Develop Training Modules and organize ToTs
- Develop IEC.
- Support States with SAPCCHH
- Document best practices.
- Document impact of actions.

Climate Change and Human Health

ACTIVITIES - SO FAR

National Action Plan for Climate Change & Human Health-Prepared

Climate Change & Human Health

- Inclusion in *National Health Mission*
- Presented at Executive Committee on Climate Change in PMO

Conducted Regional & National Consultations

Prepared templates for State- specific Action Plan for Climate Change & Human Health health

13 Centres of Excellence identified for development of Health Adaptation Plan, Training Modules/ Guidelines, IEC, Documentation of best practices and impact

Air pollution & Human Health

Activities- So far

Conducting Sentinel Surveillance for acute respiratory cases and anaylsing in relation to Air Quality Index in Delhi

Following with states to initiate similar sentinel surveillance

Issued Advisories to all states with polluted cities throughout winter season

Issued IEC prototype to all states as well as on social media

Supported MoEFCC in NCAP preparation, Indoor air pollution guidelines, 20 cities study

Supported ICMR in disease burden studies

Conducted workshops :

- 'Building the bridge between air quality, weather and health in India'.
- Technical consultation on tools for assessing health impacts of air pollution-
- National Consultation on Burden of Diseases from Air Pollution and role of health sector in combating health impacts of air pollution

Heat & Human Health

ACTIVITIES- SO FAR

- Working with IMD and NDMA. Attended NDMA meetings at Nagpur and Delhi.
- Issued advisories to states based on IMD outlook for the season
- Developed IEC – under submission for dissemination
- Daily alerts issued to state health departments for predicted heat waves in next 5 days
- Working on improving Heat Action Plan for health sector components
- Continued illness and death surveillance under IDSP network

Other Major Activities

INTEGRATION - INTER-DISCIPLINE DATA

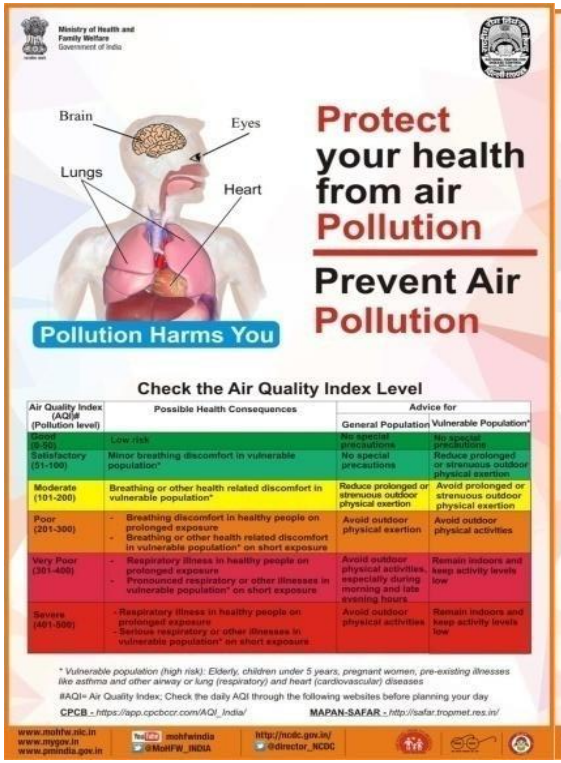
NVBDCP and IDSP – NIMR and NICED to work on use of models to predict outbreaks based on meteorological variables. 2 meetings held. Proposal of NIMR being reviewed by NVBDCP

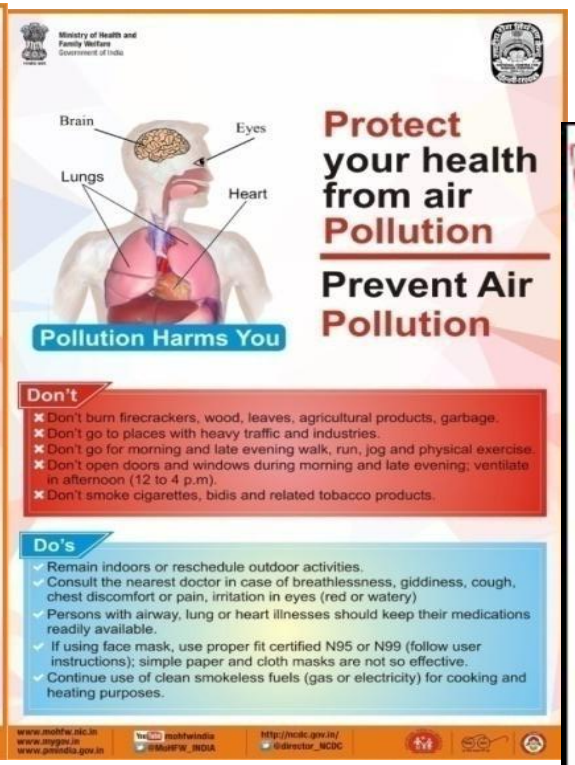
Green Hospitals

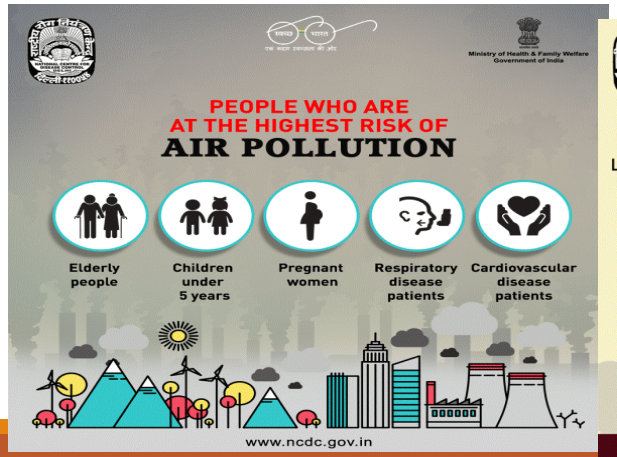
- Inclusion of environment friendly standards in IPHS – meetings with NHSRC
- Awareness generation activities – World Environment Day
- Other Environment matters – PQs, RTI, VIP correspondences, Meetings at MoEFCC, Niti Aayog, Ministry of Drinking Water and Sanitation, Environmental hazard investigations

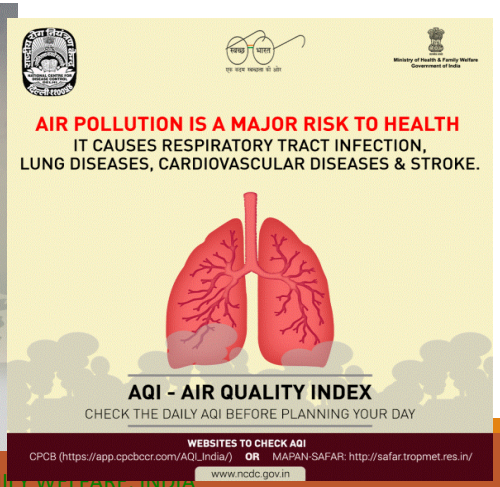
Awareness Generation Activities

Awareness Generation Activities: through posters, print & social media



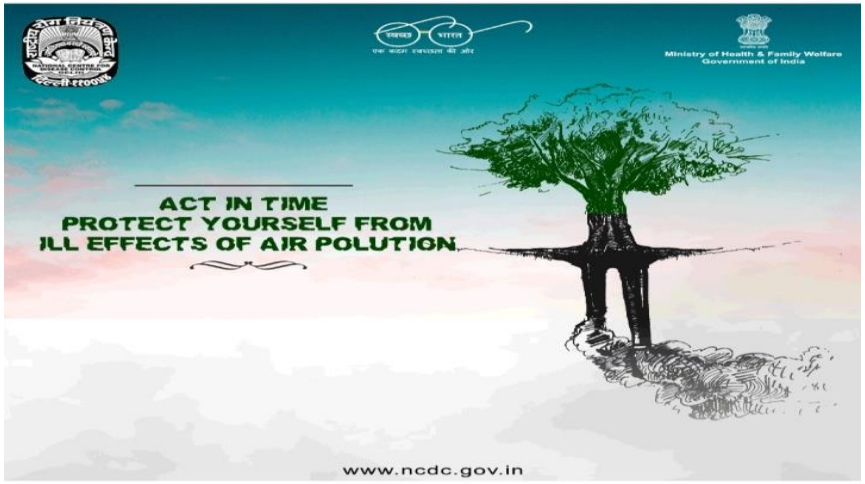






IEC Campaign NCDC: Air Pollution & Health

Social Media IEC - GIZ 2



CCEH

Recognized as a Centre of Excellence by NCDC, Government of India under National Programme for Climate Change andl Human Health

Vulnerability Assessment

Vulnerability

The propensity or predisposition to be adversely affected.

Vulnerability encompasses a variety of concepts including ***exposure***, ***sensitivity*** or susceptibility to harm & lack of capacity to cope & adapt (***adaptive capacity***).

IPCC (2013)

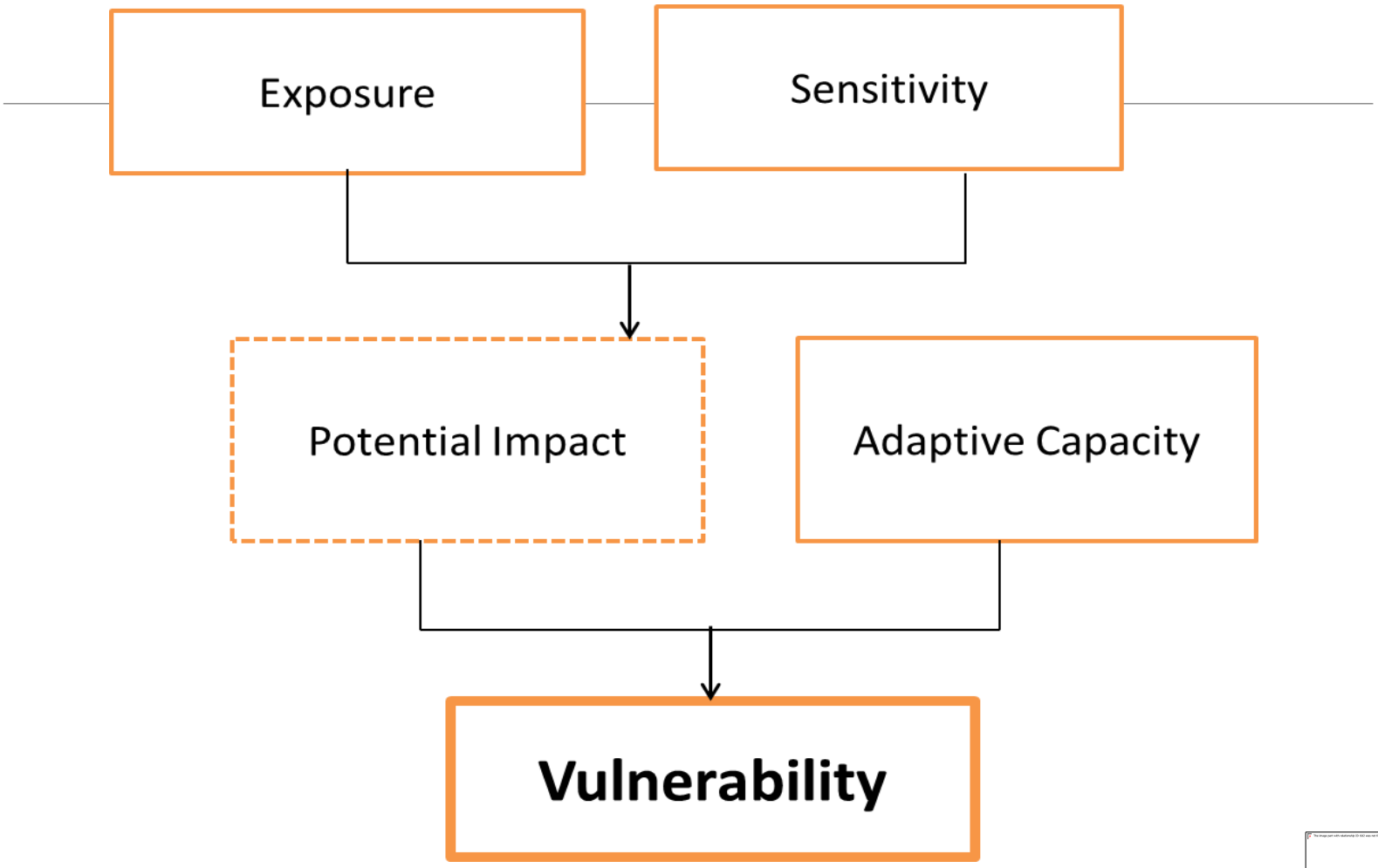
Why conduct Vulnerability Assessment

- According to the fourth assessment report of Intergovernmental Panel on Climate Change (IPCC) defined "vulnerability as a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity."

- Vulnerability Assessment (VA) is a **critical tool** in undertaking any climate change planning or implementation process. In this way, it becomes important to undertake such assessments for building health resilience against potential climate change impacts.

- VA exercise provides guidance to *identify prioritized actions, adaptation strategies and distribution of resources to most vulnerable natural ecosystems or population groups.*

VA Terminologies



Indicators for VA

Exposure: Nature and degree to which a system is exposed to significant variations in weather and climate- sensitive conditions.

Suggestive list of exposure indicators:

i. Minimum temperature (˚C)
ii. Maximum temperature (˚C)
iii. Average temperature (˚C)
iv. Relative humidity (%)
v. Rainfall (mm^2)

Indicators for VA

Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. It is usually determined by the health status, the demography of the area. Suggestive list of exposure indicators:

i. Pregnant Women (aged 15- 49 years) (%)

ii. Women (aged 15- 49 years) with BMI below normal (%)

iii. Children underweight (weight-for-age) in under five year age group (%)

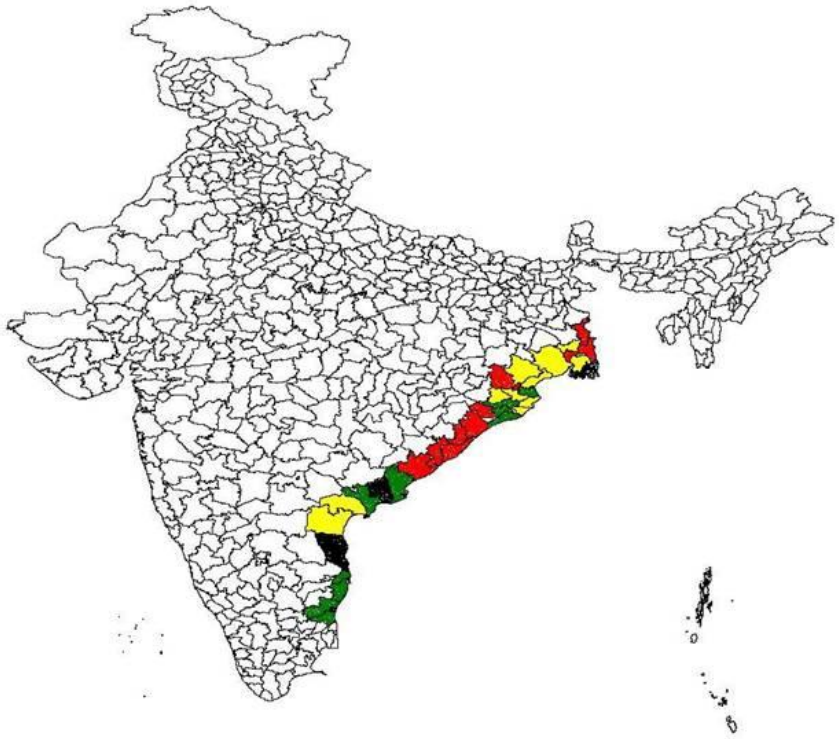
iv. Elderly population (%) etc.

Indicators for VA

Adaptive Capacity: The ability of a system to adjust to climate change, including weather variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. Suggestive list of indicators:

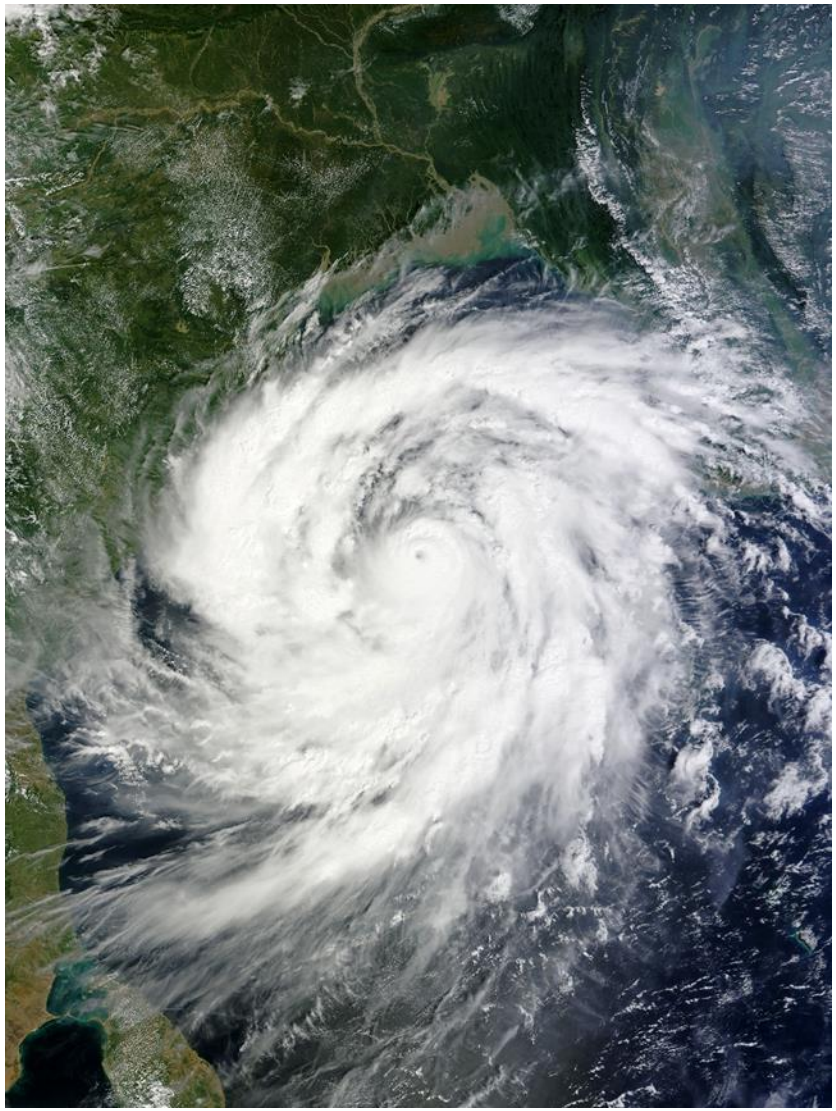
i. Women with 10 or more years of schooling (%)
ii. District GDP per capita
iii. Urban areas/ slums/ villages with Sub- health centres within 3 km of residence
iv. Urban areas/ slums/ villages with Primary health centres within 10 km
v. Primary health centres availability for 24x7 hours basis
vi. Mobile medical services
vii. Households with an improved drinking water source (%)
viii. Households with improved sanitation facility (%)
ix. Households using clean fuel for cooking (%) etc.

Developing a Climate Vulnerability Index for the Health Sector in India



Red: High Vulnerability
Yellow: Medium Vulnerability
Green: Low Vulnerability
Black: Missing Data

Source: Shukla RS, Dogra NK. Vulnerability and Adaptation. In: Dogra NK, Srivastava SK, editors. Climate change and disease dynamics in India. New Delhi: TERI Press; 2012.



Cyclone Phailin, 2013 (Source: NASA)

Pilot Tool for Assessment of
Health Vulnerability to Climate Change
at the Sub-National Level in India

Supported by
WHO South East Asia Regional Office
New Delhi
2013

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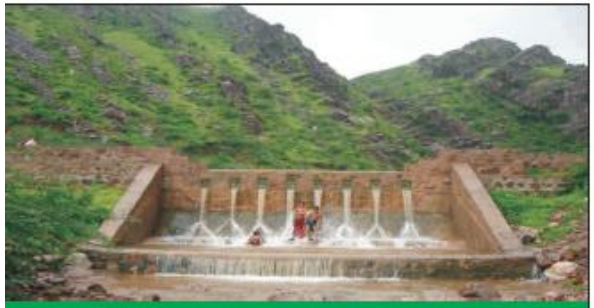

Assessment of Baseline Vulnerability for Climate-Sensitive Diseases at the Local Level in India

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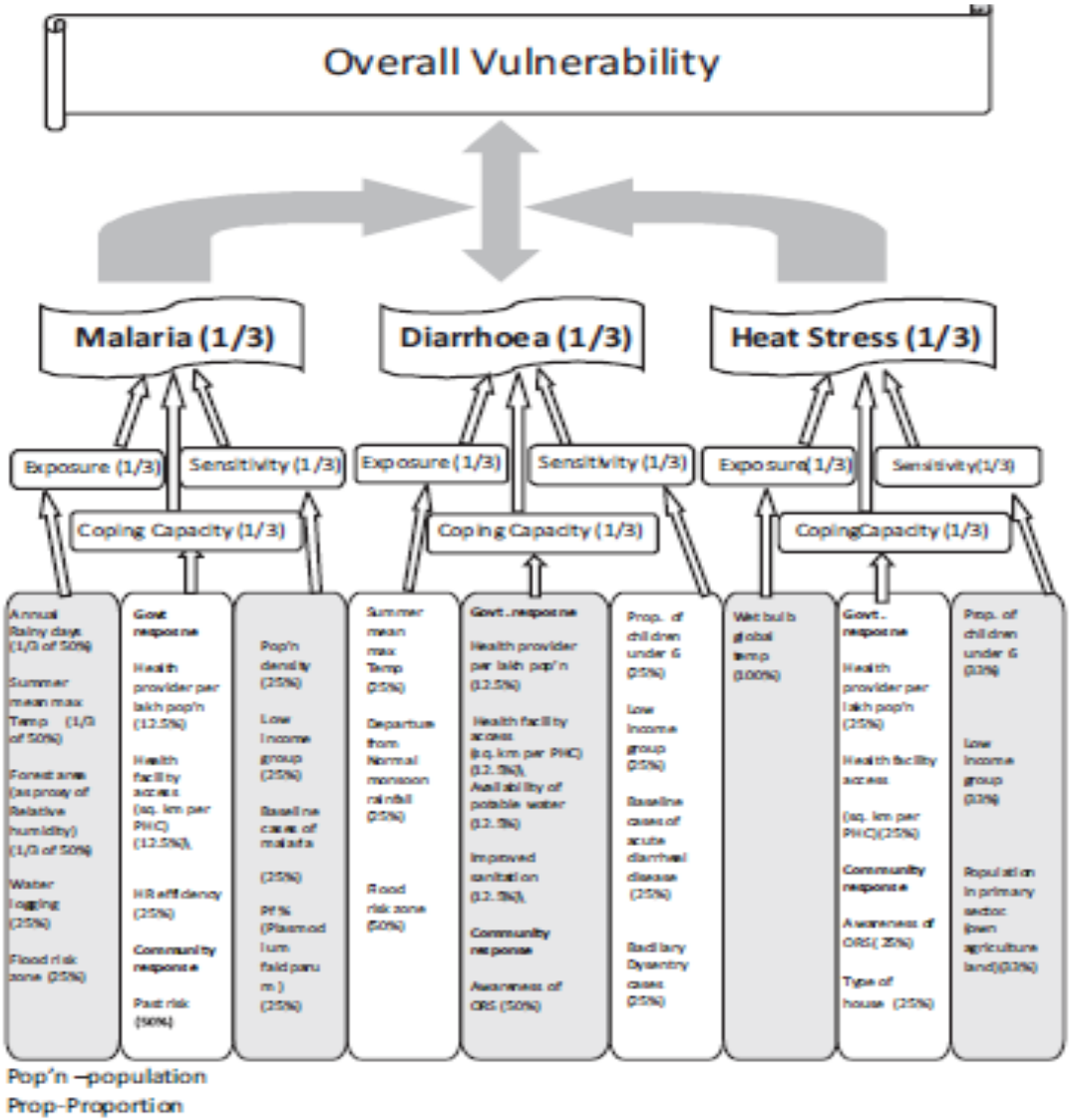
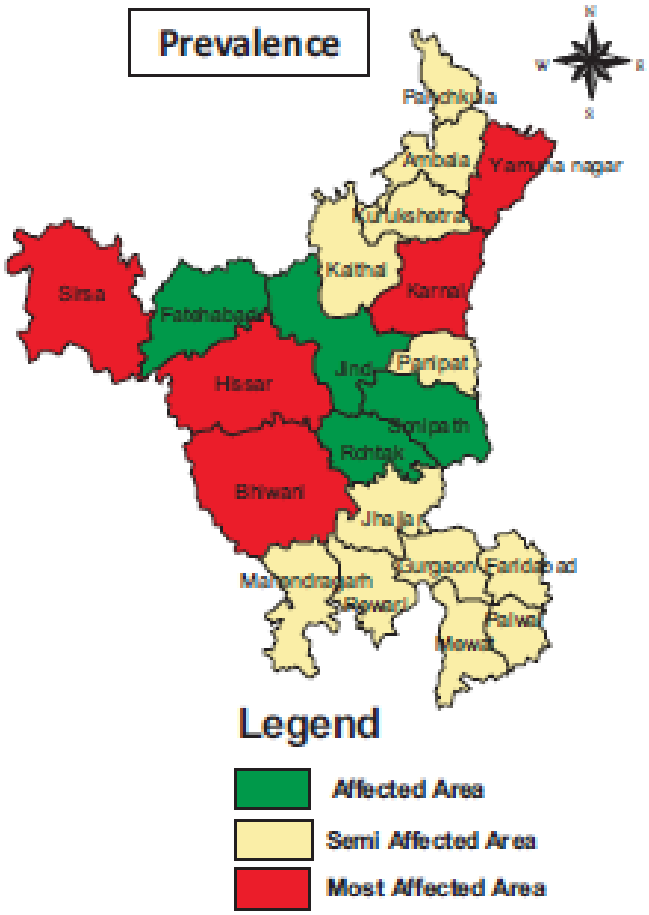
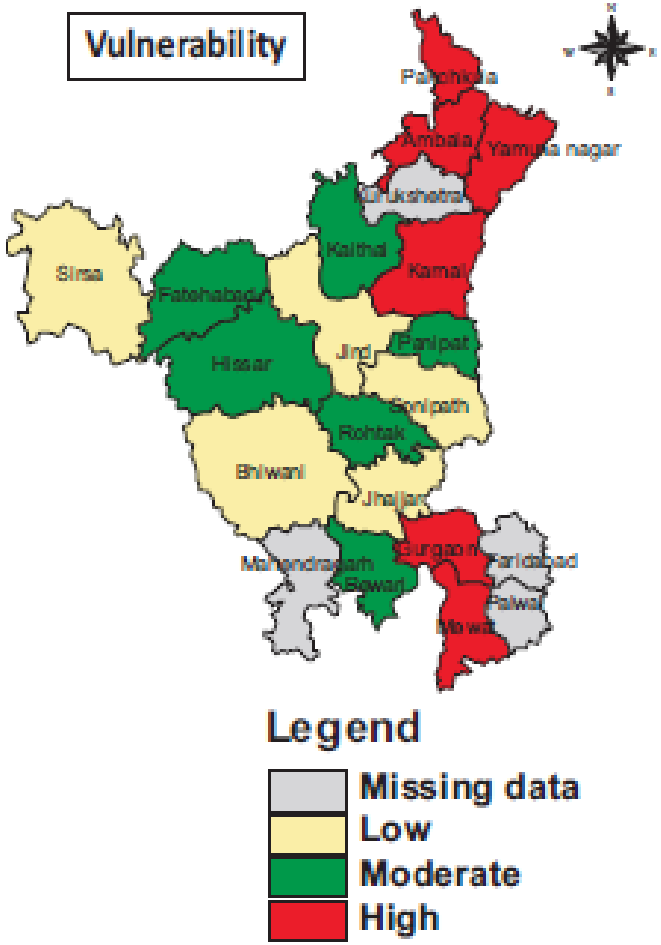


Figure 3. 2. Framework for deriving the climate change vulnerability index



Source: Haryana State Action Plan on Climate Change (21)



Climate Vulnerability Map for Malaria

Source: IIHMR, 2013

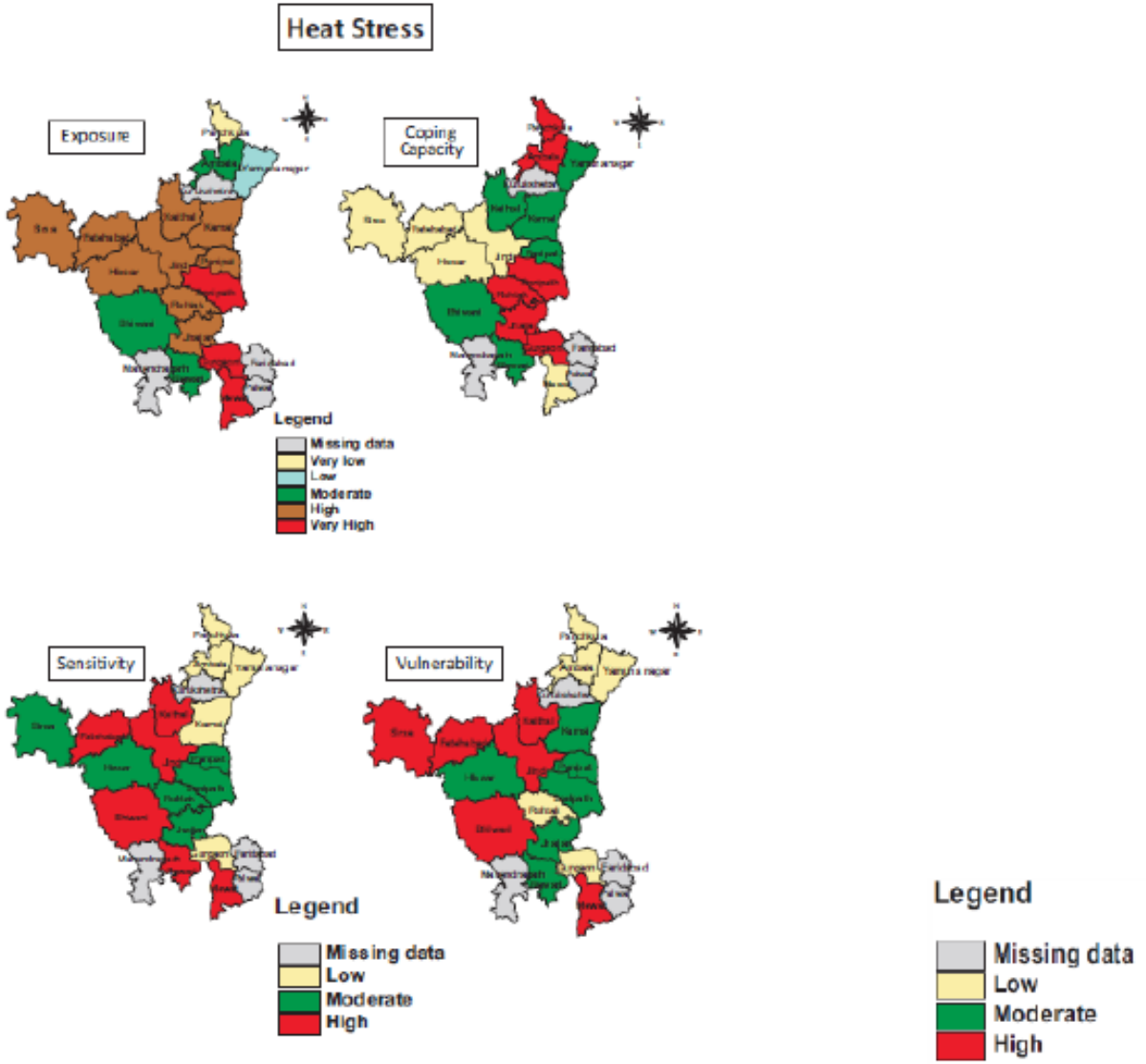


Figure 4.2 (a) : Maps for Heat Stress

Rajasthan, 2019

VULNERABILITY ASSESSMENT- CASE STUDY

Table 1 *Index of Climate Vulnerability for Vector Borne Diseases*

Exposure	Sensitivity	Adaptive Capacity
VBD		
Flood risk zone	Per capita income	Public health providers
Drought risk zone	Population density	Accessibility of health facility
Vegetation	Children under 5 years of age proportion	Human resource efficiency (vacancies versus sanctioned)
Forest area	Women of childbearing age proportion	VBD program efficiency (Slide Positivity Rate)
Altitude	Sex ratio	Mosquito net use
Water scarcity	Population migration	Type of family (nuclear versus joint)
Urbanization	VBD cases	Literacy
Transmission window	Nutritional status of children	Type of house (permanent/pucca versus temporary/kuccha)
Water logging	Nutritional status of women	Roads/mobility
Summer mean max. temperature		Telecommunication
Relative humidity		Household electrification
Annual rainy days		
Irrigation canals		

Table 2 *Index of Climate Vulnerability for Heat Stress*

Exposure	Sensitivity	Adaptive Capacity
	HEAT STRESS	
Summer mean maximum temperature (day time temperature)	Per capita income	Public health providers
Summer mean minimum temperature (night time temperature)	Population density	Accessibility of health facility
Relative humidity	Children under 5 years of age proportion	Human resource efficiency (vacancies versus sanctioned)
Wind	Women of childbearing age proportion	Women aware of ORS
Exposure to air pollution	Sex ratio	Owning radios
	Elderly population proportion	Owning TVs
	Outdoor workers	Type of house (permanent/pucca versus temporary/kuccha)
	Homeless population proportion	Type of Family (nuclear versus joint)
	Institutional population proportion	Literacy
	Cases of heat related illnesses	Roads/mobility
	Pre-existing medical condition (diabetes, hypertension)	Telecommunication
	Water scarcity	Household electrification
	Urbanization	
	Land use (Non-forest area i.e inverse of forest area)	

Table 3 *Index of Climate Vulnerability for Diarrhoea*

Exposure	Sensitivity	Adaptive Capacity
DIARRHOEA		
Flood risk zone	Exclusive breast feeding for 6 months	Literacy
Drought risk zone	Diarrhoea cases	Women aware of ORS
Summer mean maximum temperature	Nutritional status of children	Peripheral health workers
Departure from normal monsoonal rainfall	Nutritional status of women	Human resource efficiency (vacancies verus sanctioned)
Relative humidity	Population density	Skilled health providers
Water scarcity	Children under 5 years of age proportion	Accessibility of health facility
	Women of childbearing age proportion	Type of family (nuclear versus joint)
	Sex ratio	Use of available toilets
	Elderly population proportion	Household using improved drinking water
	Per capita income	Roads/mobility
		Telecommunication
		Household electrification

Rajasthan results

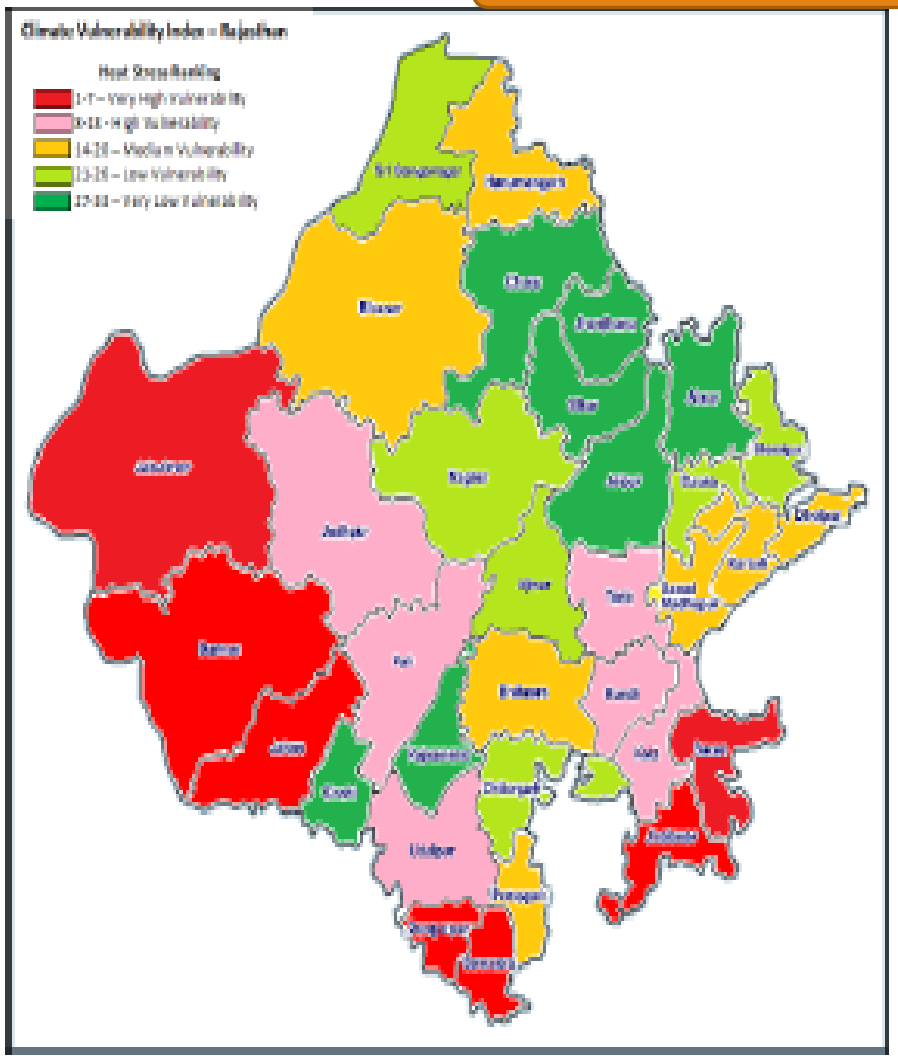


Figure 3: Overall heat vulnerability ranking district wise

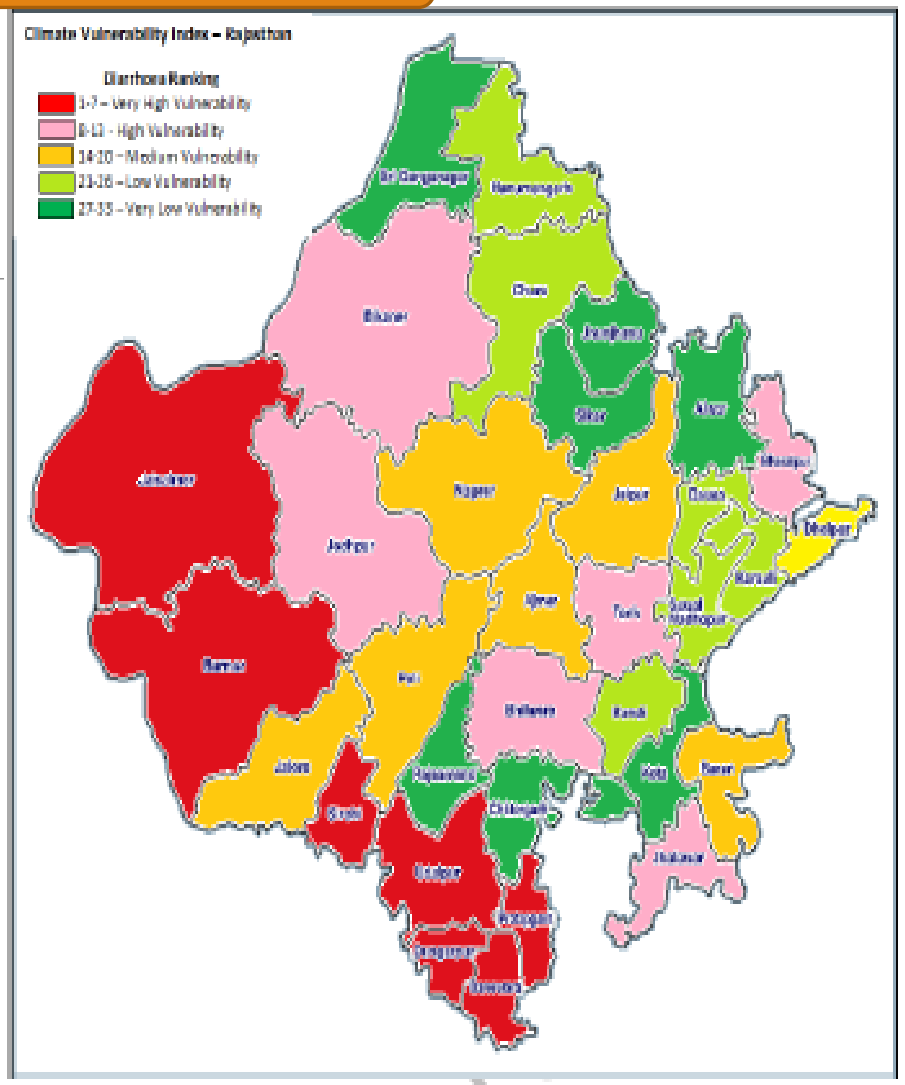


Figure 4: Overall diarrhea vulnerability ranking district wise

Rajasthan results

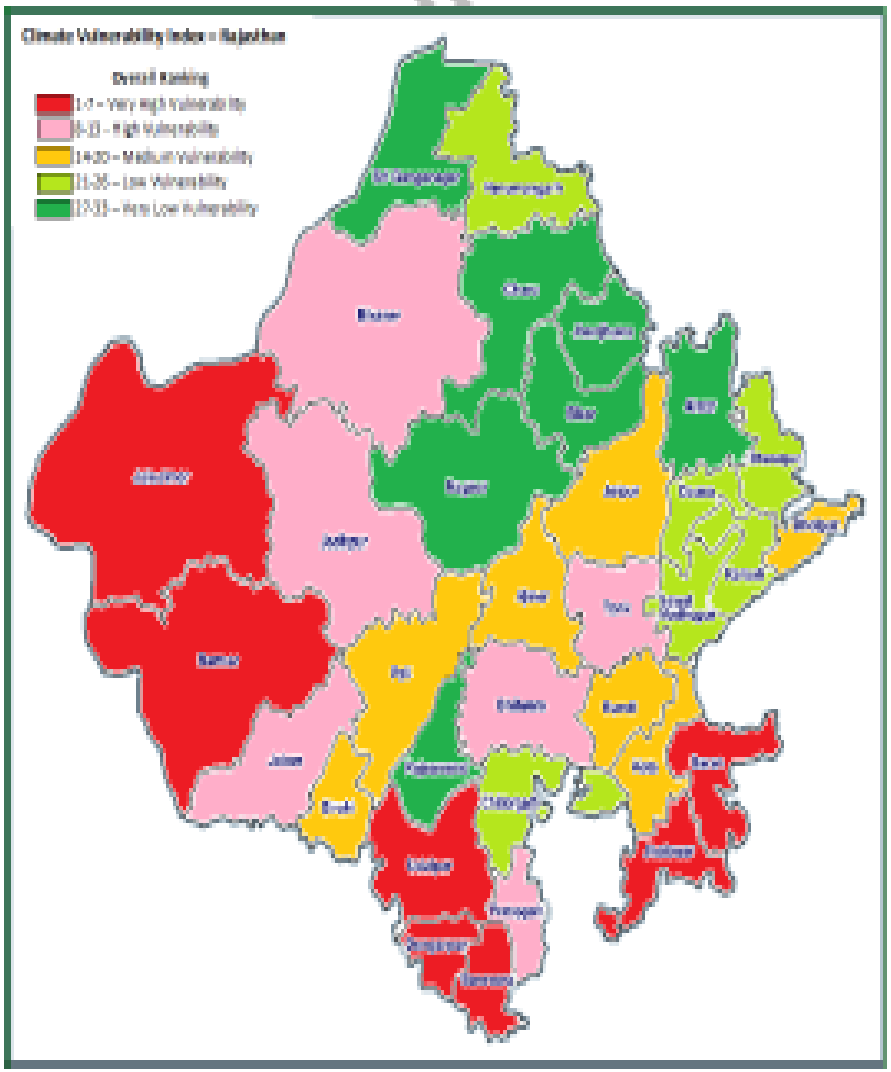


Figure1:Overall health vulnerability ranking district wise

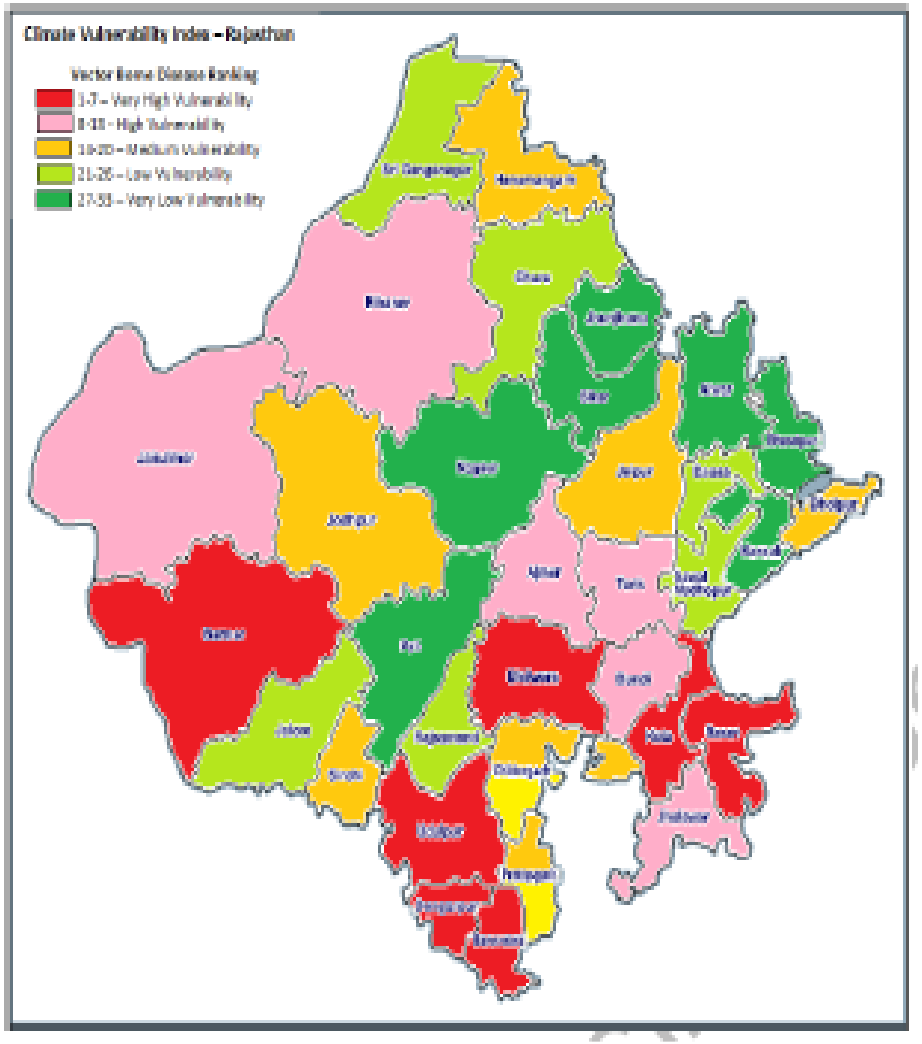


Figure 2: Overall Vector Borne disease vulnerability ranking district wise

Ground-truthing exercise

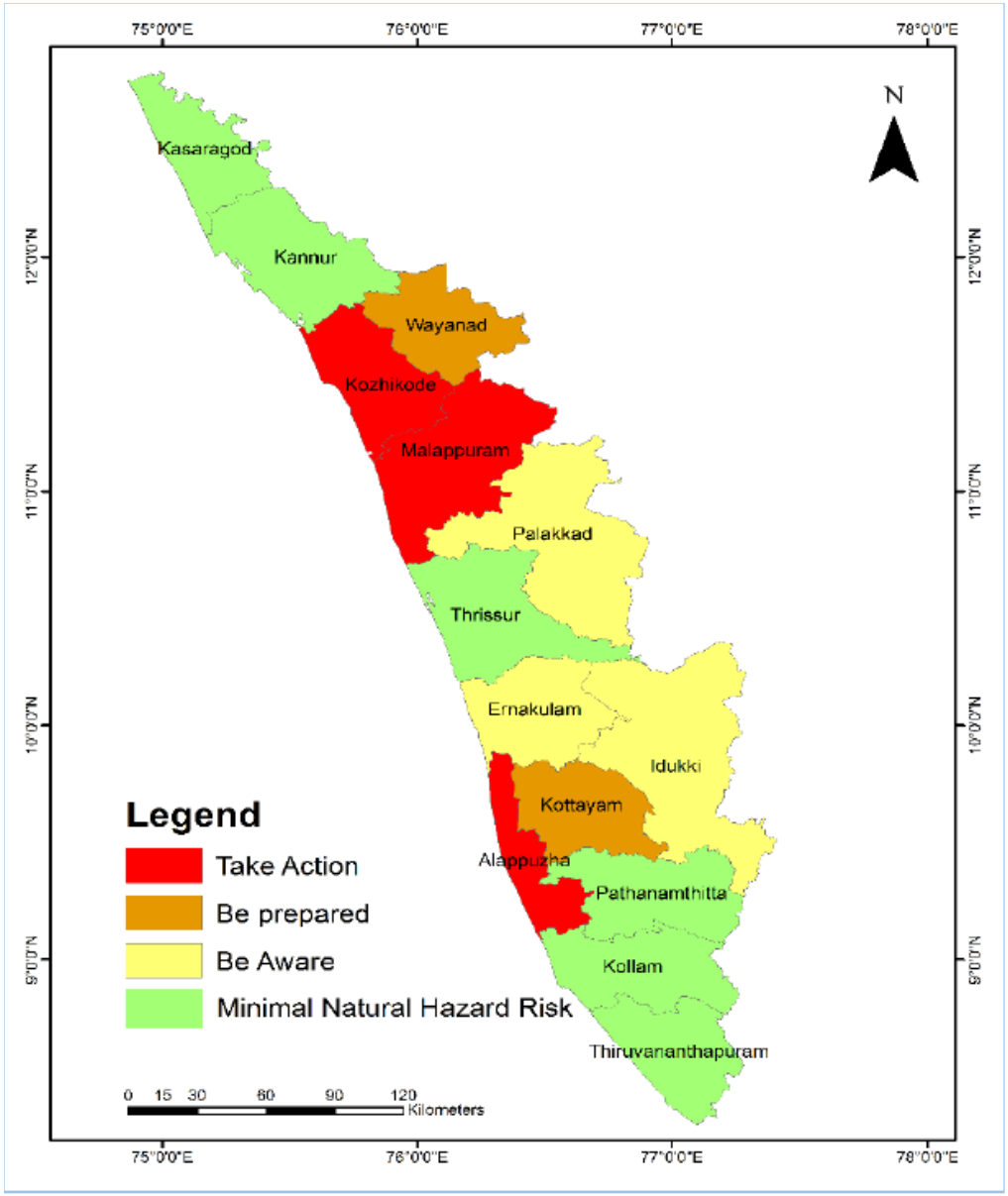
- Alwar (very low vulnerability)
- Karauli (low vulnerability)
- Tonk (high vulnerability)

Highlights of the methodology

- It is **valid**
- It is **replicable**
- It is **sustainable**
- It is **cost-effective**
- It can be carried out **rapidly**

Table: Indicators utilized for flood vulnerability mapping

	Indicator (s)	Weightage	Descriptor
	EXPOSURE	**100**	
1	Rainfall	30	Meteorological
2	Area Flooded	50	Geographic
3	Coastal District	20	Geographic
	SENSITIVITY	**100**	
1	Prior Waterlogging	5	Geographic
2	Population Density	20	Demographic
3	Proportion of Children under 6	5	Demographic
4	Households with Flush Toilets	5	Sanitation
5	Proportion of BPL population	15	Economic
6	Infant Mortality Rate	20	Health
7	Diarrhoea Cases (population adjusted)	15	Health
8	Malaria Cases (population adjusted))	15	Health
	ADAPTIVE CAPACITY	**100**	
1	Road density	5	Infrastructure
2	Mobile usage	5	Infrastructure
3	Electricity	5	Infrastructure
4	Relief Camps	10	Infrastructure
5	Public Health Infrastructure (24 Hour Primary Health Centres)	30	Health
6	Female Literacy	15	Education
7	Safe Water	25	Water
8	Waste Management	5	Sanitation


75°0'0"E
76°0'0"E
77°0'0"E
78°0'0"E
12°0'0"N
11°0'0"N
10°0'0"N
9°0'0"N
N
Kasaragod
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Legend
Take Action
Be prepared
Be Aware
Minimal Natural Hazard Risk
0 15 30 60 90 120
Kilometers

सत्यमेव जयते
भारत सरकार
राष्ट्रीय रोग नियंत्रण केन्द्र
(स्वास्थ्य सेवा महानिदेशालय)
स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार
22, शाम नाथ मार्ग, दिल्ली - 110054

Dr. Sujeet K Singh
MD, DCH
Director

Government of India
NATIONAL CENTRE FOR DISEASE CONTROL
(Formerly Known as National Institute of Communicable Disease (NICD))
Directorate General of Health Services
Ministry of Health & Family Welfare, Government of India
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E-mail: dirnicd@nic.in, sujeet647@gmail.com
Website: www.ncdc.gov.in
www.idsp.nic.in

F.No.67/NCDC/CEOHCCH/2019-20/COE
Dated: 24th Sep 2019

Subject: **Inclusion *of International Institute of Health Management Research* as Centre of Excellence under the National Programme on Climate Change and Human Health.**

Dear

Prime Minister's Council on Climate Change had proposed 'Health Mission' to deal with health effects of climate change, and National Centre for Disease Control is the Nodal Technical agency for it. Under National Programme on Climate Change and Human Health (NPCCHH) states and Union Territories have to work in coordination with other sectors and line departments and have to prepare State-specific Action Plan for dealing with illnesses due to Climate Change.

Considering technical expertise and vast experience in development of Climate Resilient Health sector including Health Vulnerability assessment, your esteemed institute has been proposed as ***Centre of Excellence*** under the NPCCHH. The Programme hereby look forward for strengthening of Healthcare services through i) *Assessment of Climate-related impacts on health in various geo-climatic regions of the country;* ii) *Health Vulnerability Assessment & Risk mapping of vulnerable population and healthcare infrastructure;* iii) *Develop data information systems which would assist in tracking trends and estimating climate linked health burden, including feedback loops to prompt action;* iv) *Develop communication strategy and IEC materials;* v) *Hand holding of states and UTs;* vi) *Development of Training Module and conduction of training, meetings and workshops for capacity building and for sharing best practices/ experiences with states and UTs;* and vii) *Documenting progress in the country with respect to health sector resilience.*

National Centre for Disease Control looks forward for your invaluable contribution to help states in strengthening of healthcare services. The financial and administrative matters are being worked out with competent authority. In the mean time it may be desired that work as listed above must be initiated at the earliest and the first draft of ***Health Adaptation plan*** (template at Annex-A) may be shared preferably by ***31st Oct' 2019*** with CEOH&CCH Division at Email: ncdc.env@gmail.com)

(Sujeet K.Singh)

To,

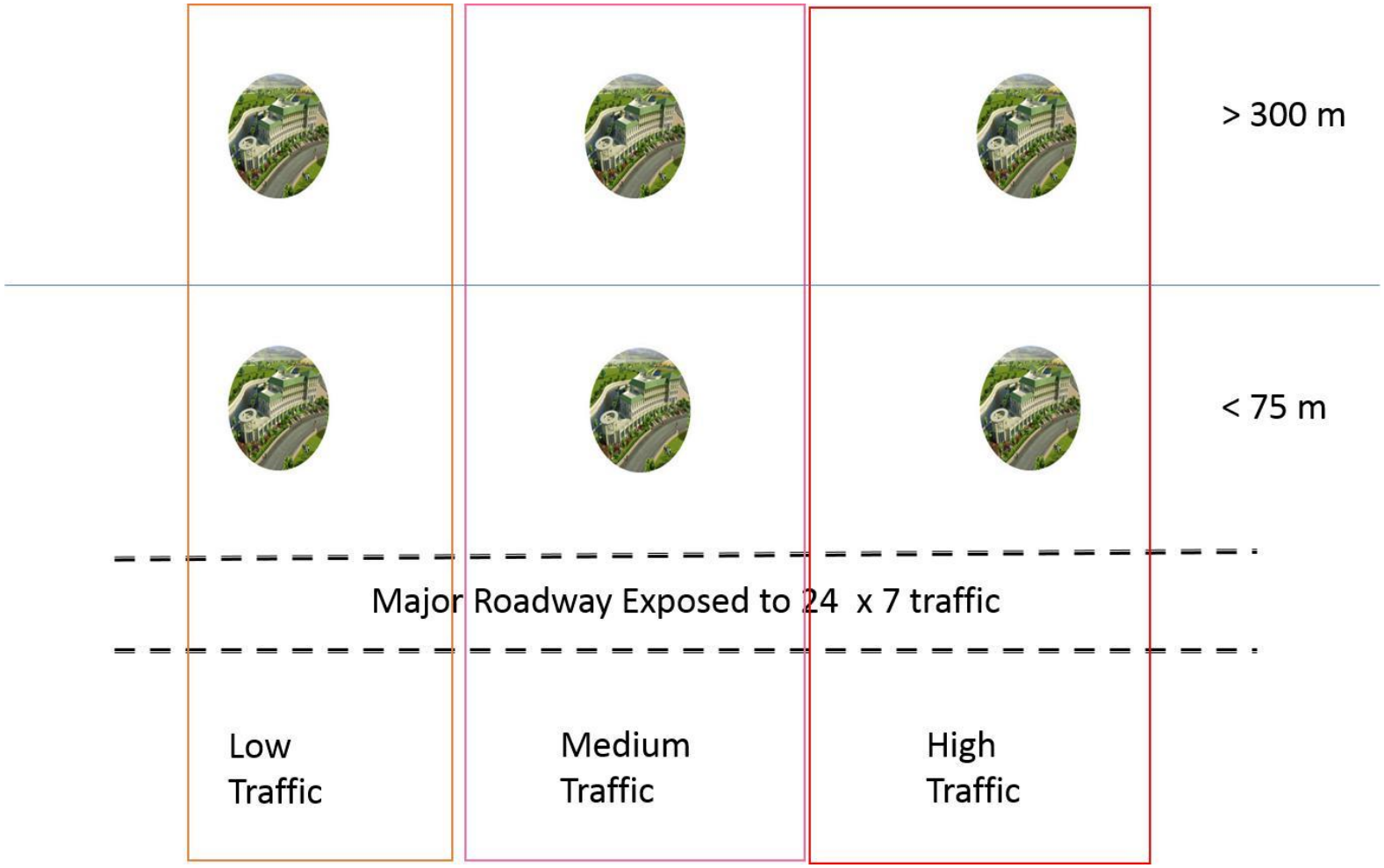
Dr Sanjiv Kumar
Director
International Institute of Health Management Research
Plot No 3, Sector - 18 A Dwarka, New Delhi-110075, India

Copy to:

- PPS to Joint Secretary-Heath (JS-LA), MoHFW, Nirman Bhawan, Maulana Azad Road, Delhi
- PPS to DGHS, MoHFW, Nirman Bhawan, Maulana Azad Road, Delhi
- Dr Nitish Dogra, Associate Professor, Convenor, Centre for Climate, Environment and Health, IIHMR, Delhi

METRO STUDY

TRAFFIC STUDY



Faculty	Big-ticket research (USD 300,000-500,00 over 5 years)
Prof. Pradeep Panda	Economic impacts of air pollution and health
Dr. G S Preetha	Air Pollution and Reproductive Health
Dr. Anandhi Ramachandran	Air Pollution and Physical Activity
Dr. Manish Priyadarshi	Sea-level rise, migration and health
Dr. Vinay Tripathi	Climate change and urban communities
Dr. Sumant Swain	Climate change and malnutrition
Dr. Nitish Dogra	Impact of disasters and air pollution on cognition

THANK YOU