Climate Change and the Public Health Dilemma in India

Marcus Arcanjo

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Introduction

India is the second largest country in the world by population and is rapidly catching up to China. At the best of times, a lack of adaptive capacity coupled with limited resources to help bolster health infrastructure have made it extremely challenging for the country to cope with the spread of illness and disease. Climate change is now making things far worse. India is an especially fascinating case study in this regard due to its diverse array of temperate zones. From the Himalayas in the far north, to coastal megacities, to deserts where the 50° Celsius mark is regularly breached, the nation is consistently ranked as one of the most vulnerable to climate change.

This paper explores the implications for human health arising from these vulnerabilities. It argues that the extreme temperatures being seen across India are rendering some areas entirely uninhabitable, with the further risk of death following exposure even for several hours. This is compounded by the increasing number of people with respiratory diseases resulting from air pollution, in turn stemming from the country’s single-minded pursuit of economic growth predicated on fossil fuels. Moreover, malaria and cholera epidemics are expected to continue, with easy access to dirty water and increased temperatures creating expanded breeding grounds for disease-carrying vectors. Severe mental health consequences will also be discussed.

This paper will argue that India’s economic, environmental, and health-related goals must not be considered in isolation, but rather as interconnected ambitions. By tackling carbon emissions and investing in accessible health services and infrastructure, the numbers of those suffering from serious ailments will fall and a healthier population will in turn help to achieve the sustained economic growth the country so desires.

Temperature Extremes and Air Pollution

Research has shown that the average temperature in India is now 1.2°C higher than during the baseline year of 2001. However, it is the seasonal variations that are of most concern today. Temperatures in the winter months have risen by 3 degrees, with pre-monsoon periods increasing by 2°C. The largest anomalies have been noticed over the preceding decade, confirming that relentless development and infrastructure-building have altered the climate. Projections by the Intergovernmental Panel on Climate Change (IPCC) suggest with “high
confidence” that deaths from heat waves, prolonged droughts, and fires will rise in the coming years and, although fewer deaths due to extreme cold will be recorded, the negative effects dramatically outweigh the positive ones.²

Temperature extremes are especially concerning. Evidence from across the world has shown that large-scale changes in climate systems are already negatively impacting human health, with mortality and morbidity increasing during episodes of extreme heat and cold. Much of India is subject to extreme heat, and May 16, 2016 saw temperatures in Phalodi reach 51°C with resulting human impacts including heat stroke, exhaustion, kidney failure, and severe dehydration, especially among the young and elderly.³ Needless to say, as average surface temperatures continue to rise annually, the land in affected areas will become even less habitable. Patz (2005) notes that rising temperatures create a ‘heat island’ effect, whereby urban environments with poor ventilation absorb and retain heat, thus amplifying and extending the rise in temperatures up to 30°C above the actual air temperature.⁴

Recent analysis has focused more on humidity than solely temperature. The ‘wet bulb’ temperature (WBT) is a measure of the lowest temperature at which the body can continue to cool itself via sweating. A temperature of 50°C with 40 percent humidity is equivalent to a WBT of 36°C with 100 percent humidity, the threshold at which the body can no longer regulate temperature and even those sitting in the shade may die within six hours.⁵ Research published in 2017 found that, under scenarios in which carbon emissions were left unabated, 4 percent of the world’s inhabitants would suffer these unsurvivable heatwaves, including in northern Indian cities with populations exceeding two million.⁶

The projections below illustrate how the distribution of WBT is expected to change. Projection B is the historical WBT from 1976-2006, showing that the vast majority of the country remained within the safe limit. C is a projection of 2071-2100 under a 2.25°C warming scenario, whilst D is an estimate for the same period under a 4.5°C scenario. These predictions are especially concerning because they fall within the IPCC estimates, suggesting an increased likelihood that many regions will be exposed to the “extreme danger” of 31°C and several more approaching the “unsurvivable” level of 36°C.
India is a prime target in this vein. Continuous construction projects across hundreds of cities are filling traditionally sparse areas, and migration to the larger cities has resulted in significant population increases. According to 2011 census data, there are over 40 Indian agglomerations with over one million inhabitants, including three – Delhi, Mumbai, and Kolkata – with over 10 million. This extreme rate of population concentration exacerbates competition for already limited resources. The World Health Organisation (WHO) has found that extreme temperatures are also linked to malnutrition, which they still consider a crisis. The lack of drinking water when temperatures soar leads to severe dehydration and heat stroke. Urban desertification in Punjab demonstrates the stark reality of a changing climate, with little to no rainfall and high temperatures rendering it nearly impossible to harvest crops.

Recently, Rohini et al. (2016) debated the excessive heat factor – a measurement based on excess heat and heat stress – and found that the frequency and duration of heat waves are increasing, with days under 37°C in areas like Rajasthan now being considered cool.

Furthermore, McMichael et al. (2005) state that many heatwave-related deaths occur in people with pre-existing cardiovascular or chronic respiratory diseases. Due to India’s heavy reliance on coal, millions suffer respiratory problems from smoke inhalation, meaning deaths due to increased temperatures are also likely to rise. Worryingly, many Indian cities find themselves in the midst of an air pollution crisis. Delhi in particular is afflicted by toxic smoke clouds containing over six times the acceptable pollutant level, leading to serious
respiratory issues. Some even estimate that half of all children in the city suffer from severe lung disease. Additionally, emissions from ongoing construction efforts coupled with fumes from vehicles in busy environments make those living in urban areas far more susceptible than those in rural regions. Anthropogenic climate issues resulting from vehicular pollution and coal-burning cause the release of black carbon aerosols (soot), leading to hotter temperatures, an increased likelihood of droughts in the north, and respiratory diseases such as asthma.

These problems are further compounded by physically demanding working conditions. Kjellstrom (2009) found that there is a physiological limit to the ability to carry out strenuous work in hot temperatures (above 37°C and high humidity). Many parts of India satisfy such conditions, and studies have found that working situations on construction sites around the country require around 15-16 hours of daily presence, thus increasing the threat of heat exhaustion and other temperature-related ailments. Such studies highlight the clear threats to longevity in India.

**Malaria and Vector-Borne Diseases**

Concerns over the spread of vector-borne diseases in India are well founded, with 96 percent of the population exposed to malaria and over 2 million annual cases. Many infectious agents, vector organisms, and the rate of pathogen replication are sensitive to climate conditions. The relationship between malaria and climate is easily explained: mosquitoes increase their reproduction and maturity as temperatures rise, up to a threshold point. Given their short lifespan, the quicker they mature, the faster they can transmit disease – and the more significant the human impacts they can cause. Epstein (2001) notes the difference between climate and weather and the respective roles they play in human health. Climate is a key determinant of health, as it constrains the range of infectious diseases whilst weather affects the timing and intensity of outbreaks. By affecting the temporal and spatial distribution, rising temperatures and fundamental changes to the global climate are therefore causing an expansion of many serious infections.

Malaria in India has always been a problem. It is endemic in all regions, excepting areas of elevation above 1800m such as the Himalayas and some coastal areas. However, current predictions show a continued rise in temperature, with the cooler areas now reaching the
minimum levels needed for vector reproduction. Global climate modelling, as reported by Bhattacharya (2006), indicates that the number of people in developing countries likely to be at risk of malarial infection will increase between 5 and 15 percent due to the dominant role of humidity and temperature in transmission.\textsuperscript{16} Given IPCC estimates regarding temperature, areas that are currently malaria free are expected to become malaria prone in the future – such as in India’s southern and coastal states – whilst malaria prevalence will persist and intensify in the central regions.

Traditionally, transmission windows lie between 15°C and 35°C – temperatures satisfied by almost every Indian region throughout the year.\textsuperscript{17} However, a report found that western India has historically experienced temperatures as high as 50°C, with malaria still prominent.\textsuperscript{18} In northern areas like Punjab and Haryana, the transmission window is expected to increase by 2-3 months as temperatures in the colder months exceed the transmission threshold, thereby placing populations under prolonged threat. For regions such as Uttar Pradesh, this would mean exposure to malaria during 10-12 months of the year.\textsuperscript{19}

Dhingra et al. (2010) estimate that approximately 200,000 deaths from malaria occur each year up to the age of 70, with a further 55,000 in early childhood.\textsuperscript{20} These numbers are expected to increase dramatically. Whilst most regions are at some risk, 65 percent of malaria cases are found in just six states, including coastal areas like Orissa, where incidence is on par with sub-Saharan Africa.\textsuperscript{21} A significant correlation has been shown between greater precipitation and rising temperatures and the incidence of malaria, linked with an increased abundance of vectors.\textsuperscript{22} Vulnerability to monsoons and flooding results in an abundance of stagnant water and humid conditions necessary for viability, with research finding that malaria incidence increases five-fold in the year following an El Niño cycle.\textsuperscript{23}

India particularly struggles in responding to disease due to a decline in social conditions and public health programs, with the current lack of resources placing greater strain on limited health services; indeed, the inability to efficiently respond to disease makes developing countries like India far more concerned about health. Less is known about the impact of climate on cases of urban malaria, but it is expected that rising inward migration due to climate change will increase poverty and the rapid spread of the disease. Such indirect effects of climate change have been found to further spread malaria. Migration from other regions or neighbouring countries like Bangladesh – where malaria incidence is also incredibly high – to densely populated peri-urban areas on the outskirts of large cities rapidly increases
transmission rates. Overpopulation and poor environmental conditions in temporary settlements are likely to make incidence rife.

**Waterborne Diseases**

The burden of waterborne disease in India is enormous. Climate change is exacerbating the issue, altering water availability and heightening the exposure to unsafe water. Temperature fluctuations, the increased frequency of heavy floods, and rising sea levels all have the power to cause havoc in the country, making the spread of disease-causing pathogens and chemical hazards more likely. In 53.7 percent of cases, Cann (2013) found that outbreaks in the wake of extreme weather events were caused by a contaminated water supply. Water-related diseases run rampant across India, with diarrhoea and cholera leading the way.

Moors et al. (2013) investigated the impact of a changing climate on the incidence of diarrhoea and concluded that it was directly linked to temperature, precipitation, and air humidity. Predictions for India indicate that an increase is likely in all three areas, and incidences of diarrhoea are therefore expected to increase by 13.1 percent in northern regions by the 2040s. The spread of these ailments is amplified by the lack of basic sanitation and a reduction in the availability of freshwater. A full 73 percent of rural India does not have water disinfection, while 74 percent do not have sanitary toilets.

The spread of cholera has also increased. Annually, there are approximately 5 million cases of cholera in India, although Zuckerman et al. (2007) believe this figure to be a vast underestimation. Cholera has been reported in 21 out of 35 Indian states, with high incidence in coastal regions and areas vulnerable to monsoons.

Predictably, cases of cholera have continued to rise throughout India. Research has shown positive correlations between temperature increases and precipitation on the spread of cholera, and case studies reflect this. Sur et al. (2000) found that 72 percent of one study group tested positive for cholera in West Bengal after heavy monsoon rainfall, whilst multiple studies have revealed severe cholera epidemics in Orissa following extreme weather events such as cyclones and flash floods. If future predictions are to be believed, waterborne diseases will spread further across the country and impact millions more people, compromising health security and the aim of guaranteeing minimum protections from
disease. Predictably, the poorest will be hardest hit as their only source of water will be both stagnant and highly contaminated.

**Mental Health**

The impacts of climate change on human health stretch far beyond easily identifiable diseases and quantifiable deaths that can be directly attributed. Indeed, the underlying and indirect effects of climate change can be far more devastating. For example, a rapidly growing research area concerns the impact of climate change on the mental health of the especially vulnerable. Bourque and Willox (2014) found evidence suggesting a correlation between mental health and climate vulnerability, with outcomes ranging from depression, psychological distress, and increased suicide rates – suggesting that climate change itself could be the next big mental health challenge.\(^{30}\)

![FARMER SUICIDES](image)

(Source: *Hindustan Times*, 2017)

India, for its part, has witnessed a dramatic rise in suicides, particularly in areas heavily reliant on agriculture as a means of livelihood and sustenance. A recent study found over 60,000 suicide cases in India over the last 30 years.\(^{31}\) Poor harvests as a result of climate vulnerability lead farmers to borrow money in order to replant, with a guarantee of repayment following the new harvest. Climate fluctuations, however, can result in multiple failed years,
creating a cycle of borrowing. Their inability to sustain a livelihood, combined with growing debt, leads many farmers to take their own life. Reports in Indian newspapers have highlighted the issue, with the Hindustan Times identifying 1309 suicides in the traditionally prosperous farming region of Punjab within a three-year period.

Conclusion

In the words of Carrington (2017), the vast implications of climate on health present “a dilemma for India between the need to grow economically at a fast pace, consuming fossil fuels, and the need to avoid such potentially lethal impacts.” Such conflicts of interest are severely threatening human health. Although attempts to reduce poverty by focusing on economic ambitions are well-intentioned, the carbon emissions resulting from those same activities are greatly increasing risks to human health – the opposite of what was intended.

To combat this health crisis, it is vital that those in positions of power understand the interconnected risks associated with a rapidly changing climate. National ambitions for health, economic growth, and environmental sustainability should be designed to complement one another, not as individual goals. Climate change negatively impacts human health, leading to higher levels of illness and disease and causing millions of working days to be lost annually. If long-lasting economic growth is truly the country’s goal, India should focus on achieving emissions reductions alongside improvements to health services and infrastructure to avoid such unnecessary productivity losses.

Serious action on health and climate change must be taken over the coming years. If effective measures are not implemented, the numbers of those suffering from easily treatable diseases could reach unprecedented levels with severe implications for countries like India. The stakes are high.

Marcus Arcanjo is a Graduate Research Fellow at the Climate Institute. He holds a BScEcon in Business Economics from Cardiff University and an MSc in Development and Security from the University of Bristol.
Notes


