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disaster." (UNISDR, 2009) Collaboration between government bodies, civil society organizations, and international partners is crucial for effective disaster risk reduction and building a more resilient nation. Disaster risks in India are compounded by increasing vulnerabilities consequential to demographic transition and socio-economic conditions, rapid urbanization including human habitation within high-risk zones, environmental degradation, climate change, epidemics and pandemics caused by human migration and animal trade. Disasters always Impact India's economy, its population and national endeavours for sustainable development.

1.2 WORLD RISK INDEX (WRI)

The World Risk Index is a synthesis of various discourses and concepts on the phenomena of hazard, exposure, and vulnerability, the interaction of which is considered to be the main cause of disaster risks (WISNER, BLAIKIE, CANNON, & DAVIES, 2004). The main idea of the WRI is to raise awareness of the relevance of social capacities in reducing disaster risks, to offer orientation for practitioners in preventing humanitarian crises, and to assist decision-making when it comes to the allocation and prioritization of resources.

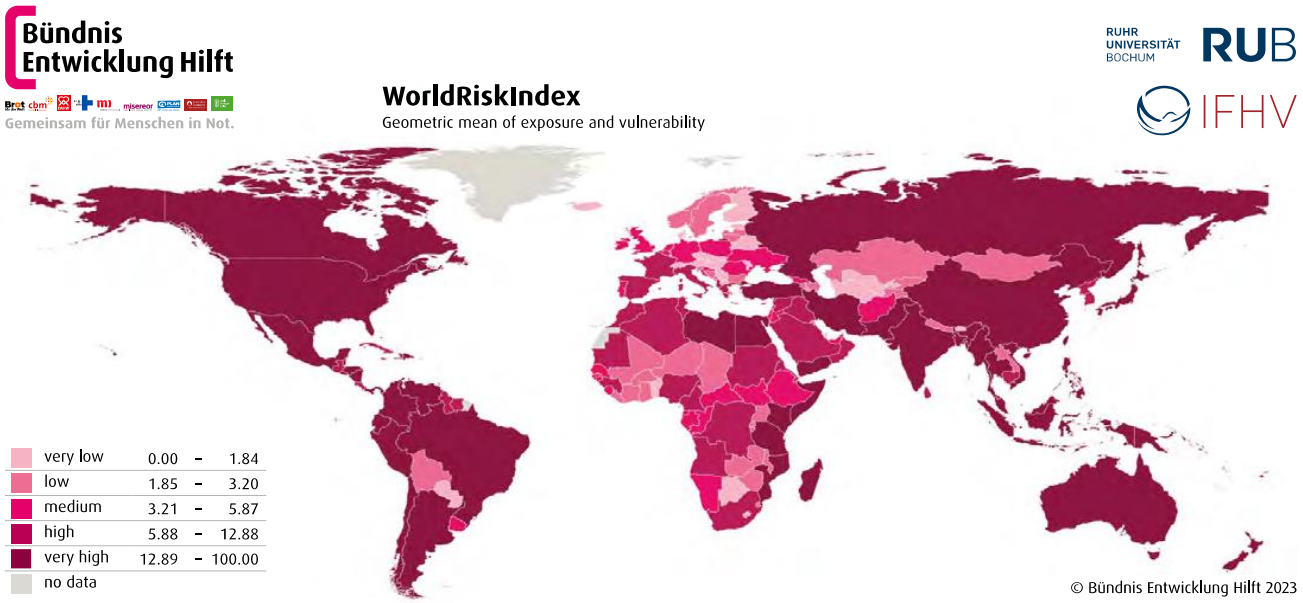


Figure 1 World Risk Index 2023 (Alliance Development Helps, 2023)

The index is supposed to foster an understanding that the emergence and progression of disasters are greatly influenced by the social conditions of the people, regions, and countries affected (Alliance Development Helps, 2023). The WRI assesses the disaster risk every year for 193 countries in the World. It covers all UN-recognized countries and more than 99 per cent of the world's population. The risk assessment in the WRR is based on the general notion that the emergence of a disaster not only depends on how severely natural hazards hit a society, but also on how vulnerable society is to their effects (World Risk Report, 2011) In the report of WRI 2023, the Top three Countries were the Philippines, and Indonesia followed by India where India was on the 2nd rank in the WRI 2022. Below mentioned Figure 1 shows the World at different Risk prone levels by its geometric mean of Exposure and Vulnerability in the data of the WRI.

2. LITERATURE REVIEW

(Welle & Birkmann, 2015) present a significant contribution to the field of disaster risk assessment with their research focused on developing the World Risk Index (WRI). The authors systematically discuss the methodology behind the WRI, emphasizing its utility as a tool for quantifying and comparing disaster risk among different nations. By incorporating a broad spectrum of risk components, including exposure, susceptibility, coping capacities, and adaptive capacities, the WRI offers a holistic perspective on disaster risk that goes beyond traditional assessments. The research underscores the importance of considering not only the physical exposure to hazards but also the socio-economic and environmental factors influencing vulnerability and resilience. Furthermore, the study advocates for the integration of qualitative and quantitative data to enhance the accuracy and reliability of risk assessments.

(Udhaya Kumar, Thirumal Kumar, Christopher, & Doss, 2020) The study searches for the COVID-19 pandemic, offering an insightful analysis of the epidemiological trajectory and the ensuing healthcare challenges

faced by India. The study discusses the rapid spread of the virus, emphasizing its socio-economic ramifications and the strain it placed on the healthcare infrastructure. The paper may also touch upon the government's response strategies, including lockdown measures and public health initiatives. Furthermore, the research assesses the efficacy of testing and contact tracing efforts in controlling the spread of the virus.

(Verma & Gupta, 2021) The Research delves into the cyclone's effects on water resources and management, aligning with the broader discourse on disaster risk reduction and environmental resilience. This work contributes significantly to the understanding of the multifaceted challenges posed by natural disasters, particularly in the context of Cyclone Tauktae. The authors delve into the various facets of Cyclone Tauktae, exploring its environmental consequences, climate implications, and disaster risk management approaches.

(DEVI, 2021) The research focuses on the atmospheric dynamics and consequences of Cyclonic Storm 'Jawad' as it weakened into a deep depression over the West Central Bay of Bengal. The investigation involves an in-depth analysis of meteorological parameters, satellite imagery, and observational data to understand the transformation of Cyclonic Storm 'Jawad' into a deep depression. The author likely explores factors such as wind patterns, atmospheric pressure changes, and sea surface temperatures to unravel the underlying mechanisms influencing the storm's evolution. The study is of significance in the context of tropical cyclone monitoring and forecasting, providing insights into the intricacies of cyclone behaviour and the associated atmospheric and oceanic conditions. Understanding the weakening process of cyclones is crucial for enhancing predictive capabilities and implementing effective early warning systems, thereby mitigating the potential impact on coastal communities and infrastructure.

(Satabdi, Majumdar, Mukherjee, & Joardar, 2022) The study focuses on the aftermath of Cyclone Yaas, shedding light on the region's disaster preparedness measures and their efficacy in reducing risks. The research explores key aspects such as early warning systems, community resilience, and infrastructure preparedness. By synthesizing empirical findings, this research provides valuable insights into the strengths and weaknesses of disaster management strategies, offering a foundation for enhancing resilience in the face of future natural disasters.

(JAISWAL, et al., 2023) Focusing on Tropical Cyclones Gulab and Shaheen, the study investigates the atmospheric and oceanic conditions surrounding these unusual events. The authors explore factors such as sea surface temperatures, wind patterns, and atmospheric pressure to discern the drivers behind the atypical behaviour of these cyclones. The findings are essential for advancing knowledge in the field of meteorology and climate science, aiding in the refinement of predictive models and disaster management strategies for coastal regions susceptible to tropical cyclones.

(Bhadran, et al., 2022) The study employs a multi-faceted approach, integrating field observations and Interferometric Synthetic Aperture Radar (InSAR) measurements. The authors delve into the aftermath of the earthquake, exploring the impact on the Earth's surface through ground failure phenomena such as landslides, liquefaction, and surface rupture. The integration of InSAR data allows for a quantitative analysis of ground deformations, aiding in the identification and mapping of areas susceptible to seismic-induced changes. The study is pivotal in enhancing understanding of the complex interactions between seismic activity and hydrogeological systems in the region. Furthermore, the integration of field observations and InSAR measurements showcases the significance of a multi-disciplinary approach in comprehensively assessing the impact of seismic events on both the Earth's surface and subsurface structures, thereby advancing the ability to predict and mitigate the consequences of future earthquakes in similar geological settings.

(Pandey, et al., 2022) By examining the geological and meteorological conditions leading up to the event, the study sheds light on the triggers of the catastrophe, including glacial dynamics and meteorological factors. The research discusses the implications of such events on local communities, infrastructure, and the broader environmental landscape. Moreover, the integration of geospatial technologies enhances the accuracy of mapping and monitoring such events, facilitating improved preparedness and response strategies for regions vulnerable to similar ice-debris flows. Overall, work significantly contributes to the scientific understanding of glacial-related hazards in the Himalayan region, emphasizing the importance of interdisciplinary approaches in studying and mitigating the impacts of such catastrophic events.

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3. RESEARCH METHODOLOGY

3.1 OBJECTIVES OF THE STUDY

- To examine various indicators used in the calculation of the World Risk Index.
- To analyse the World Risk Report and its evolving trends, with a specific focus on India.
- To identify the factors contributing to the rapid increase in the risk factor index in the context of India.

3.2 SAMPLING DESIGN

- Nature of Data: Secondary data Only
- Sources of Data: Government official websites, annual reports, acts & guidelines, journals, internationally recognized institute's research papers, handbooks etc.

4. DISCUSSION

4.1 WORLD RISK REPORT (WRR) INDICATORS

The World Risk Index precisely outlines the concepts of risk, exposure, and vulnerability, grounded in factors such as exposure to natural hazards, potential climate change phenomena, susceptibility, coping capacities, and adaptive capacities. It is essential to note that the WRI does not strive to encompass every facet of risk, exposure, and vulnerability; instead, its objective is to offer a comprehensive overview of crucial key components of global risk. Consequently, the study places significant emphasis on the intrinsic and logical combination of individual indicators within the context of the two components: exposure and vulnerabilities consist of susceptibility, coping capacities, and adaptive capacities. (Figure 2)



Figure 2 Components of World Risk Index (Alliance Development Helps, 2023)

4.1.1 EXPOSURE

Exposure is defined by the degree to which populations residing in areas prone to hazards face and bear the impacts of severe natural events or adverse outcomes of climate change. In essence, exposure encompasses the elements of hazardousness, encompassing the frequency and intensity of events such as earthquakes, tsunamis, coastal and river floods, cyclones, droughts, and sea-level rise within a specified area (hazard zone), affecting both the environment and the populations inhabiting these areas (hazard object).

Figure 4 offers a summary of the 10 most exposed countries, with a notable emphasis on the impact of the 1-meter sea level rise influencing the rankings significantly. Mexico, Japan, Philippines, and Indonesia, in particular, emerge as primarily affected, underscoring the profound influence of sea level rise on their exposure levels within the top 10 rankings. This observation highlights the critical role of rising sea levels in contributing to the exposure of these nations to environmental risks.

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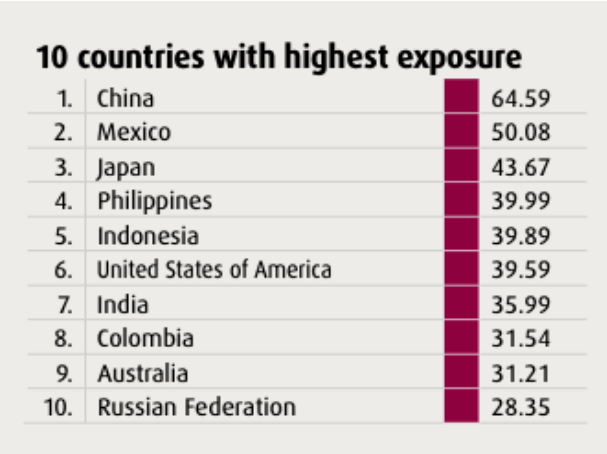


Figure 3 Top 10 countries with highest exposure - WRI - 2023 (Alliance Development Helps, 2023)

4.1.2 VULNERABILITY

Vulnerability denotes the predisposition of populations to be susceptible to harm caused by extreme natural events or adverse impacts of climate change. Encompassing economic, political, social, and environmental dimensions, vulnerability assesses the capacities and predispositions of individuals, households, and societies, revealing their susceptibility to destabilization, damage, or potential destruction by extreme events. This concept integrates three key dimensions: susceptibility, lack of coping capacities, and lack of adaptive capacities, further delineated into distinct categories. Thus, vulnerability serves as a comprehensive measure, encapsulating the multifaceted aspects that contribute to a population's potential for adverse outcomes in the face of challenging circumstances. (Alliance Development Helps, 2023) Figure 5 denoted the map of the world vulnerability sphere where it is easily noticed that India becomes an immortal part of the very high-risk index in case of vulnerability

4.1.2.1 SUSCEPTIBILITY

Susceptibility pertains to the inherent structural characteristics and overall societal conditions that elevate the likelihood of populations experiencing harm from extreme natural events, potentially leading to a state of disaster. In essence, susceptibility reflects the degree of resilience and available resources within a population to alleviate the immediate consequences of such extreme events. It serves as a measure of a community's capacity to withstand and mitigate the impacts of adverse circumstances resulting from natural disasters.



Figure 4 Indicators in the category of Susceptibility index. (Alliance Development Helps, 2023)

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Figure 4 intricately outlines the significant indicators essential for computing the susceptibility index. Susceptibility, a multifaceted construct, comprises five major components: socio-economic development, socio-economic deprivation, societal disparities, vulnerable populations arising from violence, conflict, and disasters, along with vulnerable populations affected by diseases and epidemics. This detailed breakdown, as succinctly indicated in Figure 6, encompasses a comprehensive understanding of the elements contributing to susceptibility, ranging from socio-economic factors to vulnerabilities resulting from various societal challenges.

4.1.2.2 LACK OF COPING CAPACITY:

Coping capacities encompass the skills and measures employed by societies to counter the adverse impacts of natural events or climate change through direct actions and the utilization of available resources, both formally and informally organized. These capacities involve proactive activities and measures aimed at minimizing damage in the immediate aftermath of an event and initiating recovery. In the WRI model, the deficiencies in these capacities are incorporated, leading to the term "lack of coping capacities" to highlight the areas where improvements or enhancements are needed. This concept emphasizes the importance of evaluating a community's ability to effectively respond and recover from the challenges posed by natural events or climate-related phenomena.



Figure 5 Indicators in the category of Coping Capacity index (Alliance Development Helps, 2023)

4.1.2.3 LACK OF ADAPTIVE CAPACITY:

Unlike coping capacities, adaptive capacities focus on long-term processes and strategies aimed at proactively bringing about changes in societal structures and systems to counteract, mitigate, or prevent future negative impacts. In parallel to the concept of the lack of coping capacities, the WRI incorporates the idea of the lack of adaptive capacities. This underscores the importance of evaluating not only a community's immediate response mechanisms but also its sustained ability to evolve and adapt over time to minimize the long-term impacts of adverse events and climate-related challenges.

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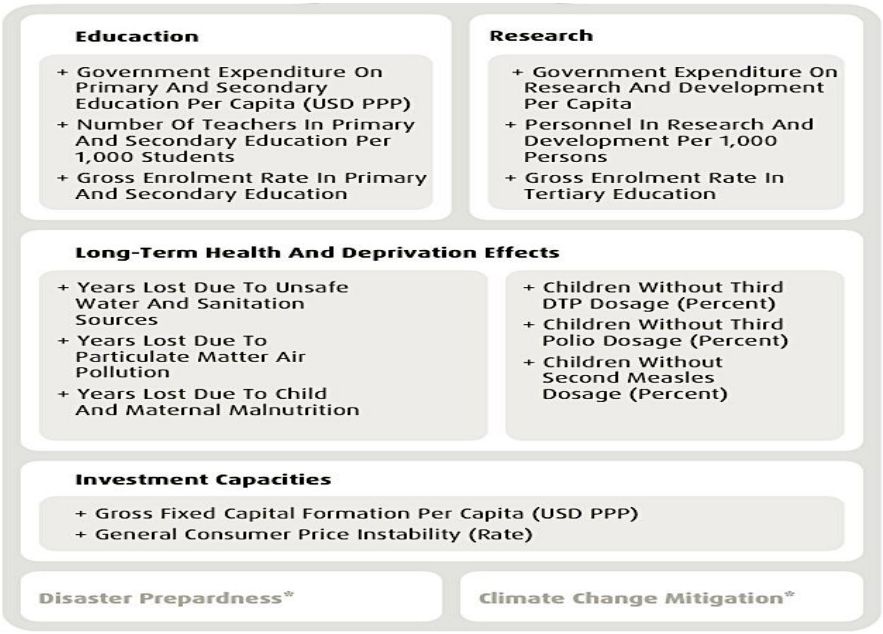


Figure 6 Indicators in the category of Adaptive Capacity Index (Alliance Development Helps, 2023)

When calculating the adaptive capacity index (illustrated in Figure 6), the factors taken into account include education, research, long-term health, deprivation effects, and investment capacities. While disaster preparedness and climate change mitigation are crucial components of the model, they are presently excluded due to data limitations. Following this, any factors currently considered will be subtracted from 100, yielding the lack of an adaptive capacity index for all countries. This method ensures a thorough assessment of adaptive capacities by incorporating pertinent elements and accounting for unavailable data, resulting in a comprehensive lack of adaptive capacity index.

In conclusion, the WRI employs a robust set of indicators to comprehensively assess the complex landscape of global risk. The exposure component delves into the extent of populations' exposure to natural hazards and potential climate change phenomena. Vulnerability, consisting of susceptibility, lack of coping capacity, and lack of adaptive capacity, offers a nuanced understanding of the predisposition and capacities of societies to withstand and recover from adverse events. Susceptibility encompasses structural and societal characteristics, while coping capacity involves immediate response measures, and adaptive capacity focuses on long-term strategies for proactive change. These indicators, collectively shaping the WRI, contribute to a holistic evaluation of the global risk scenario for disaster risk reduction and resilience enhancement.

4.2 WORLD RISK REPORT AND INDIA

In the case of India, the WRI serves as a valuable tool for raising awareness about disaster preparedness, especially emphasizing the social aspects relevant to the country's unique conditions. The index supports efforts to prevent humanitarian crises and assists in making informed decisions about resource allocation. This becomes particularly significant for a country like India, prone to various natural disasters, where a proactive approach is crucial. Additionally, the ongoing preparation of WRRs specifically for India, underscores the commitment to providing tailored insights into the risk landscape, aiding the nation in addressing and mitigating potential challenges effectively.

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YEAR	WORLD RISK INDEX	EXPOSURE	VULNERABILITY	SUSCEPTIBILITY	LACK OF COPING CAPACITIES	LACK OF ADAPTIVE CAPACITIES	RANK
2011	7.68	12.68	60.55	45.3	80.11	56.24	**71**
2012	7.28	11.94	60.95	40.88	81.78	60.18	**73**
2013	7.17	11.94	60.06	39.31	80.31	60.55	**74**
2014	7.04	11.94	58.91	38.72	80.31	57.71	**73**
2015	6.88	11.94	57.59	36.37	79.75	56.64	**78**
2016	6.64	11.94	55.6	35.79	80.22	50.78	**77**
2017	7.77	11.94	58.62	38.22	80.47	57.17	**75**
2018	6.83	12.47	54.78	35.16	79.11	50.08	**75**
2019	6.77	12.58	53.82	34.61	78.45	48.4	**85**
2020	6.62	12.51	52.94	32.08	78.15	48.6	**89**
2021	6.65	12.52	53.09	55.38	78.7	48.42	**90**
2022	**42.31**	**35.99**	**49.75**	**39.5**	**55.38**	**56.29**	**2**
2023	41.52	35.99	47.89	37.79	55.86	56.04	**3**

Figure 7 World Risk Report Index from 2011 to 2023 for India (Mucke, et al., 2011) (Welle T. , Birkmann, Rhyner, Witting, & Wolfertz, World Risk Report, 2012) (Welle T. , Birkmann, Rhyner, Witting, & Wolfertz, World Risk Report, 2013) (Welle, Birkmann, & Rhyner, World Risk Report, 2014) (Welle & Birkmann, World Risk Report, 2015) (Welle & Birkmann, World Risk Report, 2016) (Radtke, Luther, Kirch, & Prütz, 2017) (Radtke, Mann, Weller, Kirch, & Prütz, 2018) (Radtke & Weller, World Risk Report, 2019) (Radtke & Weller, World Risk Report, 2020) (Radtke & Weller, World Risk Report, 2021) (Weller, World Risk Report, 2022) (Weller, World Risk Report, 2023)

However, a pivotal turning point occurred in the WRI of 2022, where India experienced a significant and unexpected fall in its ranking, plummeting to the 2nd position. This abrupt change in standing starkly indicates a heightened susceptibility to disasters, marking India as a country with elevated disaster proneness on a global scale. Subsequently, the WRR of 2023 maintained India's high-risk status, positioning the country at the 3rd rank. This alarming shift in ranking prompted a comprehensive study to unravel the factors contributing to this sudden surge in risk, aiming to provide valuable insights into the heightened vulnerability of India to natural disasters.

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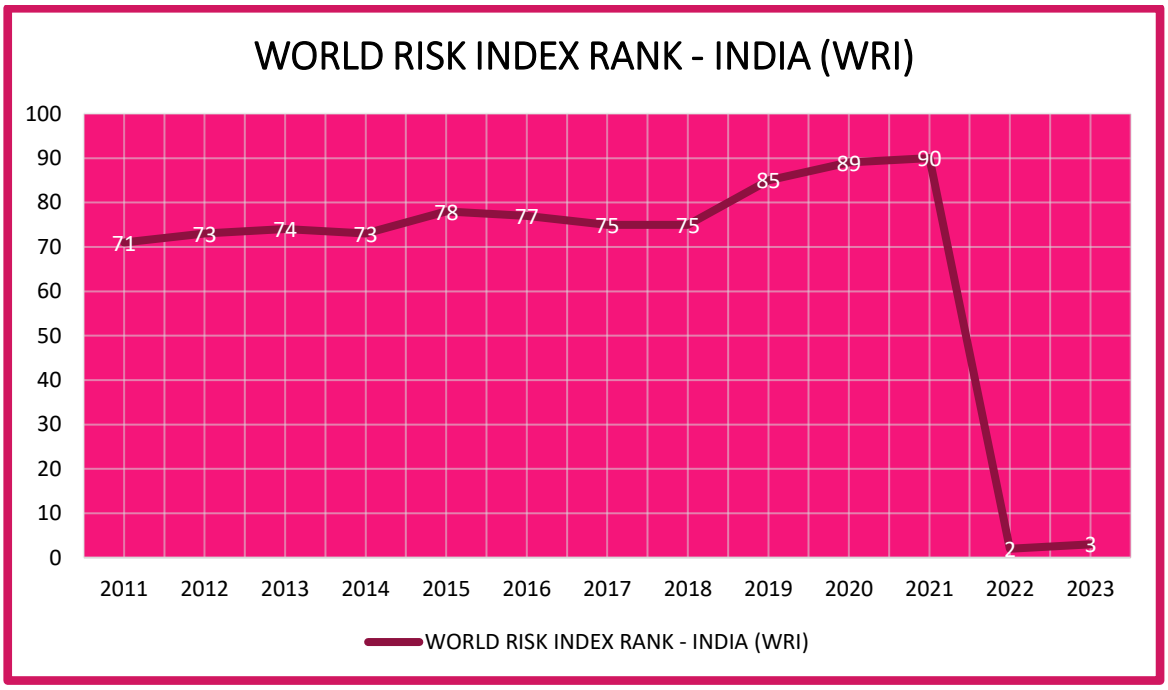


Figure 8 World Risk Index Rank Trend of India (2011-2023) (Mucke, et al., 2011) (Welle T. , Birkmann, Rhyner, Witting, & Wolfertz, World Risk Report, 2012) (Welle T. , Birkmann, Rhyner, Witting, & Wolfertz, World Risk Report, 2013) (Welle, Birkmann, & Rhyner, World Risk Report, 2014) (Welle & Birkmann, World Risk Report, 2015) (Welle & Birkmann, World Risk Report, 2016) (Radtke, Luther, Kirch, & Prütz, 2017) (Radtke, Mann, Weller, Kirch, & Prütz, 2018) (Radtke & Weller, World Risk Report, 2019) (Radtke & Weller, World Risk Report, 2020) (Radtke & Weller, World Risk Report, 2021) (Weller, World Risk Report, 2022) (Weller, World Risk Report, 2023)

Thus, Figure 8 visually encapsulates the trajectory of the WRI from the year 2011 to 2023, with a distinct focus on India as the central point in this dynamic chart. This visual representation provides a comprehensive overview of India's evolving risk profile over the years, depicting the fluctuations in its ranking and emphasizing the significant changes in disaster proneness.

4.3 FACTORS CONTRIBUTING TO THE RAPID INCREASE IN WRI OF INDIA:

In the context of the discernible and unexpected shift in India's WRI ranking, examining the factors contributing to this rapid increase becomes paramount for a comprehensive understanding of the evolving risk landscape. Several interconnected factors contribute to the observed rapid increase in India's WRI, creating a complex landscape of heightened vulnerability. This intricate web of factors underscores the multifaceted nature of India's risk landscape, requiring an understanding of how these elements interact. The contributing factors to the swift rise in India's risk index ranking are outlined below for detailed examination and analysis.

4.3.1 NOVEL VIRUS COVID-19

India has confronted a range of challenges in its response to the COVID-19 pandemic. The surge in cases strained the healthcare system, leading to shortages in hospital resources and essential medical supplies. Implementing a mass vaccination campaign for the vast population posed logistical hurdles, from distribution challenges to addressing vaccine hesitancy. Communicating accurate information and guidelines to a diverse population proved challenging, with the need to counter misinformation and ensure public adherence to preventive measures. Economic disruptions caused by lockdowns and restrictions presented the dilemma of balancing public health priorities with economic recovery. The emergence of new variants of the virus added a layer of complexity to the ongoing response. Global cooperation became crucial in securing a consistent supply of vaccines and medical supplies in the face of global market disruptions. These challenges underscored the need for a comprehensive and adaptive approach, combining robust public health measures, efficient vaccine distribution, economic support, and inclusive policies to protect the most vulnerable segments of society.

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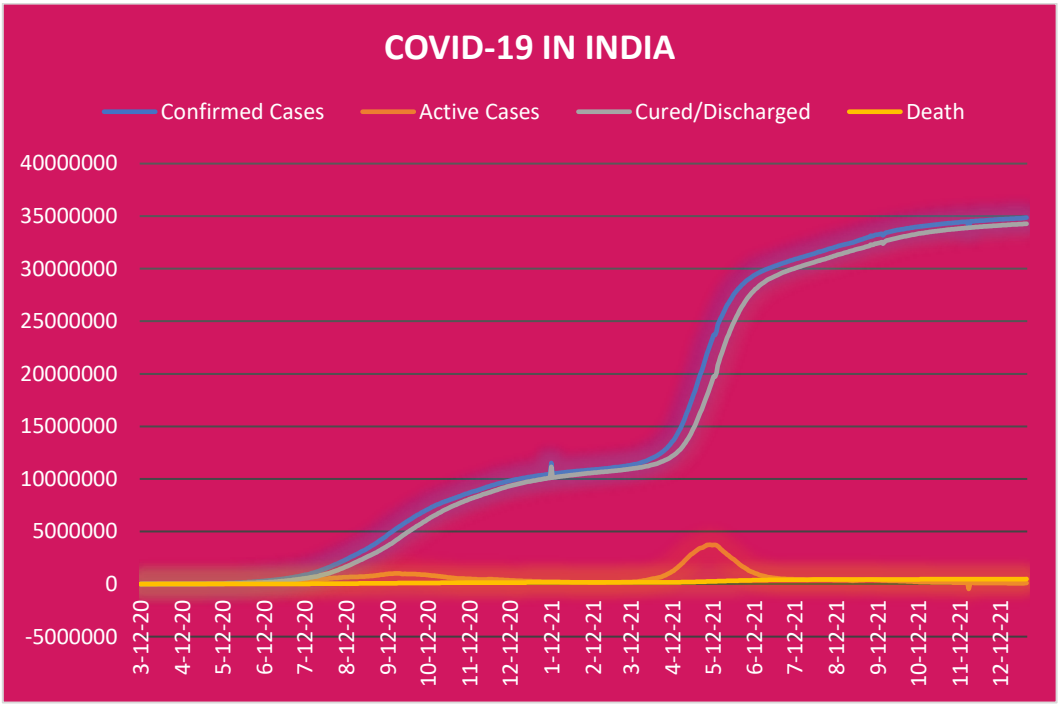


Figure 9 Covid - 19 Statistics of India (from March 2020 to December 2021) [Data - (PRS INDIA, 2024)]

Examining the statistics depicted in Figure 9 (PRS INDIA, 2024), it becomes evident that India experienced a significant impact from the COVID-19 virus. The country witnessed a continuous surge in COVID-19-related mortalities, which, in turn, had a detrimental effect on nationwide healthcare services. Despite grappling with these challenges, India faced difficulties in revitalizing its coping and adaptive capacities. This struggle to enhance preparedness and resilience against the evolving crisis contributed to India securing the 2nd rank in the risk index for the year 2022. The compounding effects of high virus prevalence, increasing fatalities, and challenges in reinforcing coping and adaptive capacities underscored the complex interplay of factors that influenced India's risk profile during this period.

4.3.2 POPULATION

As of 2022, India's population stands at 1,407,563,842, accounting for approximately 17.77% of the global population (Worldometer, 2024), securing its position as the second-most populous country in the world (World Population Prospects (2022) (Revision), 2024). Spanning an expansive land area of 2,973,190 square kilometres (1,147,955 square miles), India faces the formidable challenge of managing its vast populace (Worldometer, 2024).

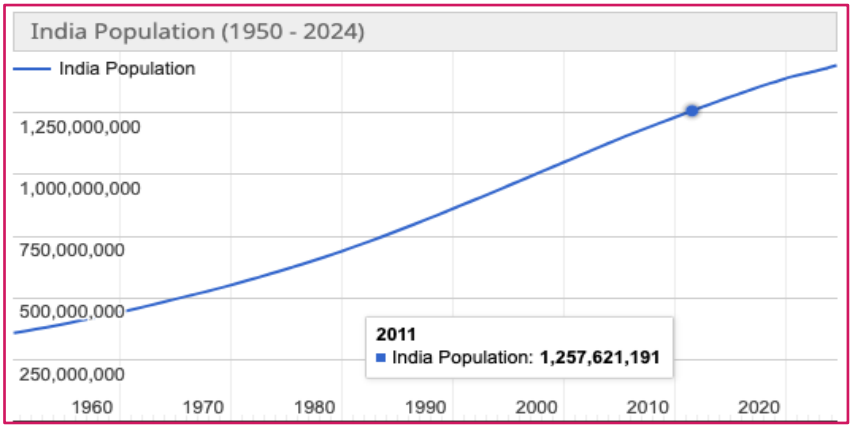


Figure 10 Total Population - 2011 – India (Worldometer, 2024)

Over a decade, India witnessed substantial growth in its population (figure 10 & 11), escalating from 1,257,621,191 in 2011 to 1,407,563,842 in 2021 (Worldometer, 2024). This surge denotes a significant increase of approximately 11.92% (Worldometer, 2024). The substantial rise in population poses intricate challenges,

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making the governance of the nation a formidable task. With the population expanding at such a pace, the demand for resources, infrastructure, and essential services intensifies, placing an added burden on governance structures. This demographic shift underscores the imperative for strategic planning and effective policies to address the evolving needs of the burgeoning population, ensuring sustainable development and improved quality of life for all citizens.

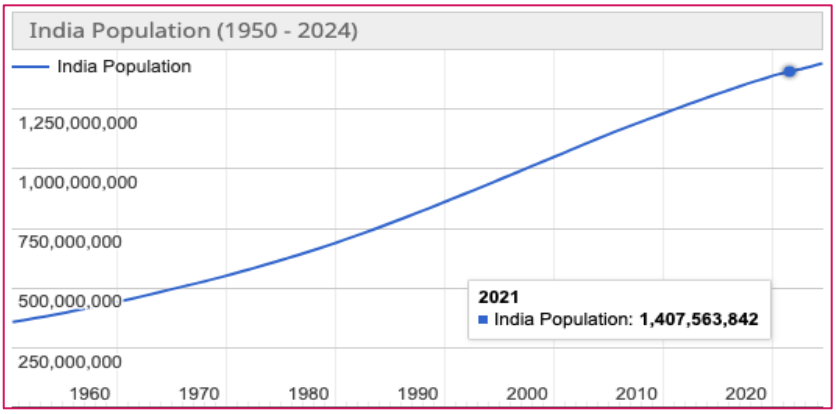


Figure 11 Total Population - 2021 – India (Worldometer, 2024)

These multifaceted challenges, intertwined with the demographic realities, contributed to India's struggle to cope and adapt to the evolving crisis. The scarcity of healthcare resources, lower ratio of healthcare professionals per person, communication breakdowns, and logistical complexities emerged as critical factors, reflected in the elevated risk rank in the WRR. The unique dynamics of India's demographic landscape underscore the necessity for tailored, innovative strategies to navigate the complexities of disaster management and pandemic response in this densely populated nation.

4.3.3 MIGRATION AND SOCIAL PROTECTION:

The COVID-19 pandemic triggered unprecedented migration patterns in India, both during the initial phases of the lockdown and in its aftermath. The sudden imposition of restrictions led to a mass exodus of migrant workers and daily-wage labourers from urban centers to their hometowns and villages. These individuals, facing unemployment and a lack of basic amenities, embarked on arduous journeys on foot, highlighting the vulnerabilities within existing social protection systems.

The widespread distress prompted a re-evaluation of India's social protection mechanisms during the lockdown. The lack of a robust safety net became evident as many individuals faced economic hardships and struggled to access essential services. The government, recognizing the urgency, implemented various relief measures, including direct cash transfers, free food distribution, and shelter provisions, aiming to mitigate the immediate impact of the crisis on vulnerable populations. These initiatives aimed to alleviate the immediate impact of the crisis on those most severely affected.

As India navigates the complexities of migration, the focus on robust and adaptable social protection mechanisms remains a critical aspect of fostering societal well-being and resilience. The intricate interplay of migration and social protection has emerged as a crucial issue, significantly influencing India's WRI in 2022.

4.3.4 OVERLAPPING DISASTER IMPACT

The year 2021 presented a formidable challenge to India as it grappled with a series of overlapping disasters, testing the nation's coping and adaptive capacities. The onslaught began with the devastating multiple waves of the COVID-19 pandemic (Udhaya Kumar, Thirumal Kumar, Christopher, & Doss, 2020), straining healthcare infrastructure and overwhelming medical resources. Subsequently, Cyclone Tauktae (Verma & Gupta, 2021) and Cyclone Yaas (Satabdi, Majumdar, Mukherjee, & Joardar, 2022)struck the coastal regions, causing widespread destruction, displacements, and disrupting normal life. Assam experienced a significant earthquake (Bhadran, et al., 2022), adding to the array of calamities, while Uttarakhand faced a severe flooding (Pandey, et al., 2022), compounding the challenges for disaster response. The occurrence of Cyclone Gulab and Shaheen (DEVI, 2021) further heightened the complexity, requiring swift and coordinated efforts to address the varied impacts.

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The phrase "Twelve nights and thirteen breaks" encapsulates the relentless nature of these disasters, emphasizing the continuous onslaught and the limited respite for authorities to regroup and respond effectively. Each event strained the government's coping and adaptive capacities, demanding quick and efficient decision-making to manage multiple crises simultaneously. The diversity of disasters, ranging from a public health emergency to cyclones, earthquakes, and floods, showcased the need for a versatile and adaptable disaster management approach.

4.3.5 REDESIGN OF WRI MODEL

The WRR model is a comprehensive framework designed to assess and evaluate the global risk landscape by integrating key components such as exposure and vulnerability. Until 2021, the WRR had been utilizing an established model to assess global risk, encompassing exposure and vulnerability dimensions. This model, implemented in 2011, was designed to gauge the risk landscape by considering the frequency and intensity of extreme natural events (exposure) and the predisposition of populations to be vulnerable to damage (vulnerability). However, recognizing the need for ongoing improvement and accuracy, the WRR underwent a revision in its model from 2022 onwards, incorporating advancements and updates to ensure a more nuanced and precise evaluation of the complex interplay between exposure and vulnerability in the ever-changing global landscape.

4.3.5.1 OLD MODEL

Indeed, the model used by the WRR from 2011 to 2021 employed a straightforward calculation for the WRI. The WRI was determined by multiplying two fundamental factors: exposure and vulnerability.

World Risk Index = Exposure × Vulnerability

As mentioned in figure 12, it explains Exposure, refers to the extent to which populations are subjected to the impacts of extreme natural events or the negative consequences of climate change. It encompasses various hazards, including earthquakes, cyclones, floods, droughts, and sea-level rise.

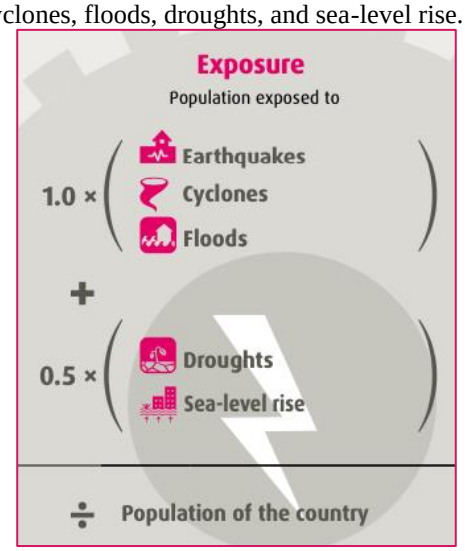


Figure 12 Exposure Components - WRR - 2021 (Radtke & Weller, World Risk Report, 2021)

On the other hand, vulnerability, in the context of the WRR (Figure 13), represents the predisposition of populations to be susceptible to damage from extreme natural events or climate change impacts.

Vulnerability = 1⁄3 × (Susceptibility + (1 – Coping) + (1 – Adaptation))

This dimension encompasses susceptibility, lack of coping capacities and lack of adaptive capacities of individuals, households, and societies. By incorporating exposure and vulnerability into its model, the WRR provides a firm understanding of global risk factors. This integrated approach aids in fostering a proactive response to disasters, as it allows for a comprehensive evaluation of the key components influencing risk at a global level.

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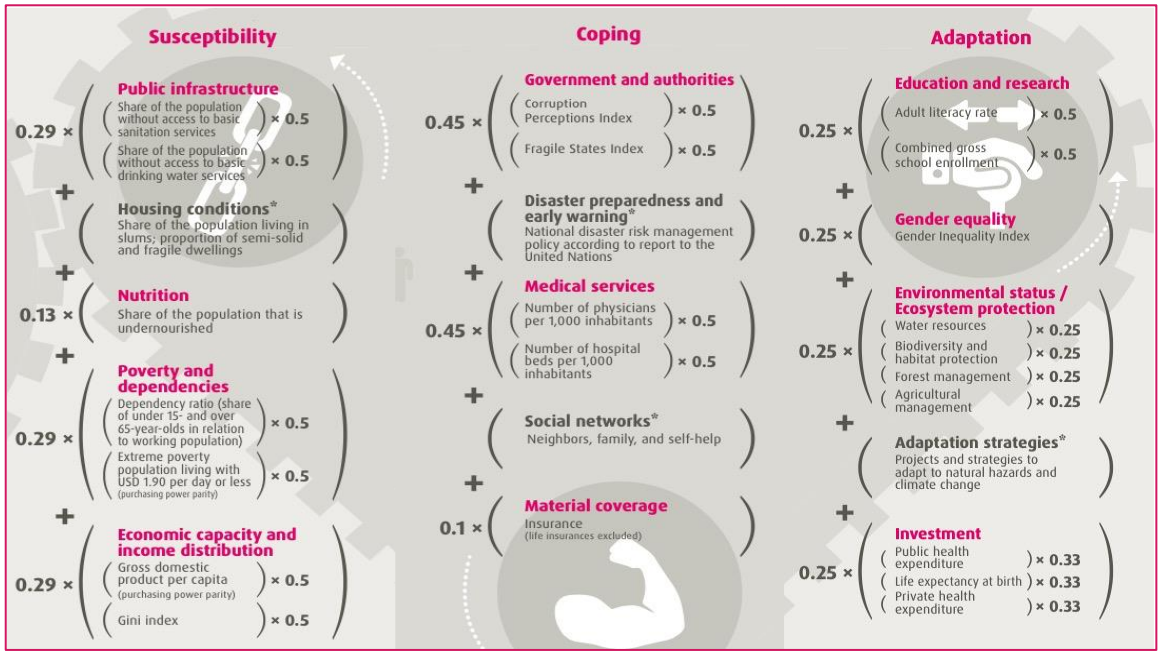


Figure 13 Susceptibility, Coping Capacity and Adaptive Capacity Components - WRR - 2021 (Radtke & Weller, World Risk Report, 2021)

4.3.5.2 NEW MODEL

In 2022, the WRR underwent a significant redesign, marking a departure from its previous model. The revised model introduced a more comprehensive and intricate approach by incorporating a total of 100 indicators.

$$\textbf{World Risk Index} = \sqrt{\textbf{Exposure} \times \textbf{Vulnerability}}$$

This shift signified a commitment to a more detailed evaluation of global risk factors, reflecting the recognition of the multidimensional nature of risk. The inclusion of 100 indicators from Exposure; encompassing the frequency and intensity of events such as earthquakes, tsunamis, coastal and river floods, cyclones, droughts, and sea-level rise within a specified area (hazard zone), affecting both the environment and the populations inhabiting these areas (hazard object) (Weller, World Risk Report, 2022), Vulnerability includes Susceptibility components (Figure 4), Lack of Coping Capacities components (Figure 5) and Lack of Adaptive Capacities components (Figure 6) which allowed the WRR to capture a broader spectrum of variables and factors influencing risk. These indicators were sourced from scientifically recognized and publicly accessible data repositories such as the World Bank, UNESCO, and WHO, ensuring reliability and transparency in the assessment process.

The updated model brings significant enhancements to the evaluation of global risk factors. Departing from the previous straightforward multiplication of exposure and vulnerability, the new approach considers the geometric mean of these elements, introducing a more refined and accurate assessment methodology. Within the exposure category, the model now comprehensively incorporates coastal flooding, riverine flooding, and the intensity levels of all disasters, providing a more detailed analysis of risk extents.

Susceptibility, a multifaceted construct within the new model, encompasses five major components: socio-economic development, socio-economic deprivation, societal disparities, vulnerable populations resulting from violence, conflict, and disasters, as well as those affected by diseases and epidemics. This multifaceted view enhances the model's capacity to capture the intricate dynamics of vulnerability. Coping capacity is evaluated by considering recent societal shocks, healthcare capacities, and the role of the state and government. Additionally, infrastructure, social networks, and material protection are factored in, offering a comprehensive insight into a community's ability to manage challenges effectively. Simultaneously, the adaptive capacity index incorporates crucial factors such as education, research, long-term health, deprivation effects, and investment capacities, further enriching the model's understanding of a region's adaptive capabilities. These refinements underscore a commitment to a more thorough and sophisticated assessment, facilitating a deeper understanding of the myriad factors contributing to global risk.

The changes in the risk assessment model might influence India's ranking in the risk index due to a more detailed and nuanced evaluation of various factors, potentially capturing the country's risk profile more accurately.

4.3.6 MISCELLANEOUS

Beyond the well-acknowledged factors like COVID-19, population dynamics, migration & social protection, overlapping disaster impact and the redesign of the WRI model, the impact of insufficient data is a critical miscellaneous factor affecting India's risk index. Incomplete or unavailable data can impede accurate risk assessments, leading to gaps in understanding vulnerabilities, exposure levels, and coping capacities. This lack of information hampers the ability to comprehensively analyze and address diverse risk factors, potentially skewing the overall risk evaluation for India. Addressing data gaps becomes imperative for a more accurate and detailed assessment of the country's risk profile.

5. CONCLUSION

In conclusion, this comprehensive exploration of the World Risk Index (WRI) and its implications for India underscores the intricate nature of disaster risk management. The World Risk Report (WRR) indicators, serving as the foundation of the WRI, provide a holistic framework for evaluating global risk, with India serving as a critical case study. The factors contributing to the rapid increase in India's WRI have been dissected, ranging from the profound impact of the novel virus COVID-19 to the challenges posed by population dynamics, migration patterns, and social protection measures. The overlapping impact of various disasters further exacerbates India's risk landscape, necessitating an in-depth understanding of effective risk mitigation.

The redesign of the WRI model, marked by a shift towards a geometric mean of exposure and vulnerability and an expanded set of factors, reflects a commitment to more accurately capture the intricacies of risk. Additionally, miscellaneous factors, including issues like insufficient data, play a significant role in shaping India's risk profile. These diverse elements collectively contribute to the dynamic and evolving nature of disaster risk in the country.

BIBLIOGRAPHY

1. *Verma, K., & Gupta, A. K. (2021). Cyclone Tauktae By Ms. Kopal Verma, Junior Consultant, Division of Environment, Climate and DRM, National Institute of Disaster Management, Ministry of Home Affairs and Prof. Anil K. Gupta, Head and Professor, ECDRM Division, and Programme Director – Cent. The water digest.*
2. *Satabdi, M., Majumdar, K. K., Mukherjee, D., & Joardar, G. K. (2022). A STUDY ON DISASTER PREPAREDNESS AND RISK REDUCTION: LESSONS FROM 'YAAS' IN BENGAL. INTERNATIONAL JOURNAL OF CURRENT ADVANCED RESEARCH, 11(9(A)), 1538-1541.*
3. *JAISWAL, N., JISHAD, M., DEB, S. K., VARMA, A. K., AGARWAL, N., & SHARMA, R. (2023). Analysis of atmospheric and oceanic conditions during unusual occurrence of tropical cyclone Gulab and Shaheen in North Indian Ocean. Journal of Earth System Science, 132(3), 1-14.*
4. *DEVI, S. S. (2021). CYCLONIC STORM 'JAWAD' WEAKENED INTO A DEEP DEPRESSION OVER WESTCENTRAL BAY OF BENGAL.*
5. *Bhadran, A., Sreejith, K. M., Girishbai, D., Duarah, B. P., Agrawal, R., & Gopinath, G. (2022). An Appraisal of Ground Failure and Hydrogeological Changes Associated with the 28 April 2021 Mw 6 Sonitpur Earthquake, Assam, India, Using Field Evidences and InSAR Measurements. Seismological Research Letters, 20, 1-12.*
6. *Pandey, V. K., Kumar, R., Singh, R., Kumar, R., Rai, S. C., Singh, R. P., . . . Latief, S. U. (2022). Catastrophic ice-debris flow in the Rishiganga River, Chamoli, Uttarakhand (India). GEOMATICS, NATURAL HAZARDS AND RISK, 13(1), 289-309.*
7. *Udhaya Kumar, S., Thirumal Kumar, D., Christopher, B. P., & Doss, C. P. (2020). The Rise and Impact of COVID-19 in India. Forntiers in Medicine, 7(250), 1-7.*
8. *NDMA. (2023). Annual Report 2022-23. NDMA.*
9. *UNISDR. (2009). Terminology on Disaster Risk Reduction. United Nations.*
10. *WISNER, B., BLAIKIE, P., CANNON, T., & DAVIES, I. (2004). At Risk: Natural hazards, people's vulnerability and disasters. London, New York: Routledge.*
11. *Alliance Development Helps, I. (2023). World Risk Report. Institute for International Law of Peace and Armed Conflict .*
12. *Welle, T., & Birkmann, J. (2015, Sept 25). The World Risk Index – An Approach to Assess Risk and Vulnerability on a Global Scale. J Extreme Events, 2(1), 1-34.*
13. *World Population Prospects (2022) (Revision). (2024). World Population Review. Retrieved from World Population Review: https://worldpopulationreview.com/countries/india-population*
14. *World Risk Report. (2011). World Risk Report. Alliance Development Helps.*
15. *United Nations Office for Disaster Risk Reduction. (2015). Sendai Framework Terminology on Disaster Risk Reduction. Retrieved from United Nations Office for Disaster Risk Reduction: https://www.undrr.org/terminology/vulnerability*

16. *Mucke, P., Birkmann, J., Welle, T., Krause, D., Wolfertz, J., Suarez, D.-C., & Setiadi, N. J. (2011). World Risk Report. Alliance Development helps.*
17. *Welle, T., Birkmann, J., Rhyner, J., Witting, M., & Wolfertz, J. (2012). World Risk Report. Alliance Development Helps.*
18. *Welle, T., Birkmann, J., Rhyner, J., Witting, M., & Wolfertz, J. (2013). World Risk Report. Alliance Development Helps.*
19. *Welle, T., Birkmann, J., & Rhyner, J. (2014). World Risk Report. Alliance Development Helps .*
20. *Welle, T., & Birkmann, J. (2015). World Risk Report. Alliance Development Helps.*
21. *Welle, T., & Birkmann, J. (2016). World Risk Report. Alliance Development Helps.*
22. *Radtke, K., Luther, S., Kirch, L., & Prütz, R. (2017). World Risk Report. Alliance Development Helps.*
23. *Radtke, K., Mann, H., Weller, D., Kirch, L., & Prütz, R. (2018). World Risk Report. Alliance Development Helps.*
24. *Radtke, K., & Weller, D. (2019). World Risk Report. Alliance Development Helps.*
25. *Radtke, K., & Weller, D. (2020). World Risk Report. Alliance Development Helps.*
26. *Radtke, K., & Weller, D. (2021). World Risk Report. Alliance Development Helps.*
27. *Weller, D. (2022). World Risk Report. Alliance Development Helps.*
28. *Weller, D. (2023). World Risk Report. Alliance Development Helps.*
29. *PRS INDIA. (2024). PRS Legislative Research. Retrieved from PRS INDIA: https://prsindia.org/covid-19/cases*
30. *Worldometer. (2024). Worldometer. Retrieved from Worldometer: https://www.worldometers.info/world-population/india-population/*