




**THE
LEPROSY
MISSION
TRUST INDIA**

Leprosy and its climate dimension

www.leprosymission.in



Contributors



Subhojit Goswami
Sr. Program Manager, TLMTI



Swagata Yadavar
Independent Consultant



Nikita Sarah
Head of Advocacy & Communications, TLMTI



Photo Credits: Subhojit Goswami

Acknowledgement

In the summer of 2022, when we were still figuring out the scope of this study and the kind of support we need from different stakeholders, the idea seemed little intimidating. Moreover, the study required us to visit some of the hard-to-reach villages and asking not-so-easy questions to the residents about the problems they live with. What really helped us going is the assurance from our project teams in Bihar and West Bengal about their complete support in reaching out to the people who are experiencing disease, deprivation, and natural disasters.

We are grateful to the individuals and their families we spoke to during our visit to the Sundarbans and Muzaffarpur. We appreciate their participation in candid conversations we had and their attempts at making us feel comfortable despite searing heat and humidity. We must acknowledge efforts of our project staff—Mr. Birinchi Mahato, Mr. James George, Azeem Khan, and Edward—for their help in facilitating visits in West Bengal and Bihar.

We are equally grateful to the NLEP consultants who managed to squeeze in time for having a discussion with us and share relevant information on challenges persons affected by Leprosy and other disabilities face due to existing poverty and climate extremes. Dr. S.N Pati, Dr. Sarbartha Roy, and Dr. Arpita Dey, are among them. Our gratitude is also reserved for the Central Leprosy Division, especially Dr. Sudarshan Mandal, Dr. Bisworanjan Dash and Neelam Singh, for obliging us by sharing Leprosy-related data of states.

The study has been ably guided and monitored by Ms. Nikita Sarah, Head of Advocacy & Communications, The Leprosy Mission Trust India. Her observations helped us fine-tune our approach and arrive at the best possible outcome.



Photo Credits: Subhojit Goswami

Abbreviations

AGVI: Agriculture Vulnerability Index

ANCDR: Annual New Case Detection Rate

ASHA: Accredited Social Health Activist

BMI: Body Mass Index

CEEW: Council on Energy, Environment and Water

CMNND: Communicable, Maternal, Neonatal, and Nutritional Diseases

DRCSC: Development Research Communication and Services Center

G2D: Grade 2 Disability

ICAR: Indian Council of Agricultural Research

IPCC: Intergovernmental Panel on Climate Change

MB: Multibacillary Leprosy

MDT: Multi-Drug Therapy

MPI: Multidimensional Poverty Index

NDRI: National Dairy Research Institute

NHP: National Health Profile

NTD: Neglected Tropical Disease

NLEP: National Leprosy Eradication Programme

PB: Paucibacillary Leprosy

PWD: Person with Disability

Tables Of Content

01	Introduction	01
02	Reports on the states:	08
	a. Bihar	09
	b. Chhattisgarh	13
	c. Maharashtra	17
	d. Odisha	20
	e. Uttar Pradesh	24
	f. West Bengal	27
03	Voices from the grassroots	33
04	Conclusion	39
05	References	40

01 Introduction

Extreme weather events impact different people differently. This is true for persons affected by Leprosy and other disabling health conditions. Unlike the general population, they get exposed to additional risks. While economic and material deprivations caused by extreme weather events and other climate anomalies are well documented and reported globally, the reportage often does not capture the complex interplay of diverse determinants of vulnerability.

For a country such as India, which is working towards addressing challenges like low Human Development Index and high climate vulnerability, it is important to untangle the intersection of climate change, disease, and economic deprivation.

To do that, we need to ask the right questions. For example, how do extreme climate events affect those who are already jeopardised by a range of vulnerabilities: disease, disability, income uncertainty, geographical remoteness, etc.? What does climate threat mean for the population living in climate-vulnerable areas and in multidimensional poverty? How disproportionate is the impact of climate change on families that require frequent access to treatment? How do climate anomalies shape people's vulnerability experiences?

The aim of this report is to answer these crucial questions, which can be a meaningful beginning towards developing responsive policies and resilient communities. The report delves into the determinants of vulnerability of people affected by Leprosy and other disabilities and their lived experiences during extreme climate events. It also explores the Issues that exclude them from the mainstream support system and make climate change impact more profound.

This report is a synthesis of the latest research into these questions, complemented by on-ground interviews with people affected by Leprosy and other disabilities in two highly climate-vulnerable states: West Bengal and Bihar. All the findings point to a need for a multi-dimensional assessment of vulnerability in leprosy endemic areas while making efforts towards health systems strengthening and climate adaptation & mitigation.

The Problem Statement

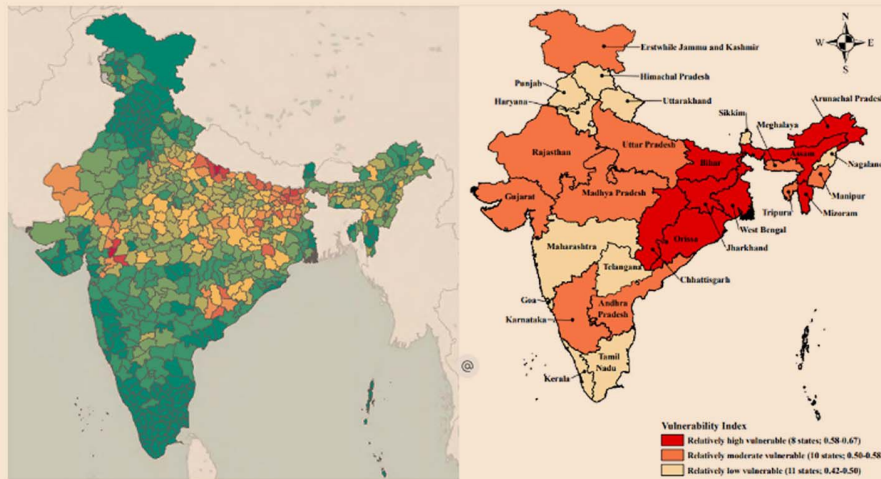
On April 17, 2021, the Government of India released an important report titled *Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework*¹. It identified Jharkhand, Mizoram, Odisha, Chhattisgarh, Assam, Bihar, Arunachal Pradesh, and West Bengal as states highly vulnerable to climate change. The report assessed Sensitivity (“the degree to which a system or species is affected by climate variability or change”) and Adaptive Capacity (“ability of systems, institutions, humans, and other organisms to adjust to potential damage and to respond to consequences”) of all the states and union territories.

The report mentioned that “all districts or states are vulnerable, but some are relatively more vulnerable than others, requiring prioritised adaptation interventions.” In Assam, Bihar, and Jharkhand, for example, over 60% districts are highly vulnerable.²

Less than a year later, in March 2022, the Intergovernmental Panel on Climate Change (IPCC) released a report titled *Climate Change 2022: Impacts, Adaptation and Vulnerability*.³ It mentioned that climate-related risks to agriculture and food systems in Asia will progressively intensify with changing climate. “In South Asia, extreme climatic conditions are threatening food security, thus agro-based economies like India and Pakistan are the most vulnerable to climate change in this regard,” the report said.

It also highlighted 11 states—Odisha, Assam, Meghalaya, Tripura, West Bengal, Bihar, Jharkhand, Chhattisgarh, Uttar Pradesh, Haryana, and Punjab—that will get most severely affected. The major projected impacts include decline in fisheries, aquaculture, and crop production.

Between the release of the climate vulnerability report and IPCC report, another important development took place. In November 2021, the NITI Aayog released the *Multidimensional Poverty Index (MPI) for India*⁴, which measured “multiple and overlapping deprivations” in basic parameters of health, education and living standards.



Map 1. Map showing multidimensional poverty (Left) and climate vulnerability (Right).

The report pointed to high levels of multidimensional poverty in the states and UTs. Interestingly, “the same states that have high climate vulnerability, were featured among those with the highest percentage of population living in multidimensional poverty” Bihar, Jharkhand, Uttar Pradesh, Odisha, and Chhattisgarh.

“The same states that have high climate vulnerability, were featured among those with the highest percentage of population living in multidimensional poverty.”

Multidimensional Poverty

- Household members are undernourished
- No household member completing 6 years of schooling
- Household uses coal, wood, cow dung to cook
- Unimproved or no sanitation facility
- Household does not have access to safe drinking water
- Household has no electricity
- Houses are built of rudimentary materials
- No household member has bank account

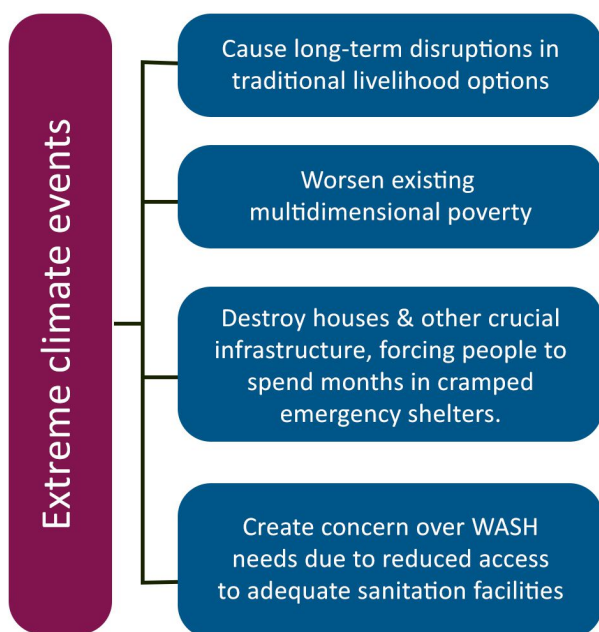
Climate Vulnerability

- High proportion of BPL population
- Large share of marginal and small landholdings
- Lack of irrigation and heavy dependence on rainfall
- Limited coverage of crop insurance
- Low density of healthcare workers
- High incidence of vector-borne and water-borne diseases
- Low road density
- Low participation of women in workforce

As an organisation focussed on Leprosy and other neglected tropical diseases (NTDs), we know that besides climate vulnerability and multidimensional poverty, another common thread that runs through these states is high endemicity of Leprosy.

States	Total districts	Number (%age) of highly and very highly climate vulnerable districts	Percentage of population who are multidimensionally poor	Leprosy Cases Reported in 2019-20
Bihar	38	38 (100%)	51.91	16595
Chhattisgarh	18	3 (16.67%)	29.91	8905
Jharkhand	24	23 (96%)	42.16	6160
Odisha	30	19 (63%)	29.35	10077
Uttar Pradesh	70	48 (69%)	37.79	15484
West Bengal	19	14 (74%)	21.43	6208
Maharashtra	35	19 (54%)	14.85	16572
Total	234	164 (70%)		80001

Table 1: Source : Climate Leprosy Division, NITI Aayog MPI, and Climate Vulnerability Assessment for adaptation planning in India using a common framework



But, what’s the connection between climate vulnerability, multidimensional poverty, and Leprosy? The connection is multiple and overlapping. Both sudden and slow onset climate anomalies such as extremely heavy rain, intense cyclones, floods, and droughts destroy established ecosystem, causing displacement of people and damages to infrastructure. They threaten agriculture and other trades, thus, affecting livelihood. A steady rise in such events, especially in the last two decades, has raised concerns over food security and access to clean water and sanitation— prerequisites for prevention of Leprosy transmission.

“ A steady rise in such events, especially in the last two decades, has raised concerns over food security and access to clean water and sanitation— prerequisites for prevention of Leprosy transmission. ”

A body of research suggests that nutritional deficiencies can facilitate a progression from M. leprae infection to the clinical presentation of Leprosy by impairing immune system.⁵ The results of the studies conducted in South Asia and Africa bear a striking resemblance to this claim as almost all of them draw a connection between protein-energy malnutrition, inadequate intake of vitamins and/or minerals, reduced cell-mediated immunity, and Leprosy transmission. When we look at the Multidimensional Poverty Index and the states that fare poorly in nutrition intake, we find that most of them have high Leprosy endemicity.

Leprosy-endemic states with nutrition poverty

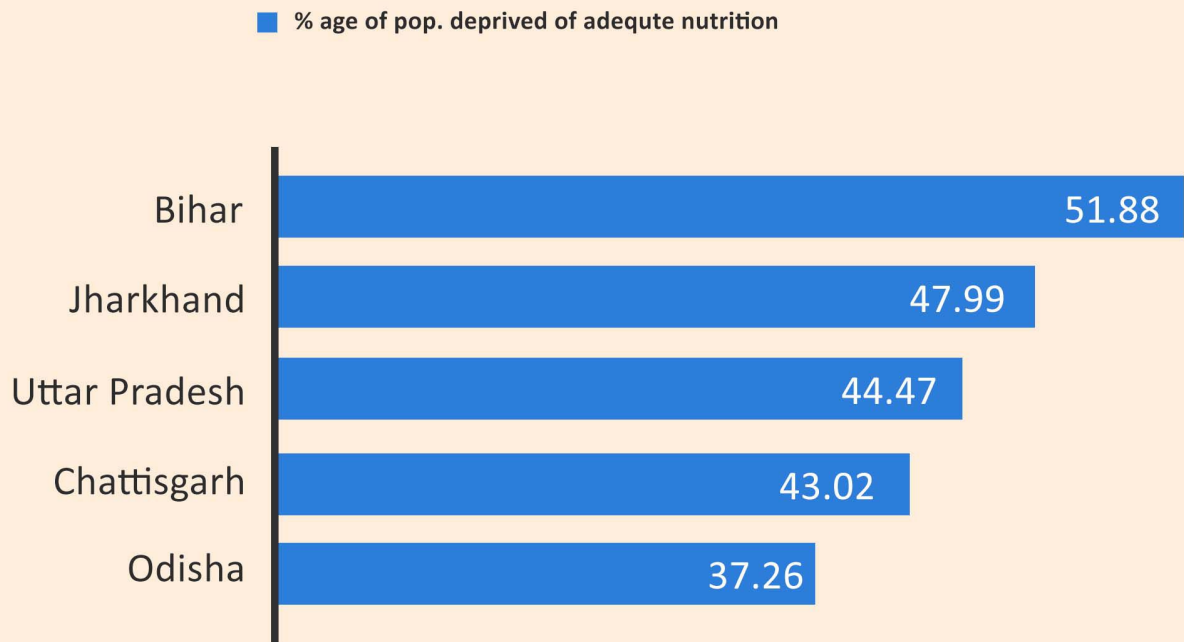


Fig 2. States with the highest percentage of population deprived of adequate nutrition.
Source: NITI Aayog MPI

There are studies that attribute Leprosy transmission to “lack of hygiene and proper sanitation, poor and inadequate supply of water”.⁶ A study by The Leprosy Mission Trust India⁷, published in the Indian Journal of Dermatology, Venereology, and Leprology in 2018, suggested that the contacts of active Leprosy cases “are getting constantly exposed directly to both patients and an environment (soil and water) wherein *M. leprae* has been shown to remain alive in all seasons for long duration.” The study recommended improving the environment for health and hygiene, without which “shedding of bacilli from infected cases will prove to be a continuous source of exposure to infection”. This is true for many other neglected tropical diseases (NTDs).

Being present in several climate-vulnerable states, The Leprosy Mission Trust India has close encounters with extreme weather events and their consequences. Our experience of designing and implementing projects for vulnerable communities tells us how access to sanitation and clean drinking water becomes a challenge during and after extreme weather events, and how persons affected by Leprosy and other disabilities find it hard to navigate through the challenge.

Considering the lived experiences of the communities we serve, and the findings of the government reports, we decided to probe into evolving threats of climate change and their potential to hinder progress towards prevention of Leprosy transmission and elimination of disease by 2027, the target of the National Leprosy Eradication Programme (NLEP).

We approached this problem statement in two different ways. We visited some of the most climate-vulnerable villages in West Bengal and Bihar. The villages were mapped based on the vulnerability we had experienced during past community interventions. We met close to 60 members from 10 households in the Sundarbans and Muzaffarpur and had semi-structured discussions to understand the challenges they face in accessing livelihood and health care, and how resilient are they in the face of extreme climate events. Most of these households had one or two members either cured of Leprosy or undergoing treatment or have some form of disability.

We also delved into the observations made by government reports and multilateral organisations. Insights were drawn from research papers on intersection of Leprosy, poverty, and access to hygienic living conditions. Media reports were also referred to for understanding widespread impact of extreme climate events on the well-being of concerned population. Available data on Leprosy was also analysed to map hotspots and level of endemicity.

In the following pages, what you will find is state-specific observations on how the intersectionality of climate change, multidimensional poverty, and Leprosy is vying for our attention.



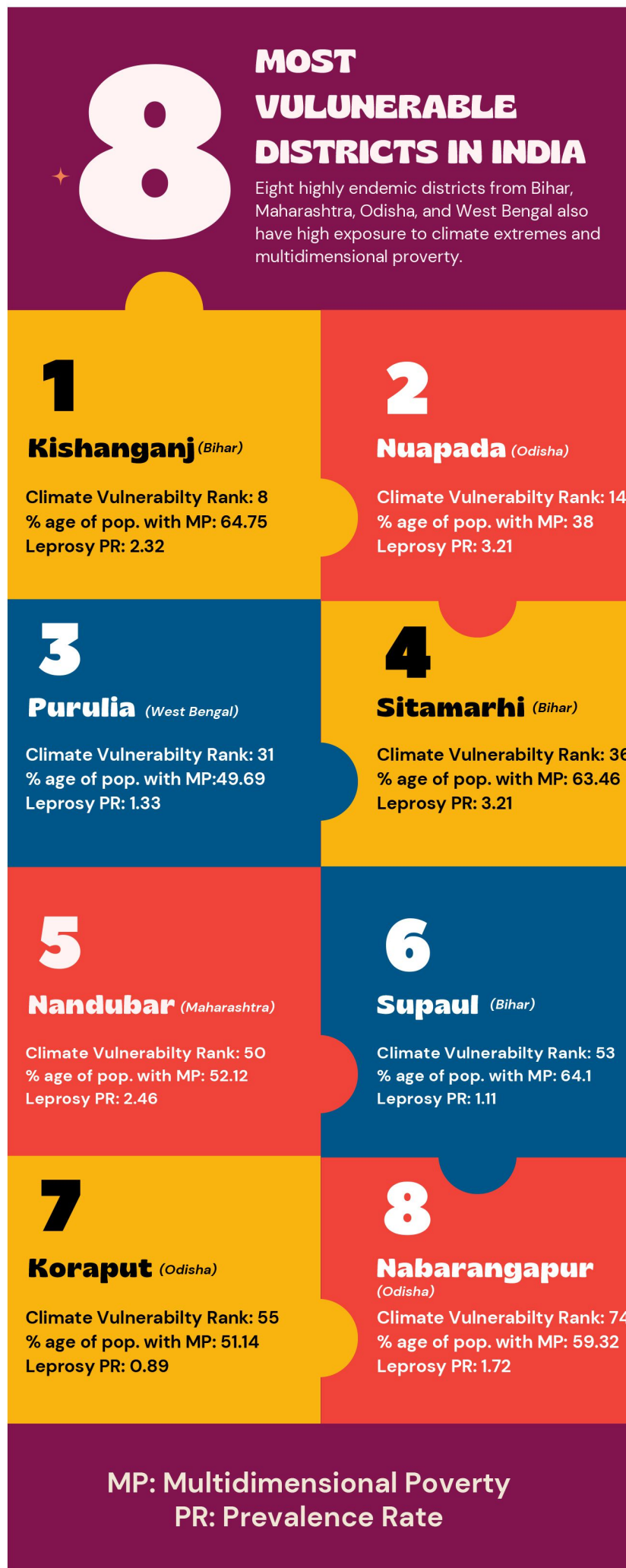


Fig 3. Eight most vulnerable districts based on a combination of three factors.

02 Reports on the states

Imrana Khatun, 61, from Majholi village in Muzaffarpur district, Bihar, does not know that she has Leprosy, but calls it '*Sunn wali bimari*', a disease that numbs your skin. She and four of her seven children were diagnosed with the same disease a few years ago, but none of them completed their MDT course. Now, her 18-year-old daughter Rashida Khatun gets a tingling sensation and numbness in her arm, which is getting worse. "We didn't have the knowledge and could not take precautions," she says, but even today she doesn't know how Leprosy is spread and why she must not default on the prescribed treatment. Her family income comes from a chicken shop they have and remittance from another son who has migrated for work. The 14 members of the household share a small toilet. Sushila Devi (name changed), a 50-year-old ASHA worker and a resident of the village, says stigma associated with Leprosy is still prevalent and hence, she tries to explain the disease to the villagers in a way that it doesn't create fear.



Bihar

Finding an active cluster of cases in just one village in Muzaffarpur illustrates the reality. Every year, 15-20% of new Leprosy cases in India are reported from Bihar. In 2020, 16,595 new cases were reported in the state with annual case detection rate of 13.07 per 10,000 population, higher than the national average of 8.13 per 10,000. Districts such as Muzaffarpur pose a bigger challenge. A 2019 study⁸ found Leprosy prevalence in the district as high as 17.1 per 10,000 and strong spatial clustering of Leprosy cases, especially within the household and among neighbours.

Leprosy has a strong hold in other parts of the state as well. Let's take the example of three northern districts of Bihar: Sitamarhi, Supaul, and Kishanganj. Besides high prevalence rate, another element of concern is high share of multibacillary (MB) cases: 55%, 64%, and 75% respectively. Due to high bacterial load as opposed to paucibacillary Leprosy, MB patients are a major source of infection, leading to further transmission of *M. leprae*. They are also at greater risk of reactions and consequent nerve damage. The treatment is long-drawn and requires a more elaborate protocol for patients to follow.

We must also remember that MB Leprosy develops in patients with reduced or impaired cell-mediated immune reaction, which is caused due to protein-energy malnutrition. This should lead us consider an important factor: a high rate of multidimensional poverty. In Kishanganj district, for example, more than 64% of residents are multidimensionally poor and it has a Leprosy prevalence rate of 2.32, which is more than three times the state average.

In fact, Bihar has the maximum percentage of population living in poverty among all the States and the Union Territories: more than half (51.9%) of its population is identified as "multidimensionally poor". Bihar also has 50% of its population deprived of nutrition, which is the highest among all states and UTs.

Photo Credits: Swagata Yadavar



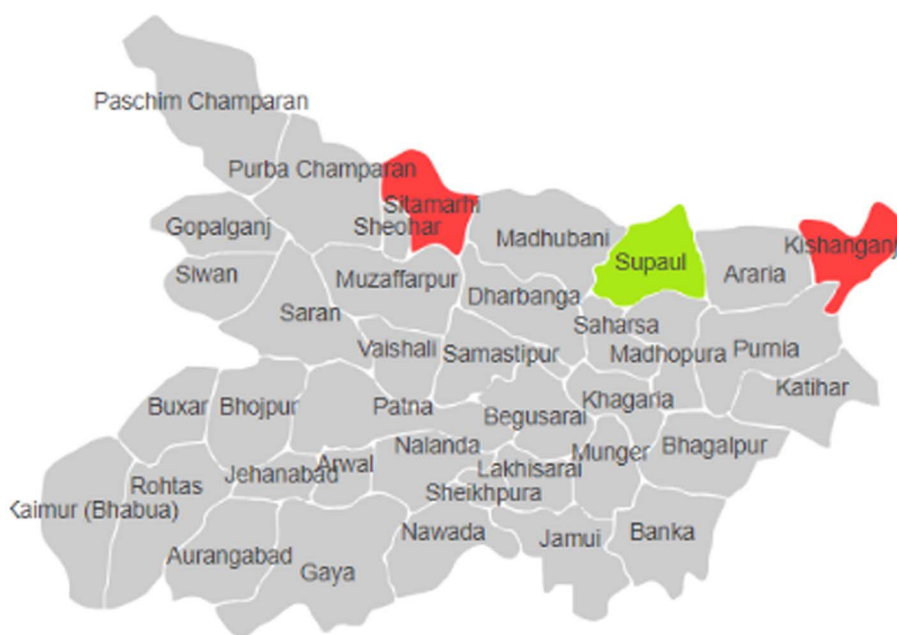
Besides high levels of poverty and prevalence of Leprosy, Bihar has other competing concerns. A host of other NTDs, including Kala-azar (Visceral leishmaniasis), Dengue, and Lymphatic Filariasis, are endemic to Bihar. Currently, more than 90 per cent of the Kala-azar cases in India are reported from Bihar and Jharkhand. The state joins Uttar Pradesh, Odisha, and Telangana to contribute about 60% of Lymphedema cases in India. Moreover, Lymphatic filariasis is endemic in all the 38 districts of Bihar with as many as 125,000 lymphoedema and hydrocele cases reported in 2020-21.

And then there is climate hazard.

More than 17% of India’s total flood-prone area is in Bihar, according to the state's water resources department website. About 68.80 lakh hectares of the state’s area (94.16 lakh hectare) is flood-prone, which covers 76% of north and 73% of south Bihar. In the recent past, 28 of 38 districts of Bihar have been declared flood-prone, according to a 2021 report in Down To Earth⁹.

Districts	Leprosy Prevalence Rate (2021-2022)	% age of population multidimensionally poor	Climate Vulnerability Rank
Kishanganj	2.32	64.75	8
Supaul	1.11	64.1	53
Sitamarhi	0.95	63.46	36

Table 2: List of districts that face the triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.



About 80% (31 out of 38) of the districts in Bihar are among the top 25% of the most climate-vulnerable districts in the country. Lack of area under horticulture, low coverage of central crop insurance schemes and prevalence of small and marginal landholders unable to make adequate decisions about when to sow and what to grow are major drivers of vulnerability in these districts, according to the report 'Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework' by IIT Mandi and IIT Guwahati.

The impact of climate change is getting pronounced every passing year and affecting farmers due to frequent occurrences of erratic monsoon rainfall, extended dry spells during summer, short duration rainfall, and abnormal rise and fall of temperature, particularly during planting season (Rabi crops) in winter, according to a 2018 report¹⁰. Factors like lack of forest cover, high yield-variability of food grains, and presence of marginal and small landholdings add to its vulnerability.



Photo Credit: Swagata Yadavar

Chhattisgarh is home to little over 2% of India's population but contributed about 8% of total new Leprosy cases in the country in 2019-20¹¹. The state has an average Leprosy prevalence rate (PR) of 2.08 / 10,000 population (2019-20), much higher than the national average of 0.57/ 10,000 population. It is the target of the National Leprosy Eradication Programme (NLEP) to reduce PR to below 1/10,000 population at state and district levels.

If we take a more granular look, we can see a pattern emerging. The districts with high prevalence rate also have a high tribal population. Bilaspur, Raigarh, Durg, Mahasamund, and Kabirdham are some of the districts that have a PR ranging from 1.9/ 10,000 to 4.4 / 10,000, with 10-20% of total population being tribals. Data on annual new case detection rate (ANCDR) also reflect the same pattern. Thirteen out of 27 districts have ANCDR of more than 10/ 100,000. In Mahasamund and Raigarh districts, which have significant tribal population, ANCDR is 24.95/ 100,000 and 31.79/ 100,000, respectively.



Chhattisgarh

A report suggests that there is disproportionate burden of Leprosy among tribal population¹² and in other states such as Odisha, Madhya Pradesh, Maharashtra, West Bengal, and Jharkhand, nearly 50% of new Leprosy cases are reported from tribal and/or Dalit communities. Leprosy is becoming highly concentrated amongst the Adivasis (tribals) and the number and proportion of states and districts with elimination-level prevalence is fast decreasing,” according to the Observer Research Foundation.¹³ What it means is that the rate of decline of Leprosy cases in tribal population is much lower than the non-tribal population. Reports on Leprosy situation in tribal areas of India point to the fact that the proportion of new Leprosy patients belonging to tribal communities increased from 13.3% in 2009 to 18.8% in 2017¹⁴.

Several districts in Chhattisgarh also report a large share of multibacillary (MB) cases. In 15 out of 28 districts, new MB cases are more than 70% of total reported cases. In districts such as Balarampur and Dantewada, more than 80% of reported cases are MB cases. It is widely accepted that household contacts of MB patients have a higher risk of *M. leprae* infection as opposed to contacts of paucibacillary (PB) patients. Delayed reporting and high bacterial load among tribal population—which can pose problem in controlling Leprosy transmission and managing complications—are attributed to poor health access and awareness among tribal population that negatively impacts their health-seeking behaviour at an early stage.

Grade 2 disability (G2D) is another concern. In nine out of 28 districts, G2D ranges from 4.38% to 13% of new cases. The NLEP target is to reduce G2D to less than 1% of new cases at national level. High proportion of G2D suggests delayed presentation and diagnosis of patients, also points to ‘hidden endemicity’. According to experts,¹⁵ and even a single new case with Grade 2 disability/new case of child Leprosy should be considered as evidence of hidden endemicity of Leprosy, especially in a tribal belt.

If we include existing socio-economic vulnerabilities to this, the task at hand looks formidable. Data speaks for itself. Three districts—Raigarh, Mahasamund, Korba—which contributed 26% of total Leprosy cases in the state, are multi-dimensionally poor.¹⁶ Leprosy prevalence rate in these districts is 4.4, 3.34, and 1.52/ 10,000, respectively. Similar situation prevails in Bijapur and Bastar districts where between 41% and 46% of population live in multidimensional poverty and Leprosy prevalence is high as well.

“Leprosy is becoming highly concentrated amongst the Adivasis (tribals)”

Districts	Leprosy Prevalence Rate (2022)	% age of population multidimensionally poor	Climate Vulnerability Rank
Surguja	0.99	47.37	419
Bastar	1.71	46.95	NA
Jashpur	1.10	45.85	NA
Bijapur	1.54	41.2	427
Kabirdham	1.94	39.6	474
Korba	1.52	31.86	413
Raigarh	4.40	30.82	263
Mahasamund	3.34	29.85	328
Bilaspur	1.99	25.66	273

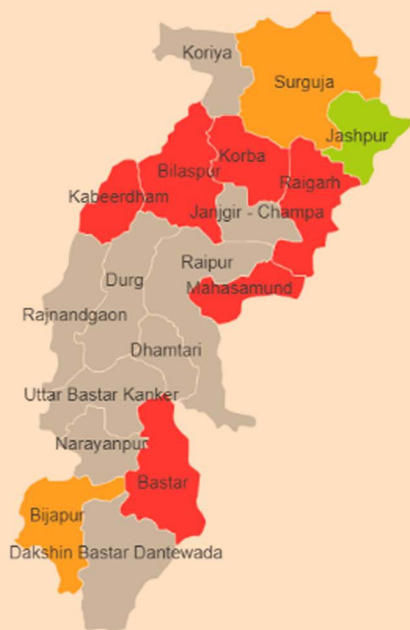
Table 3: List of districts that face the triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.

One of the important determinants of multidimensional poverty is absence of basic facilities such as safe drinking water and improved sanitation practices. While only 40% of the population in Chhattisgarh uses improved sanitation facilities, it reduces to 12% in high-poverty zones.¹⁷

On top of this lurks the threat of climate change, and its multiple facets.

According to a study by the Center for Study of Science, Technology and Policy (CSTEP)¹⁸, Chhattisgarh “is prone to loss and damages caused by several natural hazards.” On the one hand, over 80% of its area is drought-prone. Five western and central districts of Baloda Bazar, Bemetara, Mungeli, Kabirdham and Raipur have a high probability of drought occurrence. On the other hand, “17 out of the 27* districts have moderate to high flood proneness because of very high-intensity rainfall distributed over a short period of time,” the report observes.

**After the report was published, new districts were carved out in Chattishgarh*



A vulnerability analysis for the three agro-climatic zones of Chhattisgarh¹⁹—Chhattisgarh plains, Bastar plateau and Northern hills—revealed that agricultural vulnerability was the major contributor to composite vulnerability to climate change from 2000–2018. Take Bastar Plateau as an example. The region, with the highest percentage of tribal population, is also home to highly Leprosy-endemic districts. Cyclones are frequent here due to its proximity to coastal areas of Andhra Pradesh.

In the past decade, the frequency has increased, thus, lowering crop yields. In 2014, the region was struck by Hudhud cyclone and farmers in some villages lost most of their crops. In 2015, both Bastar Plateau and Northern Hills reported crop failure due to drought, which left households entirely dependent on government support for food. The next year, there was severe flooding. This shuttling between droughts and floods is having the greatest bearing on agriculture and allied sectors that provide income to around 80% of its rural population.

“Shuttling between droughts and floods is having the greatest bearing on agriculture and allied sectors that provide income to around 80% of its rural population.”

Of this 80%, around 46% are marginal farmers and most of them rely on rain-fed monocrop agriculture, making them most vulnerable to the impact of climate change.

Bastar, a district with the highest percentage of tribal population, is already experiencing the impact. Wheat productivity is expected to decrease by 24% in Bastar Plateau by 2050. According to the Agriculture Vulnerability Index (AGVI) of the 27* districts of Chhattisgarh, Jashpur, Janjgir-Champa, Korba, Surguja, Raigarh, and Uttar Bastar Kanker are highly vulnerable to climate change-induced weather patterns.

By threatening food and nutrition security, climate change is adding another dimension to the layered poverty: undernutrition. Chhattisgarh has more than 43% of its population undernourished, more than 67% of its children (<5 years) anaemic, and one in every four women with below normal BMI. In fact, high proportion of communicable, maternal, neonatal, and nutritional diseases [CMNND], which contribute 34.78% of total disease burden (2019), is suggestive of widespread malnutrition in the state.

**After the report was published, new districts were carved out in Chattisgarh*

Maharashtra, the third largest and second most populous state in the country, has a high incidence of Leprosy. In 2020, when case detection activities were affected due to COVID-19 restrictions, it reported 16,572 cases, the second highest in the country. The state not only has a high annual case detection rate (12.91 per 100,000), but also a high multibacillary (MB) rate of 54.9%. In May 2022, for example, 487 cases of Leprosy were reported in the state, out of which 274 were MB.

What is surprising about Maharashtra is that it is among the more developed and prosperous states to have such a high prevalence of Leprosy. The disease is largely concentrated¹⁵ in the Vidarbha region (Nagpur, Gadchiroli, Chandrapur and Gondia), which has a higher percentage of tribal population, difficult terrain and poor health infrastructure. This is followed by the Mumbai circle²⁰ (Raigad, Thane and Palghar) and the Marathwada region.



Maharashtra

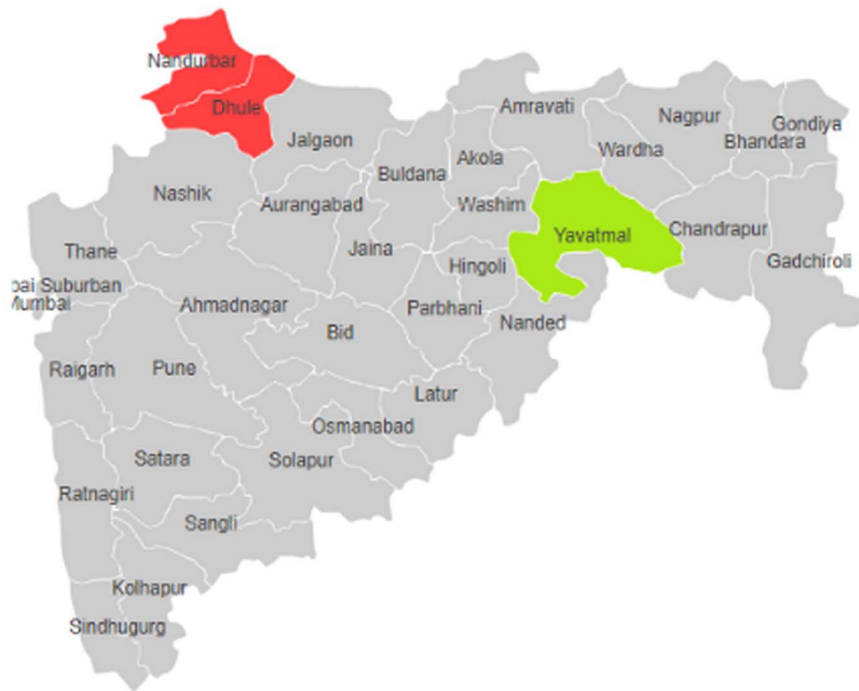
In Vidarbha region, Amravati, Buldhana, Chandrapur, Gadchiroli, Gondia, and Wardha districts have high prevalence of Leprosy as compared to other districts. Hingoli a tribal-dominated district in Marathwada region, also has high prevalence rate. The state also has a high burden of tuberculosis and drug-resistant tuberculosis.²¹ It has also seen an increase in anaemia rate among women from 49.7% to 57.2% from 2015-16 to 2020-21, according to the National Family Health Survey-5.²²

Besides disease prevalence, the state is equally concerned over climate impact that has started to surface more prominently than ever before. Almost 50% of the districts, especially drought-prone Marathwada and Vidarbha regions, are highly vulnerable to climate change. The state is equally vulnerable²³ to floods and cyclones.

A 2021 study²⁴ by the Indian Council of Agricultural Research (ICAR) and the National Dairy Research Institute (NDRI) revealed that 11 of 36 districts in Maharashtra, accounting for 40% of agricultural area, are highly vulnerable to climate change. “Mapping of districts shows that there is an instant need for focused policy efforts to address the socio-economic vulnerability in Central Maharashtra Plateau Zone, Scarcity Zone (Dhule, Part of Nandurbar and Aurangabad), and Eastern Vidarbha Zone,” said Chaitanya Adhav, a researcher who led the study.

Districts	Leprosy Prevalence Rate (2022)	% age of population multidimensionally poor	Climate Vulnerability Rank
Nandurbar	2.46	52.12	50
Dhule	1.79	33.23	101
Yavatmal	1.4	23.54	167

Table 4: List of districts that face the triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.



Among the climate-vulnerable districts, Nandurbar in north Maharashtra was found to be the most vulnerable to cyclones, floods, droughts, changing rainfall patterns, and extreme temperatures affecting crop production. The district has witnessed the highest reduction in rainfall in the recent past. This not only affects farmers, but also has a direct impact on food security of the district, which is already grappling with malnutrition. Nandurbar has the second highest number of underweight children under five in the country (57.2%). In 2021, about 411 children under five died²⁵ due to malnutrition in the district alone.

It is also important to note that Nandurbar (69.3%), Dhule (31.5%) and Yavatmal (18.5%) have much higher proportion of tribal²⁶ populations than the state average (9.3%). This specific population is more vulnerable to climate change as they are dependent on natural resources for their livelihood. They have poor coping capacity, which compounds the challenge of multidimensional poverty, high Leprosy prevalence, and climate vulnerability.

Odisha



Photo Credits: Shutterstock

When Odisha declared itself Leprosy-free in 2006-07, it had not anticipated that in less than a decade (2013-14), it will again register over 10,000 Leprosy cases every year. In the past five to six years, the rate of deformity caused by Leprosy has also gone up, exceeding 10%. During the reporting period 2020-21, when cases could not be detected at regular intervals due to COVID-19 restrictions, the state recorded 6,156 cases²⁷. Besides a high prevalence rate (> 1%), what concerns Odisha is the fact that it has high rate of multibacillary (MB) cases—an indication that transmission of infection is high.

After the declaration of Odisha as a Leprosy-free state, there was a steady decline in the number of skilled health workers, including paramedical workers, and a halt on fresh recruitments. This is not an encouraging development for a state that has the second highest prevalence rate in the country, after Chhattisgarh, according to the National Health Profile (NHP) released by the Union Ministry of Health and Family Welfare in 2019.

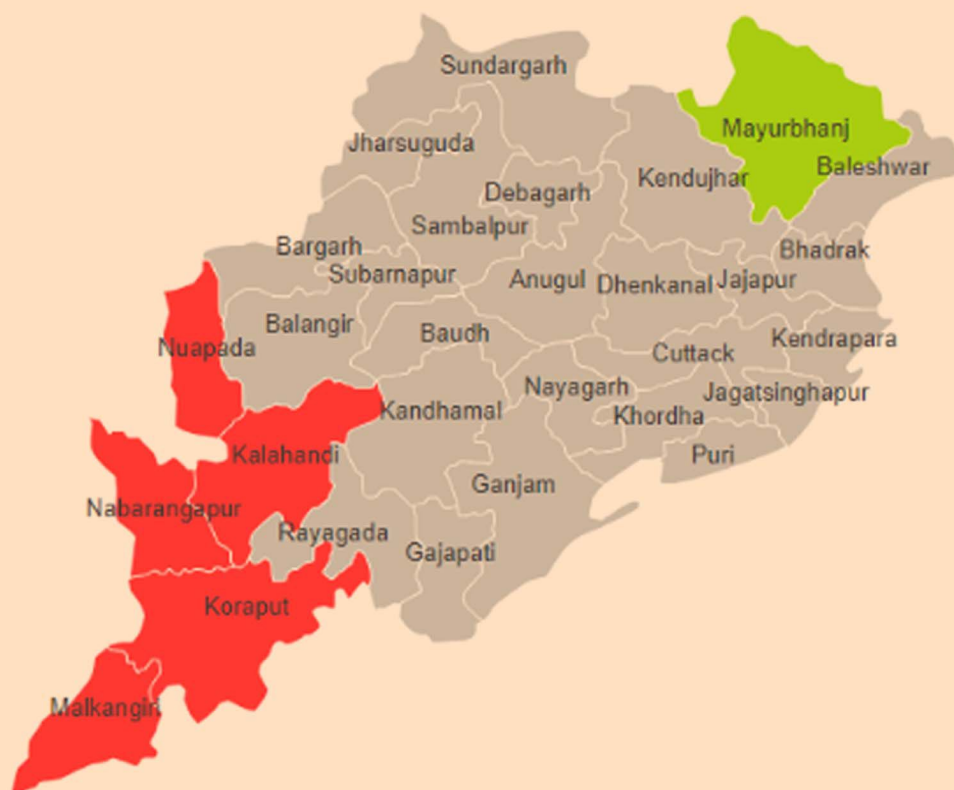
The other health indicators in the state are not very encouraging with communicable, maternal, neonatal, and nutritional diseases (CMNND) contributing 34.77% of total disease burden. If we look at the socio-economic indicators, Odisha has 29.3% of the population facing multidimensional poverty, according to National Multidimensional Poverty Index 2021. About 37.2% of the population gets inadequate nutrition and 39.5% of the state has inadequate sanitation facility.

Can we put a finger on the reason for high rate of undernutrition?

According to the Council on Energy, Environment and Water (CEEW), 26 districts in Odisha are exposed to extreme climate events such as cyclones, floods, and droughts. The state has witnessed a three-fold increase in cyclones between 1970 and 2019. Storm surges, too, have tripled during this period. Koraput, for example, features in the top 100 most climate-vulnerable districts in the country. The district is no stranger to frequent floods that disrupt agricultural productivity and affect food and income source of villagers as lot of them are agricultural workers. Moreover, over 51% of population in the district are multidimensionally poor and Leprosy prevalence rate is close to 1 per 10,000.

Districts	Leprosy Prevalence Rate (2022)	% age of population multidimensionally poor	Climate Vulnerability Rank
Nabarangapur	1.72	59.32	74
Malkangiri	0.45	58.71	100
Koraput	0.89	51.14	55
Kalahandi	1.22	47.28	
Mayurbhanj	1.05	44.90	
Nuapada	3.21	38	14

Table 5: List of districts that face triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.



Other districts that mirror such challenges in eliminating Leprosy include Nabarangapur and Nuapada. They have the triple challenge of high rate of multidimensional poverty, high Leprosy prevalence, and extreme climate vulnerability. They are drought-prone regions, and, according to the multi-hazard mapping done by the Odisha State Disaster Management Authority, both are high-risk zones for floods as well²⁸, despite these districts being located away from the 480-km-long coastline that’s exposed to cyclones. It is an indication that threats of climate-mediated cyclones are no more limited to coastal districts alone.

Districts	Risk of flood	Risk of drought
Nabarangapur	High	Very High
Koraput	Very High	High
Kalahandi	High	Very High
Mayurbhanj	High	Very High
Nuapada	High	Very High

Table 6: Source: Multi-hazard mapping by Odisha State Disaster Management Authority (OSDMA)

Both Nuapada and Nabarangapur, which have high and very high risks of flood and drought, respectively, also have extremely high rate of annual new case detection rate (ANCDR). Nabarangapur has ANCDR of 19.5 per 1,00,000 population, and in case of Nuapada, it is as high as 47/1,00,000, which is more than 10 times the national average of 5.09 / 100,000 population (2021-2022).

In Odisha, like in many other states, agriculture is turning into an unsustainable livelihood option owing to overt dependence on rain-fed paddy cultivation, scanty rainfall, and poor network of irrigation. Limited provision and promotion of alternative crops and dwindling options for work diversification force working age population to opt for distress migration.

Lack of healthcare facilities in villages leads to increased out-of-pocket expenditure²⁹ as they travel long distances to access such facilities. Increased spending on healthcare often forces households to compromise on food security, which worsens during floods and droughts. According to an expert operating in Odisha, “Expecting mothers, children and infants find themselves at the receiving end of a diet that is low in nutritive quality and quantity. Most of the children suffer from malnutrition and vitamin deficiency.” A study on child nutritional status³⁰ in Odisha revealed that children in flooded households were more likely stunted and underweight compared with those in non-flooded ones.

Climate change is causing stress even in hitherto less vulnerable parts of Odisha. Let’s consider Kendrapara. It had been a fertile and prosperous region. “But climate extremes, in the form of rapid onset events, have proven that even stable ecosystems and prosperous economies can erode, said a collaborative study³¹. The study went on to assert that social protection mechanisms are not able to absorb climate shocks or efficiently cover all eligible households.

“But climate extremes, in the form of rapid onset events, have proven that even stable ecosystems and prosperous economies can erode.”

Uttar Pradesh



Photo Credits: Agefotostock

Ramnagara used to be a bustling village of 60 families in Shravasti district of Uttar Pradesh. In the first week of October 2022, Shravasti and several other districts in eastern Uttar Pradesh started receiving rainfall that was unprecedented both in terms of time and intensity. River Rapti swallowed Ramnagara and several other villages. While 110 villages in Shravasti were inundated, its neighbouring Bahraich district saw more than 100 villages going under water.

The residents lost homes and crops to this October flood, which flattened standing paddy and other crops that villagers were planning to harvest. Ironically, the same farmers were planning to seek financial assistance from the Centre because drought during the monsoon months had delayed planting of paddy, and they had anticipated at least 20% dip in production. This untimely rain even made work difficult for the government agencies that were assessing losses farmers suffered due to drought-like condition just a few months ago.

Kaushambi and Sitapur were among the 18 districts that witnessed floods and crop and property losses in 2022 and had to depend on government efforts for respite. At the same time, several districts had no other option but to stare at wilting and dying paddy crops. A media report confirms that over 23.32 million farmers in Uttar Pradesh were “swinging between drought and floods” during the monsoon months of 2022.³²

According to the CEEW’s report²³, 69% of districts in Uttar Pradesh are exposed to compounded climate events such as floods and droughts. Over the last two decades, the state experienced an increase in incidence of extremely high temperatures, torrential rain, and, in certain areas, devastating floods and droughts. Hence, it is hardly any surprise that the state’s agricultural productivity is predicted to decline by up to 25% in irrigated areas and up to 50% in rain-fed areas.³³

A high proportion of small and marginal farmers (92%) makes the state more vulnerable to climate change. Inconsistent and erratic monsoons have already affected crop yields, cropped areas, and livestock in Bundelkhand region in the last 4-5 years. Low percentage of area covered under crop insurance and lack of forest area per 1,000 rural population also reduce adaptation capacity of the state, according to the CEEW report.

This is just a snapshot of climate vulnerability of the most populous state in India, which is also among the six states contributing two-thirds of Leprosy cases in India³⁴. In 2020, Uttar Pradesh reported 15,484 new cases of Leprosy³⁵, the third highest in the country, with a high prevalence rate in some blocks and districts. Shravasti and Bahraich, for example, have Leprosy prevalence rate of 1.24 and 0.72, respectively.

The state is also grappling with several other neglected tropical diseases (NTDs) such as Kala-azar, Filariasis, and Chikungunya. While 51 districts of Uttar Pradesh are affected with Filariasis, six districts have high prevalence of Kala-azar. Cases of Leprosy, Malaria, and Chikungunya are reported from across the state, according to the data. The state, however, aims at eliminating Leprosy, Filariasis, Malaria, Chikungunya by 2030, and Kala-azar by the end of 2023.

Some of these districts with high prevalence of Leprosy and other NTDs also have an alarmingly high multidimensional poverty. For example, more than 74% of the population in Shravasti and 71.8% of the population in Bahraich are multidimensionally poor.

“Over 23.32 million farmers in Uttar Pradesh were “swinging between drought and floods” during the monsoon months of 2022.”

Districts	Leprosy Prevalence Rate (2019-20)	% age of population multidimensionally poor	Climate Vulnerability Rank
Shravasti	1.24	74.38	272
Bahraich	0.72	71.88	187
Kaushambi	0.61	56.06	176
Kheri	0.98	59.95	205
Sitapur	0.98	56.83	260

Table 7: List of districts that face triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.

This poverty stems from several factors. About 50.5% of population of Uttar Pradesh do not have access to clean fuel for cooking and 31.2% do not have adequate sanitation facilities, according to the National Family Health Survey (2020-21)³⁶. Lack of health care facilities is also a challenge. The state has a 40.8%, 50.7%, and 51.3% shortfall in the number of sub-centres, primary health centres, and community health centres, respectively. Out-of-pocket expenditure accounts for 72.6% of the state's total health expenditure, much higher than national average of 48.8%, forcing households to compromise food security that is already uncertain during floods and droughts.

Does that explain why 93.9% of children between 6-23 months suffer from undernutrition?³⁹ Does that explain why the state has the third-highest malnutrition rate (44% of its population), and the highest child and adolescent mortality rate (4.97%) in the country? Does that explain why 21.5% of men and 50.4% of women are anaemic, and 17.9% of men and 19% of women have below-normal body mass index? May be.



West Bengal

When cyclone Amphan made a landfall in West Bengal in May 2020, Shankar Sarkar, a 28-year-old resident of Bamonpukur (the Sundarbans), evacuated his house and took his family to a nearby cyclone shelter. Fierce storm continued for hours, and intense rain for several days flooded two villages. Roads became unnavigable with waist-deep water. For a month, members of about 80 households in two villages (along with their cattle) were forced to take refuge in a two-storied cyclone shelter. People had to be crammed* inside a small building for weeks.

*Density of occupancy plays a role in Leprosy transmission. The denser the residential spaces, the faster and easier is the movement of a disease.

With no livelihood opportunities available, villagers had to depend on relief aid for over a month. When water receded, Shankar and six other family members returned to their village and came back to a damaged house, and a pond full of dead fish. During the cyclone, their nearby embankment was breached, making way for polluted and saline sea water to enter their pond and kill all the fish.

Even before the region could limp back to near-normalcy and think of rebuilding hopes and houses, another cyclone (Yaas) made a landfall in May 2021, exactly at the time of high tide. The powerful waves destroyed embankments in about 200 places, further inundating lands with saline water, destroying crops, and killing fishes in the ponds. In a region where most of the residents survive on subsistence agriculture and fishing, the damages done by frequent and intense cyclones are hard to reverse.

Shankar used to earn INR 15,000 per month from his fish farming business. With recurring cyclones rendering his pond incapable of harvesting fish, his monthly income has taken a hit. “Even though close to two years have passed, fish in my pond still don’t seem to survive. Often, I see dead fish floating,” says Shankar. He is not very hopeful of seeing his business revive any time soon. As the only breadwinner of the family, he now earns INR 7,000 every month by driving a cycle van for transporting goods and working as a construction worker.

With monthly income having reduced by more than 50%, Shankar’s family now lives on less nutritional food options. Leafy vegetables grown in the wild have replaced eggs, fish, and chicken, and only rice and starch have become staple. “We mostly have *panta bhaat* (cooked rice soaked in water overnight) with salt and onion. On some days, we buy eggs for children,” says Savita Sarkar, wife of Shankar. The family must also set aside money to pay off the debt they incur every few years because of rebuilding their homes after a cyclone.

Shankar’s uncle, 48-year-old Suresh Sarkar, lives next door. He was diagnosed with Leprosy in 2003, few years after he started losing sensation in his feet and hands and developing ulcers on his feet. He was on MDT but left treatment midway as he experienced hot flashes. It was only in 2011 when his disease relapsed that he came to The Leprosy Mission hospital in Kolkata and got his ulcers treated and MDT treatment completed.

Suresh is now cured, but unlike his nephew, he can’t drive a van or work as a construction labour as he fears developing wounds and ulcers. He has a 16-year-old boy and an 18-year-old girl, who bear testimony to intergenerational poverty in their family. Their father had little to eat when they were growing up, and now, their family has little to survive on. They always feel fatigued and struggle to concentrate on studies.

Such stories abound in the Sundarbans, and they reflect an undeniable truth: people in these low-lying islands are facing a double whammy of climate hazards and chronic poverty.

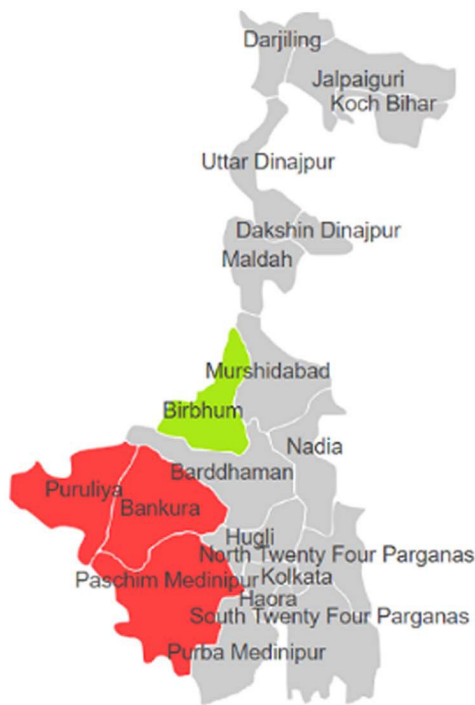
According to the Future Health Systems—a research consortium—food insecurity level has a positive correlation with climatic vulnerability of households. “Recurrent climatic shocks and long-term climatic variability has downgraded all four dimensions of food security—availability, accessibility, utilisation and food system stability across the Indian Sundarbans,” says their research.³⁸ It also suggests that over 25% of households in the Sundarbans faced “extremely high losses to food resources during climatic emergencies in the last five years,” and 30% of children (0–6 years) in climatically vulnerable households face chronic malnourishment.

Climate anomalies and food insecurity are not the only stressors for West Bengal. Unfortunately, the districts that experience poverty and face slow-onset climate events such as drought, also have high Leprosy prevalence rate.

“Recurrent climatic shocks and long-term climatic variability has downgraded all four dimensions of food security—availability, accessibility, utilisation and food system stability across the Indian Sundarbans.”

Districts	Leprosy Prevalence Rate (2020-2022)	% age of population multidimensionally poor	Climate Vulnerability Rank
Purulia	1.33	49.69	31
Birbhum	0.9	27.6	161
Bankura	0.8	27.4	146
Jhargram	1.45	23.82	57

Table 8: List of districts that face triple challenge of multidimensional poverty, climate vulnerability and high Leprosy prevalence.



Let's consider the south-western districts— Purulia, Bankura, Birbhum, and Jhargram. All the 20 blocks of Purulia, a district where almost 50% of population are multi-dimensionally poor, has annual new case detection rate (ANCDR) of more than 17/ 100,000, with the highest being 37.83/ 100,000. This is almost 900% higher than the national average of 5.09 / 100,000 population (2021-22)³⁹.

Jhargram, a neighbouring district, has an average ANCDR of about 15/ 100,000. Some of the blocks report as high as 21/100,000. In Bankura, the average ANCDR of 16 blocks is more than 10/ 100,000.

These districts are also in the grip of multidimensional poverty because large chunk of population has poor access to nutrition, sanitation, decent housing, assets, and healthcare facilities. Poverty, especially nutrition poverty, is an important risk factor for Leprosy susceptibility. According to a study by the Department of Dermatology, Erasmus University Medical Center in the Netherlands, “unstable income, anaemia, and higher household food insecurity are significantly associated with an increased risk of having Leprosy.” It calls for “improving dietary diversity through food-based approaches”, which should be directed toward high-prevalence villages.⁴⁰

Like the Sundarbans, these districts have also been witnessing climate anomalies. They are frequently exposed to droughts of various magnitude that extend for years. In fact, West Bengal is among the top 25% most climate vulnerable states with 14 out of 19 districts (74%) classified as highly and very highly climate vulnerable. High proportion of natural resource-based income, prevalence of marginal and small landholdings, lack of forest area per 1,000 rural population, and high incidence of water-borne diseases are some of the drivers of climate vulnerability.

“Unstable income, anaemia, and higher household food insecurity are significantly associated with an increased risk of having Leprosy.” It calls for “improving dietary diversity through food based approaches.”

“Regions that have red soil (Purulia, Bankura, etc.) are usually single-crop areas, from which families get sustenance for about six months. For the remaining six months, they struggle to make ends meet. This prompts small-scale farmers to work as migrant and agricultural labourers during the lean season. Climate change is now affecting even the single crop,” said Ardhendu Chatterjee, executive director of Development Research Communication and Services Center (DRCSC).⁴¹

How difficult it must be for a multi-dimensionally poor district such as Purulia to end Leprosy transmission when endemicity is so high, when most residents are deprived of nutrition, and a large population of small and marginal farmers don't see respite from chronic drought?

Photo Credits: Swagata Yadavar



30 districts with high number of at-risk populations

State	Districts	Leprosy Prevalence Rate	% age of population multidimensionally poor	Climate Vulnerability Rank	
Bihar	Kishanganj	2.32	64.75	8	
	Supaul	1.11	64.1	53	
	Sitamarhi	0.95	63.46	36	
Chhattisgarh	Surguja	0.99	47.37	419	
	Bastar	1.71	46.95	NA	
	Jashpur	1.10	45.85	NA	
	Bijapur	1.54	41.2	427	
	Kabirdham	1.94	39.6	474	
	Korba	1.52	31.86	413	
	Raigarh	4.40	30.82	263	
	Mahasamund	3.34	29.85	328	
	Bilaspur	1.99	25.66	273	
	Maharashtra	Nandurbar	2.46	52.12	50
		Dhule	1.79	33.23	101
Yavatmal		1.4	23.54	167	
Odisha	Nabarangapur	1.72	59.32	74	
	Malkangiri	0.45	58.71	100	
	Koraput	0.89	51.14	55	
	Kalahandi	1.22	47.28	NA	
	Mayurbhanj	1.05	44.90	NA	
	Nuapada	3.21	38	14	
Uttar Pradesh	Shravasti	1.24	74.38	272	
	Bahraich	0.72	71.88	187	
	Kaushambi	0.61	56.06	176	
	Kheri	0.98	59.95	205	
	Sitapur	0.98	56.83	260	
West Bengal	Purulia	1.33	49.69	31	
	Birbhum	0.9	27.6	161	
	Bankura	0.8	27.4	146	
	Jhargram	1.45	23.82	57	

Table 9: Top 30 districts that have three-dimensional vulnerabilities.

03 Voices from the grassroots

Dealing with frequent floods and disability in Bihar



Photo credit: Swagata Yadavar.

Chanchala Devi, 55, used to work in Anganwadi, but now she must stay at home and take care of her husband who is blind and paralysed. Already struggling to earn enough for her needs, frequent floods in her village make the situation more difficult for the family.

For 55-year-old Chanchala Devi from Burh Nagar Radha village in Muzaffarpur, monsoon months bring a sense of dread. From May to August, heavy downpour causes the river Budhi Gandak to flood and her village to submerge. For weeks, villagers are cut off from supplies. Families gather their most essential documents and rations and head to the roofs of their houses or the river embankment. Entire family is forced to be on a chowki (wooden platform), that becomes their bed, their living room, and their dining space. They cook on the side of the wooden platform with whatever food stock they manage to salvage. Things get worse for Chanchala Devi because her husband is a person with disability (PWD) and her children are away. Her husband lost his eyesight two years ago and suffered a paralytic attack recently. He is dependent on her for most of his chores and it is difficult for Chanchala Devi to lift him up and get him to the roof alone. “I have to ask for help from neighbours, but everyone is busy, saving their own families,” she said.

The family does not own a TV or many electrical appliances, they just have one radio. “There is no need to buy new things, the flood damages it anyways,” she said. During floods, they collect rainwater and boil it for drinking purposes or buy packaged water cans. To charge their mobile phone, they must go to the embankment. Answering nature’s call during floods is tricky. Women hold on to the ropes tied on the sides and use a temporary enclosure on slightly higher ground to relieve themselves.

Floods are both a blessing and a bane for Bihar. Located in the northern plains, Bihar gets rich alluvial soil due to depositions of Ganga and its tributaries. This makes the soil highly fertile, which is why 77% of the state’s workforce is engaged in agriculture. However, floods also cause despair. About 74% of its districts are flood-prone. Muzaffarpur is among the 15 districts in Bihar which are worst hit by floods, according to the flood hazard atlas⁴² based on satellite data from 1998-2019.

“The floods are keeping us poor. We cannot prosper,” Chanchala Devi said. Her husband used to work in Kolkata but is retired now. She worked as a support staff in a school helping with mid-day meals but had to stop working to take care of her husband. They have a small patch of land that gives them about 1.5 quintals of wheat every year, which is just about enough for their own needs. The produce, however, often rots during floods. Out of her four children, three daughters are married, and her 20-year-old son works as a medical representative in Darbhanga, 60 km away. He is the sole breadwinner earning about Rs.10,000 a month.

The impact of climate anomalies is already making lives more challenging. “It used to flood once in 10 years, but now it floods every year,” said Chanchala Devi. Data mirrors her claim. From 1998-2019, the state witnessed 10 high-magnitude floods (1998, 2004, 2007, 2008, 2012, 2013, 2016, 2017, 2018 and 2019)⁴² resulting in severe loss in overall economy and development. Climate change is also expected to have an impact on crop yields, according to the prediction of the Indian Council of Agricultural Research.⁴³

Poverty, Disease and Cyclones: Living with Leprosy in Sundarbans

Kanchan Maity, 32, contracted Leprosy in her childhood but it was not treated on time. Her house often gets damaged due to cyclones, and she struggles to make ends meet.



To reach Bounia in the Sandeshkhali block of the Sundarbans, you need to travel 27 km by road from the nearest census town, get into a jetty to cross the Bidyadhari river and then take an e-rickshaw through a narrow one-way road with thick mangroves on both sides. This is the village that Kanchan Maity, 32, calls home. It is perhaps the remoteness of the village that caused her Leprosy to stay undetected and untreated for long.

Maity does not remember at what age she was diagnosed with Leprosy. All she can recall is that she was a little girl. The doctors her father took her to, did not think it was Leprosy. She took the medicines he prescribed, but not regularly. When she saw patches on her skin after a few months, her father took her to a government hospital where she was correctly diagnosed. By then, her fingers had become deformed. Doctors suggested physiotherapy, but she was not consistent in accessing the service. Moreover, she did not opt for surgery to correct her deformity. “What if the surgery ruined her hand?” people in her village had expressed concern. Soon, Leprosy even affected her nose, which became thickened.

Still in her teens without much schooling, Maity was married off and now has a daughter who is 16. Her husband left her several years ago and lives in another town. He visits her occasionally and sends money, but it is too meagre to run her household. Her disability pension of Rs. 1000 is the only fixed income she has. She looks emaciated, with rod-thin arms, besides poverty and disability, her hardships are punctuated with frequent climate anomalies, especially cyclones.

“Our house gets damaged often. Whatever little money we have is spent on repairs,” Maity said. Her husband did not come when cyclone Amphan damaged their home. He sent money instead. While some villagers got a compensation of Rs. 20,000, she didn’t. She hopes she can afford to build a pucca house with solid ceilings, because asbestos sheets are often blown away by cyclones. Currently, it is out of her reach. She believes that the training on sewing that she is getting with the help of The Leprosy Mission and Rotary Club will supplement her income and help her save up enough to build a strong roof above her.



Photo credit: Swagata Yadava.

Lingering effect of climate extremes and Leprosy

Vishwajit Pramanik, 30, first noticed loss of sensation in his hand in 2017. It wasn't until 2021 that he was diagnosed with Leprosy and could start treatment.

Vishwajit Pramanik, 30, used to work in his father's salon. In 2017, he lost sensation in his left hand. Spending hundreds of rupees, he reached a private hospital in Kolkata. There, he was referred to the Neuromedicine department where they took a biopsy of his patch, but after a long follow-up, he was told the sample couldn't give a conclusive report. So, he stopped going.

In 2021, when he started developing deformity in his right hand, he went back to the hospital. He was referred to the dermatology department and was diagnosed with Leprosy. He is the second person in the family to have been diagnosed with Leprosy, after his paternal uncle was diagnosed with it nine years back.

By the time Pramanik completed his treatment, both his hands developed deformity. In February 2022, he got in touch with The Leprosy Mission hospital in Kolkata and underwent reconstructive surgeries, which helped correct the deformity and regain mobility in his hands. "I can no longer work in the salon because there is risk of getting cuts and wounds. I worked in a ration shop (fair price shop) for some time, but because of muscle weakness, I could not lift heavy bags, and so, I had to discontinue," said Vishwajit.

Vishwajit used to earn INR 9,000 a few months before his deformity became a barrier, but now it is a struggle to run his household. His wife gets INR 500 every month under the West Bengal government's Lakshmi Bhandar scheme for women. She used to work in a brick kiln, but after the birth of their second son two years back, she quit work to stay at home. Vishwajit now depends on his in-laws for running the family. He receives foodgrains at a subsidised rate, but the family meals are not nutritious. Sometimes, there is not enough to eat, even for the two-year-old child.

More than half of the population in the Sundarbans lives below poverty line. Much of it is due to dwindling income from aquaculture and agriculture that are affected by frequent storm surges and saline water intrusion into farms and ponds. Vishwajit's family is no exception.

Every time the floods hit their village and rains refuse to hold off, Vishwajit's house and other houses in the vicinity get submerged. With the family yet to fortify their house and build strong roofs on all the rooms, it somehow manages to stay dry by adding a layer of tarpaulins on asbestos roofs. As their house do not have toilets, they either use a neighbour's toilet or defecate in the open. This continues to happen in a region where communicable diseases are common⁴⁴, and so are the diseases related to water and sanitation, especially among children.

04 Conclusion

It may not be easy to accurately estimate or quantify the impact that climate change has on Leprosy transmission, however, evidence from the grassroots suggest a correlation between extreme weather events, food insecurity, reduced access to health care services and increased disease prevalence. In general, increase in morbidity and mortality globally is attributed to climate anomalies in the form of heat waves, storm surges, and floods that disrupt established support systems.

These climate threats are disproportionately felt by the most vulnerable and disadvantaged population, including poor communities, displaced persons, women, children, older populations, and of course, persons affected by Leprosy, as they lack the wherewithal to become resilient.

When global discourse on Leprosy revolves around achieving zero transmission (disease) and zero disability, it is important to focus on socioeconomic and environmental factors associated with risk of Leprosy occurrence, and how extreme weather events could potentially delay progress towards achieving those goals, as evident from overlapping concerns in some of the states and districts in India.

To effectively prevent transmission, reduce disease prevalence and prevent Leprosy-related disability, we need to ensure active case detection, early diagnosis and contact screening, and treatment compliance. For this to happen, we need the at-risk population in endemic areas to be able to put their health before anything else. But how can we expect improved health seeking behaviour when frequent and intense climate events are not allowing people to put aside concerns over food insecurity, homelessness, debts, etc.?

This question may lead to germination of new ideas on cross-sectoral and multi-disciplinary approach towards eradication of Leprosy and other neglected tropical diseases. Through this report, we call upon all stakeholders to prioritise concerns of persons affected by Leprosy and other disabilities, who operate in resource-poor settings and are already rendered vulnerable due to recurring climate disasters that not only exacerbate their existing health threats, but also create new public health challenges.

“But how can we expect improved health seeking behaviour when frequent and intense climate events are not allowing people to put aside concerns over food insecurity, homelessness, debts, etc.?”

05 References

1. IIT- Mandi and IIT-Guwahati, Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework, 2019-20,
<https://dst.gov.in/sites/default/files/Full%20Report%20%281%29.pdf>
2. Ministry of Science & Technology, National climate vulnerability assessment identifies eight eastern states as highly vulnerable, April 17, 2021,
<https://pib.gov.in/PressReleaselframePage.aspx?PRID=1712450>
3. IPCC, Climate Change 2022: Impacts, Adaptation and Vulnerability, March 2022,
<https://www.ipcc.ch/report/ar6/wg2/>
4. NITI Aayog, National Multidimensional Poverty Index, November, 2021,
https://www.niti.gov.in/sites/default/files/2021-11/National_MPI_India-11242021.pdf
5. W. Inge, M. Lisanne, et al., Diet-Related Risk Factors for Leprosy: A Case-Control Study, National Library of Medicine, May 12, 2015,
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4428634/#:~:text=Nutritional%20deficiencies%20impair%20the%20immune,the%20clinical%20presentation%20of%20Leprosy.>
6. L. Yu-Ye, S. Sunaula, et al., Factors Influencing Leprosy Incidence: A Comprehensive Analysis of Observations in Wenshan of China, Nepal, and Other Global Epidemic Areas, Frontiers, May 31, 2021,
<https://www.frontiersin.org/articles/10.3389/fpubh.2021.666307/full>
7. S. Utpal, Elimination of Leprosy in India: An analysis, Indian Journal of Dermatology and Venereology and Leprology, Feb 7, 2018,
<https://ijdvl.com/elimination-of-Leprosy-in-india-an-analysis/#ref52>
8. H. Epco, M. Paritosh, et al., Post kala azar dermal leishmaniasis and Leprosy prevalence and distribution in the Muzaffarpur health and demographic surveillance site, National Library of Medicine, Oct 25, 2019,
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6834282/>

9. K. Mohammad, Early, repeated floods wreaked havoc on north Bihar farms, Down To Earth, Aug 6, 2021,
<https://www.downtoearth.org.in/news/natural-disasters/early-repeated-floods-wreaked-havoc-on-north-bihar-farms-78326>
10. K. Mohammad, Climate Change Hits Bihar Farmers Twice This Year, The Wire, Oct 27, 2018,
<https://thewire.in/agriculture/climate-change-hits-bihar-farmers-twice-this-year>
11. Director General of Health Services, State-wise Report 2019-20,
<https://dghs.gov.in/WriteReadData/userfiles/file/Leprosy/State%20wise%20report-2019-20.pdf>
12. S. Mukul, D. Purna, S. Pushpendra, Current situation of Leprosy in tribal areas of India in the post-elimination era, Indian Journal of Dermatology and Venereology and Leprology, June 2022,
<https://ijdvl.com/current-situation-of-Leprosy-in-tribal-areas-of-india-in-the-post-elimination-era/>
13. K. Oommen, Leprosy and inequities in India's healthcare: Beyond the persistent rhetoric of 'Elimination', ORF, Feb 12, 2019,
<https://www.orfonline.org/research/Leprosy-and-inequities-in-indias-healthcare-beyond-the-persistent-rhetoric-of-elimination47968/>
14. S. Mukul, D. Purna, et al., Current situation of Leprosy in tribal areas of India in the post-elimination era, Indian Journal of Dermatology and Venereology and Leprology, June 2022,
<https://ijdvl.com/current-situation-of-Leprosy-in-tribal-areas-of-india-in-the-post-elimination-era/>
15. K. Dhananjay, M. Balu, et al., Epidemiological Perspective of National Leprosy Eradication Programme in Maharashtra: Focusing on "Tribal Hot-spot" of Tribal District, Indian Journal of Community Medicine, Jul-Sep 2017,
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5561698/>
16. In 2021-22, over 2,110 cases of Leprosy reported in CG, The Times of India, Feb 27, 2022,
<https://timesofindia.indiatimes.com/city/raipur/in-2021-22-over-2110-cases-of-Leprosy-reported-in-cg/articleshow/89859837.cms>
17. B. Laveesh and C. Minakshi, Spatial Poverty in Chhattisgarh, Mint, Mar 9, 2015,
<https://www.livemint.com/Opinion/TelfQDSiZ1IPufDbwZ526K/Spatial-poverty-in-Chhattisgarh.htmls>

18. S. Vidya and M. Indu, District-level Changes in Climate: Historical Climate and Climate Change Projections for the Central States of India, India Environment Portal, Jan 2022, <http://www.indiaenvironmentportal.org.in/files/file/Central%20region.pdf>
19. Y. Avinash and D. GK, Assessment of Vulnerability in three agro-climatic zones of Chhattisgarh with reference to climate change, Apr 2022, ResearchGate, https://www.researchgate.net/publication/360127843_Assessment_of_Vulnerability_in_three_agro-climatic_zones_of_Chhattisgarh_with_reference_to_climate_change
20. Over 65,000 Leprosy cases recorded in India in 2020-21: Report, The Indian Express, Jan 29, 2022, <https://indianexpress.com/article/cities/pune/over-65000-Leprosy-cases-recorded-in-india-in-2020-21-report-7746973/>
21. Ministry of Health & Family Welfare, National Health Profile 2021, Pg 151, <https://www.cbhidghs.nic.in/showfile.php?lid=1160>
22. Ministry of Health & Family Welfare, National Family Health Survey – 5 2019-20 http://rchiips.org/nfhs/NFHS-5_FCTS/Maharashtra.pdf
23. M. Abinash and W. Shreya, Mapping India's Climate Vulnerability: A district-level assessment, CEEW & India Climate Collaborative, Oct 2021, <https://www.ceew.in/sites/default/files/ceew-study-on-climate-change-vulnerability-index-and-district-level-risk-assessment.pdf>
24. Nandurbar among 11 districts highly vulnerable to extreme weather events, droughts: Study, The Indian Express, Aug 6, 2021, <https://indianexpress.com/article/cities/mumbai/nandurbar-among-11-districts-highly-vulnerable-to-extreme-weather-events-droughts-study-7442141/>
25. B. Tabassum, Nandurbar's nutrition centres are showing dismal results in helping malnourished children, Scroll.in, Oct 6, 2022, <https://scroll.in/article/1034223/nandurbars-nutrition-centres-are-showing-dismal-results-in-helping-malnourished-children>
26. Tribal Research and Training Institute, Government of Maharashtra, Division-wise Total and Tribal Population of Maharashtra State (As per 2011 Census) <https://trti.maharashtra.gov.in/index.php/en/divisionwise-total-tribal-population>
27. B. Satyasundar, 'Leprosy free' Odisha sees worrying rise in cases, The Hindu, Nov 27, 2021, <https://www.thehindu.com/news/national/other-states/Leprosy-free-odisha-sees-worrying-rise-in-cases/article37725190.ece>

28. ENVIS Centre of Odisha's State of Environment, Climate, <http://orienviis.nic.in/index1.aspx?lid=24&mid=1&langid=1&linkid=22>
29. D. Taran, India's persistently high out-of-pocket health expenditure continues to push people into poverty, Down To Earth, Sep 22 2023, <https://www.downtoearth.org.in/news/health/india-s-persistent-high-out-of-pocket-health-expenditure-continues-to-push-people-into-poverty-85070>
30. L. Jose, D. Shishir, et al., Child malnutrition and recurrent flooding in rural eastern India: a community-based survey, National Library of Medicine, Nov 2011, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208901/>
31. B. Ritu, C. Devanshu, et al., Climate change, migration, and vulnerability to trafficking, International Institute for Environment and Development, May 2022, <https://www.iied.org/20936iied>
32. R. Ankit, Farmers in Uttar Pradesh crushed by drought and drowning fields, Gaon Connection, Sep 14, 2022, <https://www.gaonconnection.com/lead-stories/drought-monsoon-floods-uttar-pradesh-farmers-yogi-adityanath-irrigation-varanasi-crop-loss-51247>
33. State Action Plan on Climate Change: Uttar Pradesh, Department of Environment, Government of Uttar Pradesh, 2014 https://moef.gov.in/wp-content/uploads/2017/09/SAPCC_UP_final_version_0.pdf
34. India accounts for over half of world's new Leprosy patients, shows data, Business Standard, Jan 30, 2022, https://www.business-standard.com/article/news-ani/india-accounts-for-over-half-of-world-s-new-Leprosy-patients-shows-data-122013000422_1.html
35. Annual Report April 2019-March 2020, National Leprosy Eradication Programme, Directorate General of Health Services, Ministry of Health & Family Welfare <https://dghs.gov.in/WriteReadData/userfiles/file/Leprosy/State%20wise%20report-2019-20.pdf>
36. National Family Health Survey – 5 2019 -21: State Fact Sheet Uttar Pradesh, http://rchiips.org/nfhs/NFHS-5_FCTS/Uttar_Pradesh.pdf
37. J. Rashmi, N. Prateek, et al., Nutritional Status of Patients With Leprosy Attending a Tertiary Care Institute in North India, National Center for Biotechnology Information, Mar 16, 2022, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9012245/>

38. Climate change: a threat to child food security in the Indian Sundarbans, Future Health Systems, Issue 1, June 2018,
https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/13823/FHS_IssueBrief1_Sundarbans.pdf?sequence=15&isAllowed=y
39. Progress Achieved in National Leprosy Eradication Programme, Press Information Bureau, Dec 14, 2021,
<https://pib.gov.in/PressReleaselframePage.aspx?PRID=1781264>
40. O. Salma, H. Norma, et al., Dietary diversity and poverty as risk factors for Leprosy in Indonesia: A case-control study, National Center for Biotechnology Information, Mar 13, 2018,
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5865754/>
41. 'Climate-hit Bengal farmers need new tech to survive', The Times of India, Jul 23, 2022
<https://timesofindia.indiatimes.com/city/kolkata/climate-hit-bengal-farmers-need-new-tech-to-survive/articleshow/93064865.cms>
42. Flood Hazard Atlas - Bihar - A Geospatial Approach, ReliefWeb, Dec 18, 2022,
<https://reliefweb.int/report/india/flood-hazard-atlas-bihar-geospatial-approach>
43. R. CA, R. BMK, et al., Risk and Vulnerability Assessment of Indian Agriculture to Climate Change, ICAR - Central Research Institute for Dryland Agriculture, 2019
<http://www.nicra-icar.in/nicrarevised/images/publications/Risk%20&%20vulnerability%20assessment%20of%20Indian%20agriculture%20to%20climate%20change.pdf>
44. P. Malay, S. Sylvia, et al., Population health risks in multi-hazard environments: action needed in the Cyclone Amphan and COVID-19 -hit Sundarbans region, ResearchGate, India, Feb 2021,
https://www.researchgate.net/publication/349670247_Population_health_risks_in_multi-hazard_environments_action_needed_in_the_Cyclone_Amphan_and_COVID-19_-hit_Sundarbans_region_India





Photo credit: Subhojit Goswami



📍 **The Leprosy Mission Trust India**
CNI Bhavan 16, Pandit Pant Marg,
New Delhi - 110001

☎ **011 4353 3300**

✉ **www.leprosymission.in**

