October 2020

Protect a generation: Climate security for India's children

pwc

Save the Children

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Preface

Save the Children, India and PwC India Foundation (PwCIF) have come together to focus on the globally critical issue of climate change and its impact on children. Climate change is one of the most significant issues impacting not just the lives of children, but also the timely accomplishment of the Sustainable Development Goals, as set by the United Nations (UN). It is imperative to develop climate-resilient policies and programme frameworks with children at the centre of all the action. These policies and frameworks would be helpful in mitigating climate-induced risks and pave the way for a safer future for children.

It gives us immense pleasure to share this report based on empirical evidence collected from the three states of Uttarakhand, Madhya Pradesh and West Bengal. The report has analysed findings from three regions that differ in terms of geography and exposure to climatic hazards. The report identifies how the children in these regions are impacted by climate change and the factors affecting their vulnerability. These children are exposed to the threats of mortality and morbidity, along with compromised education and food and nutrition security.

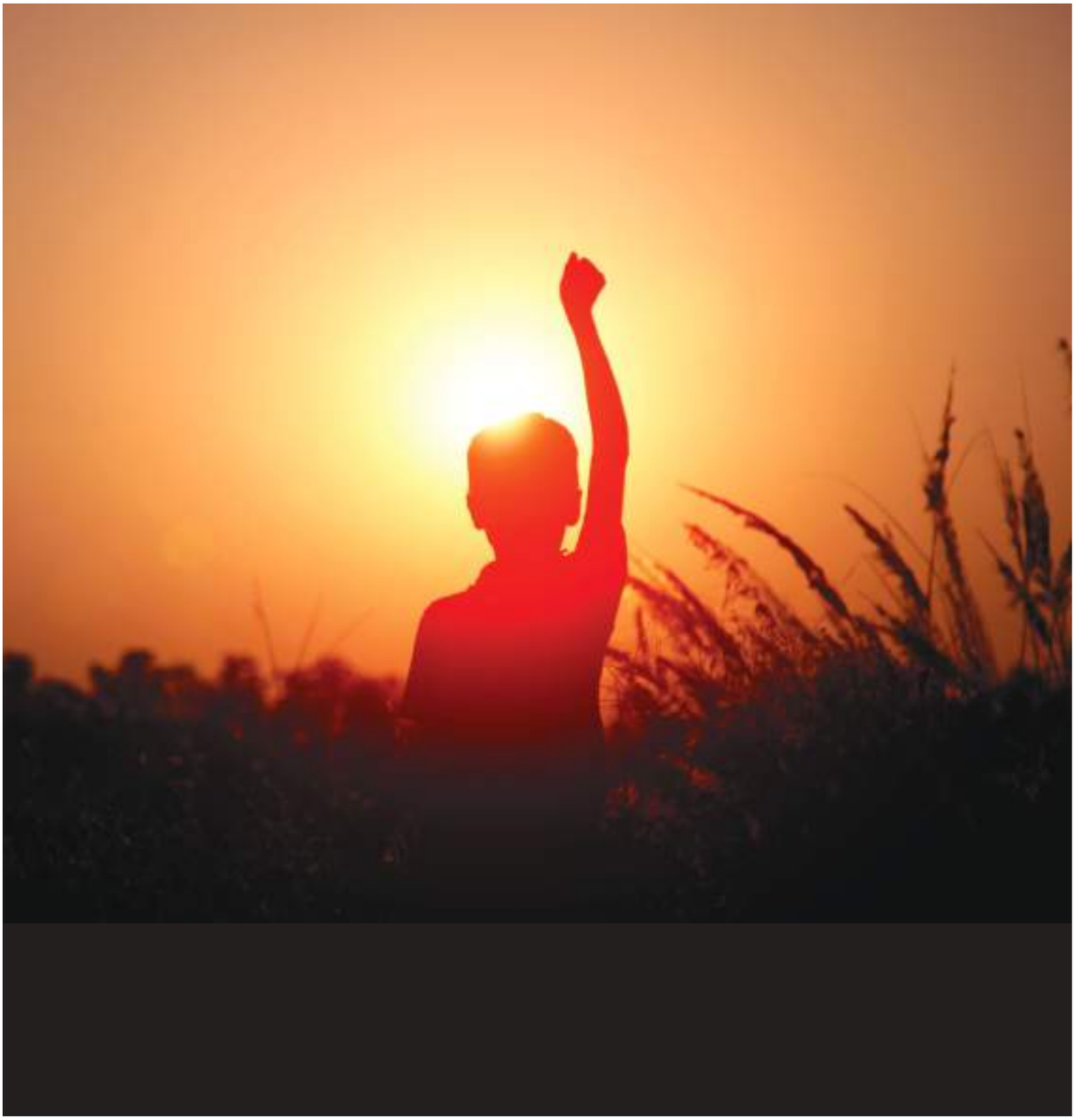
Save the Children, India is one of the world's largest non-governmental organisations and frontrunners in responding to emergencies and humanitarian crises. Humanitarian action at Save the Children, India is built upon the organisation's vision of a world in which every child realises its right to survival, protection, development and participation. It is this vision that governs the organisation's approach to assessing issues and designing interventions that are sensitive towards the needs of vulnerable families and communities. PwCIF, through collaborations for humanitarian action, has supported projects to rebuild infrastructure and encourage resilience in communities through training and awareness building in the wake of natural disasters. PwCIF's experience in complex geographies, including Jammu and Kashmir, post-flood Kerala, drought-prone Maharashtra and Madhya Pradesh, as well as cyclone-impacted Odisha has developed our understanding and response framework as a private sector entity. Through projects and research on issues related to children, PwCIF has also provided insights into the vulnerabilities of children and is committed to creating a more child-friendly and safe environment for children to realise their rights.

Through this research, Save the Children, India and PwC India Foundation have tried to voice the challenges faced by children during times of climatic crisis and sought to provide a series of practical and feasible strategies that are essential for building resilience among children in India.

We hope this report forms the basis for further evidence generation, informed advocacy and policymaking to bring about lasting changes in the lives of children in India and beyond.

Bidisha Pillai
CEO, Save the Children, India

Jaivir Singh
Leader, PwC's Global Office for Humanitarian Affairs
Vice Chairman, PwC India Foundation



MESSAGE FROM DIA MIRZA, ARTIST AMBASSADOR, SAVE THE CHILDREN, INDIA

India, we know, is one of the most vulnerable countries faci of Climate crises We know from evidence that women and children remain most affected in extreme climatic events like floods and drought.

Nature is constantly giving us warning sign urging our immediate attention to ensure we do our best to protect our present and future generations.

This crucial report reinforces the vulnerabilities that children from most marginalised households face, especially during any extreme climate events. We often are unaware that that the impact of such events on children are more long term, jeopardizing their present and future.
What this report does most importantly is gives voice to the concerns of vulnerable children and offers solutions by includin them in the adaptation process, so children and communities are resilient to future disasters.

timed report indicates the impact of climate change on the children's rights to survive, thrive and be
or stand to lose all the gains we have made for children in the last few decades.

It is encouraging to see voices and action by children captured in the report. Children know the truth and they speak the truth. They speak plainly; they ask simple questions. And the great part about this is that they are not only asking us the right questions, but they are also saying that they want to work with us to fix these problems that pose a threat to us.

is real, it is happening all around us. And Investing in children today is the only way to achiev development in years to come.

India has made tremendous changes in our climate change policies and mitigation tactics. But our work is far from over. India is key to the world achieving the **Sustainable Development Goals**, if we miss our chance to change, the world will stand to lose. This is a fight we must win!

It is achievable, if there is public, private partnership. Private doesn't end at the industry. It begins with industry, gove with policy, with lawmakers, inter ernmental, civil society, community and children. What can I do at the individual level? These questions need to be asked.

As a society, we have our will and ability to unite for a common purpose. During the pandemic the rld saw a drastic reduction in air, water and land

It gives me hope, it makes me dream. protect our planet, because we have

We need to work together to achieve the *Sustainable Development Goals* and ensure as we walk
back better, greener and safer for people and planet. The tide is in our favour to change our consumption patterns and reduce the stress inflicted on nature. We can change climate for the better if we act now

The time is now to stand together and learn from our mistakes. I am confident that we must and will do
rewrite the future.

Artist Ambassador, Save the Children
UN Environment Goodwill Ambassador for India


Save the Children

Executive summary

Need for the study

Climate change is one of the key areas of concern for India. Human activities worldwide have caused approximately 1° C of global warming above pre-industrial levels.[1] This rise in global temperature is likely to reach 1.5° C between 2030 and 2052 if carbon dioxide emissions continue to increase at the current rate of 0.6%.[2] The increase in global mean surface temperature, which was 1.48° C in 1986–2005, could be as high as 4.8° C by the end of the twenty-first century (2081–2100).[3] The rising global temperature impacts health, livelihoods, food security, water supply, human security and economic growth. These effects are projected to increase with global warming. Moreover, shifting weather patterns are expected to threaten food production and raise sea levels, thus increasing the risk of severe floods. The impact of climate change is global in scope and unprecedented in scale. Disadvantaged and vulnerable populations (including children), indigenous people and local communities dependent on agricultural or coastal livelihoods are at a disproportionately higher risk of adverse consequences due to climate change. According to the Global Climate Risk Index of 2020, India is the fifth-most vulnerable country to climate change impact.[4]

1 *IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*

2 *Global Carbon Project (2019) Carbon budget and trends 2019*

3 *IPCC, 2018*

4 *Eckstein, D., Winges, M., Künzel, V. and Schäfer, L., 2019. Global Climate Risk Index 2020*

According to a report by the United Nations Children's Fund (UNICEF), climate change will increasingly and disproportionately affect children.[5] Climate change can impact children through increased morbidity and mortality due to extreme weather events and subsequent disasters, water scarcity and food insecurity, air pollution, and vector- and waterborne diseases. Moreover, it also has an impact on children's mental health.[6] Other potential effects of climate change on children are orphanhood, trafficking, child labour, loss of education and development opportunities, separation from family, homelessness, begging, trauma, emotional disruption, illnesses, etc. A recent study has found that children in disaster-prone areas in India are twice as likely to be living in chronic poverty than to escape poverty and three times as likely to become impoverished.[7]

The Paris Agreement, which was ratified in December 2015 and is considered to be a landmark global action plan to tackle climate change, acknowledges the importance of protecting the rights of children and ensuring intergenerational equity. Resolution 32/33 of the Human Rights Council (HRC) of the United Nations (UN) on human rights and climate change emphasises the importance of addressing the adverse consequences of climate change, especially on children from disadvantaged backgrounds, as a human rights obligation.[8] This necessitates an in-depth study on how child rights are affected by climate change.

Against the background of multiplying vulnerabilities for children in many states of India over the last few years, **PwC India Foundation and Save the Children, India (Bal Raksha Bharat)** sought to improve their understanding of the direct and indirect impact of climate change on children, especially in rural India. A detailed vulnerability, risk and impact assessment was carried out in three states with varying geographies (Madhya Pradesh, West Bengal and Uttarakhand), with the aim of providing insights into vulnerabilities, adaptation practices and the effectiveness of these practices. The states were selected based on their distinctiveness in terms of the type of environmental and geographic context as well as exposure to climate hazards. A detailed survey and analysis were conducted to explain the impact of multiple climate change induced insecurities related to livelihood, health, hygiene, nutrition, education, etc., on children.

This report is the outcome of a year-long study through which we aimed to build an evidence base of the impact of climate change on children and key factors that make children vulnerable to such impact. The report advocates the implementation of child-centric adaptation strategies, along with the integration of a child focus in the general climate action commitments by the country.

The specific objectives of the study were:

a. to assess the risks and impact of climate change on children in geographic regions where they are exposed to frequent and intense climatic hazards and are vulnerable to such hazards due to intrinsic socio-economic conditions

b. to identify risk mitigation and adaptation measures in the short, medium, and long term to reduce the impact of climate change on children

c. to propose a roadmap for implementation of identified climate change adaptation strategies.

5 UNICEF Office of Research (2014). 'The Challenges of Climate Change: Children on the front line'

6 OHCHR, 2017, Analytical study on the relationship between climate change and the full and effective enjoyment of the rights of the child

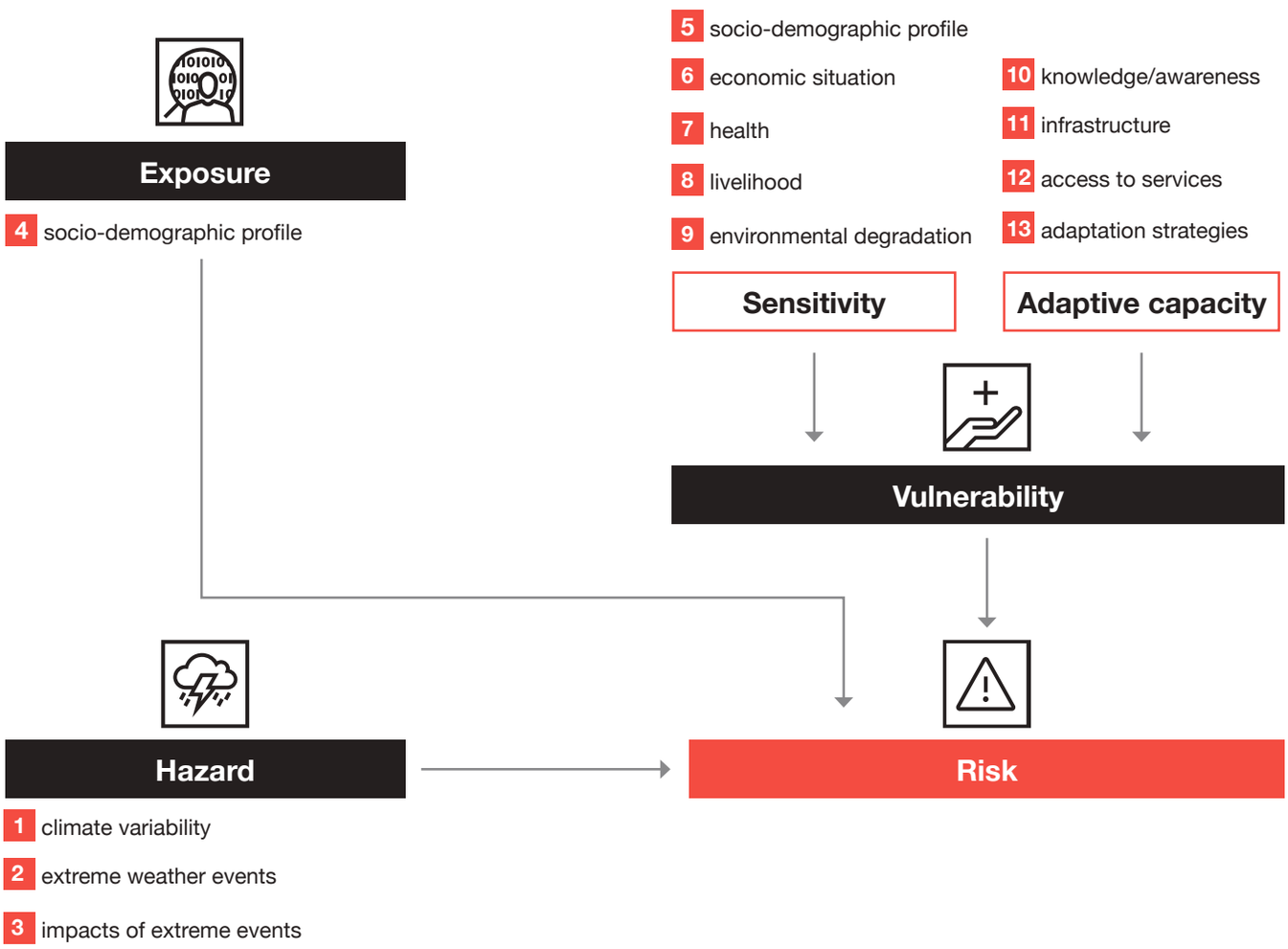
7 Diwakar, V, et.at. 2019, Child poverty, disasters and climate change

8 Human rights Council (HRC), 2016. Resolution adopted by the Human Rights Council on 1 July 2016 - 32/33. Human rights and climate change

Methodology of the study

The risk and impact assessment methodology adopted in this study (Figure A) has its basis in the risk/impact framework laid out in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), which defines climate change risk or impact as a function of three components (hazard, exposure, and vulnerability). Impact is the measurable outcome of a hazard interacting with a vulnerable system. Hence, impact is a factor of the vulnerability of a system, the nature of a hazard, and the chances of such a hazard occurring at the place where the system is located. Vulnerability is defined as a system property arising out of its sensitivity and adaptive capacity.

Figure A: Methodology for risk assessment (Source: PwC analysis)



The findings from the vulnerability assessment using the IPCC's AR5 framework were studied from the lens of the United Nations Convention on the Rights of the Child (UNCRC) framework, commonly known as the Rights Framework for Children. The United Nations Convention on the Rights of the Child (UNCRC) is an international legal framework that defines the fundamental rights of children under four themes – survival rights, development rights, protection rights, and participation rights of the child, and lays out responsibilities of governments towards protecting those rights. The essence of the four themes is presented in Figure B.

Figure B: Child rights themes under the UNCRC

1 Survival rights

Include a child's right to life and the needs that are most basic to existence, such as nutrition

2 Development rights

Include the right to education, play, leisure, cultural activities, etc.

3 Protection rights

Ensure children are safeguarded against all forms of abuse, neglect and exploitation

4 Participation rights

Encompass children's freedom to express opinions, to have a say in matters affecting their own lives

Geographic scope for this study was defined based on historical information on exposure to climate-related hazards and distinctiveness in terms of the type of ecosystem for conducting this assessment of the impact of climate change on child rights. A two-stage process was followed: identification of vulnerable states and subsequent selection of districts in the identified states as study regions. The states identified through this exercise were prioritised based on certain parameters (child sex ratio, school dropout rates, prevalence of diarrhoea, etc.) and three states – West Bengal, Uttarakhand, and Madhya Pradesh – were selected. Finally, a six districts (two from each of the states) were finalised: Khargone and Morena in Madhya Pradesh; Haridwar and Uttarkashi in Uttarakhand; and Purulia and South 24 Parganas West Bengal.

Primary and secondary data was collected to conduct this study. A mixed method approach was used to collect primary data, which involved the use of a combination of quantitative methods like household surveys (through the World Bank survey app) and qualitative methods like focus group discussions (FGDs) and key informant interviews (KIIs) with stakeholders and local government officials. Secondary data for this study was gathered through an exhaustive literature review. The Statistical Package for the Social Sciences (SPSS) software was used to analyse the basic features of the obtained survey data. A total of 57 theoretically important and policy-relevant bio-physical and socio-economic variables (sub-components) were selected under 13 major components for each of the factors of risk in the framework. The findings were then classified as per IPCC's AR5 framework working definitions, hazard, exposure, vulnerability (sensitivity and adaptive capacity), and the risk-impact aspects.

Summary of findings

Children bear the brunt of climate change as it affects their fundamental right to survival, development, protection and participation. They are particularly susceptible to injuries during extreme weather events due to their lack of capacity to understand and respond well to danger. They face emotional distress in the aftermath of climate-related disasters due to high rates of sleep disturbance, loss of life and property, and other psycho-social issues. They are also more susceptible to water- and vector-borne diseases. Further, their education and academic performances get affected due to climate-related disasters. In extreme cases, they are forced to drop out of school to support the needs of their households. In some cases, indebtedness of households due to poor agricultural productivity has led to children dropping out of schools.

Decrease in groundwater levels has affected the availability of drinking water and dehydration was observed among children. It was also observed that children faced difficulties in availing medical treatment post a climate-related disaster due to inaccessibility of hospitals in some regions. This was in addition to the difficulties they faced in navigating their way to schools. In some poor families, the education of children was a low priority as families migrated out of their villages in search of subsistence livelihoods.

9 *IPCC, 2014: Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report*

The following is a summary of the main findings using the IPCC AR5 framework:

Hazards – increase in frequency and intensity

Hazards are understood as the potential occurrence of a natural or human-induced physical event, trend or physical impact that may cause loss of life, injury, or other health impacts.[9]

- More than 70% of the respondents across all states agreed that the temperature in their respective regions had increased over the past five years. This corroborated the alarming increase in the frequency of droughts in all the three drought-prone districts of Purulia, Morena and Khargone.
- More than 50% of the respondents reported that extreme events like floods, cyclones and erosions had become more hazardous and frequent in the last 10 years. Respondents from South 24 Parganas in West Bengal could recall many experiences of significant flooding and cyclone events in the last 10 years.
- Almost all the respondents in South 24 Parganas feared the desilting of the earthen embankments which was a common phenomenon in the district.
- In the flood-prone study zones, a majority of the respondents noted a substantial increase in the occurrence of floods and cyclones in the last 10 years. They feared that during monsoons, heavy rains could flood the villages near the banks of the river. This prevented stable settlement of families close to the river/sea.
- Landslides were identified as one of the most common disasters in Uttarkashi, Uttarakhand, as communities believed that the frequency of landslides had increased in the last 10 years.

Exposure – children will bear the brunt of climate change

Climate change, including climate variability and extreme weather events, disproportionately affects marginalised sections of the population – those in rural areas, the poor, disabled, children, women and the elderly. It poses a significant threat to children's health because children have unique metabolism, behaviour, physiology and development characteristics. Children are also more vulnerable to vector-borne diseases than adults.

- The number of children per household averaged around three across all the study locations. All districts except Uttarkashi had more girls per household.

Vulnerability – risks faced by households and children due to climate change

Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.[10]

Sensitivity

- There were a considerable number of households in which either parent or both parents had migrated for better livelihood opportunities. During climate-related disasters, female heads of households often found it more difficult to recover economically due to sector-specific employment, lower wages and family responsibilities. Further, the absence of a primary caregiver due to outdoor/income-generating activities adversely affected children's education, health and food security, thereby increasing the sensitivity of households towards climate change adversities.
- The low income of households was directly correlated with low food and nutrition intake. Respondents in Khargone, Morena and Purulia reported that all the members in the household were able to afford only one meal per day or even less than that at times.
- Issues related to food and nutrition insecurity were more prominent in landless households since they largely depended on casual labour work in which remuneration is highly irregular.
- Child labour was observed in households in Madhya Pradesh and West Bengal where the family head was less educated.
- It was observed that a child's right to development was hindered by losing out on school days due to extreme climate events. In many cases, children were not engaged in work outside their homes and were instead working at home.
- In most of the surveyed areas, a single cropping pattern is prevalent, supported by seasonal vegetable production in a few pockets. The loss of productivity amounted to at least a 20–30% decrease in the last few years.
- Farmers tended to improve their productivity with increased use of artificial irrigation, fertilisers and pesticides. The increased use of such products was found to affect soil fertility in the long term and led to the use of higher amounts of fertilisers every year. This correspondingly put pressure on the limited groundwater reserves, leading to further degradation of the environment.

9 *IPCC, 2014: Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report*

10 *IPCC, 2014: Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report*

Adaptive capacity

- Alternative livelihoods or measures such as mixed farming, climate-tolerant crops and crop diversification were rarely taken up. Rather, migration seemed an easy and viable option to many.
- Access to health services was also observed as an issue due to poor connectivity of many interior villages. These villages still suffer from last-mile connectivity problems. In a few cases, ambulance services were provided to pregnant women or seriously ill patients; however, the provision of such services became more challenging during extreme climate events.
- Institutional support from local government offices was provided in the form of mini kits of seeds, fertilisers, pesticides, and disaster relief and response took the form of distribution of relief materials (food, medicine and garments).
- In flood-prone Haridwar, schools were asked to prepare a school safety plan, as per the guidelines issued by the disaster management office. However, the infrastructure of schools in this region was a serious issue as the number of students enrolled in each school was very high due to children and their families shifting from the nearby hills to Haridwar.
- Non-governmental organisations (NGOs) were present in very few pockets. They gave training to farmers on cultivating drought-resistant agricultural crops and extended support in times of crisis.

Risk/impact – increasing influence on livelihood, health and children

- Damaged infrastructure was a common impact across the states. Floods and extreme rainfall, coupled with instances of cloudbursts, were reported to be the major causes for the damage.
- More than half the houses in the study areas were observed to be kutcha houses. This situation was worse in West Bengal, where more than 90% of the houses were kutcha. As a result, there was considerable fear among the families and they are forced to relocate to safer places every monsoon. Additionally, short-term relocation occurred once in a while and children's school activities were consequently hampered. Children also got injured while trying to reach schools in difficult terrain.
- Illegal extraction of groundwater through dug wells for agricultural purposes is common despite restrictions by the Government.
- A negative impact of climate change on economic security was reported across all the states surveyed.
- Water quality was at risk in all three states, with the increased concentration of chemical (iron, fluoride, nitrates, etc.) impurities. Microbial contamination also possibly increased after a climate-related disaster.
- After extreme events, diarrhoeal illnesses related to contaminants in drinking water and sanitation can take more lives than the initial disaster. More than half of the respondents in Haridwar said that the health of their children had been affected by waterborne diseases in the aftermath of a climate-related disaster. Around 39% of the respondents in Uttarakhand said that their child had been admitted to the hospital in the aftermath of a climate-related disaster.

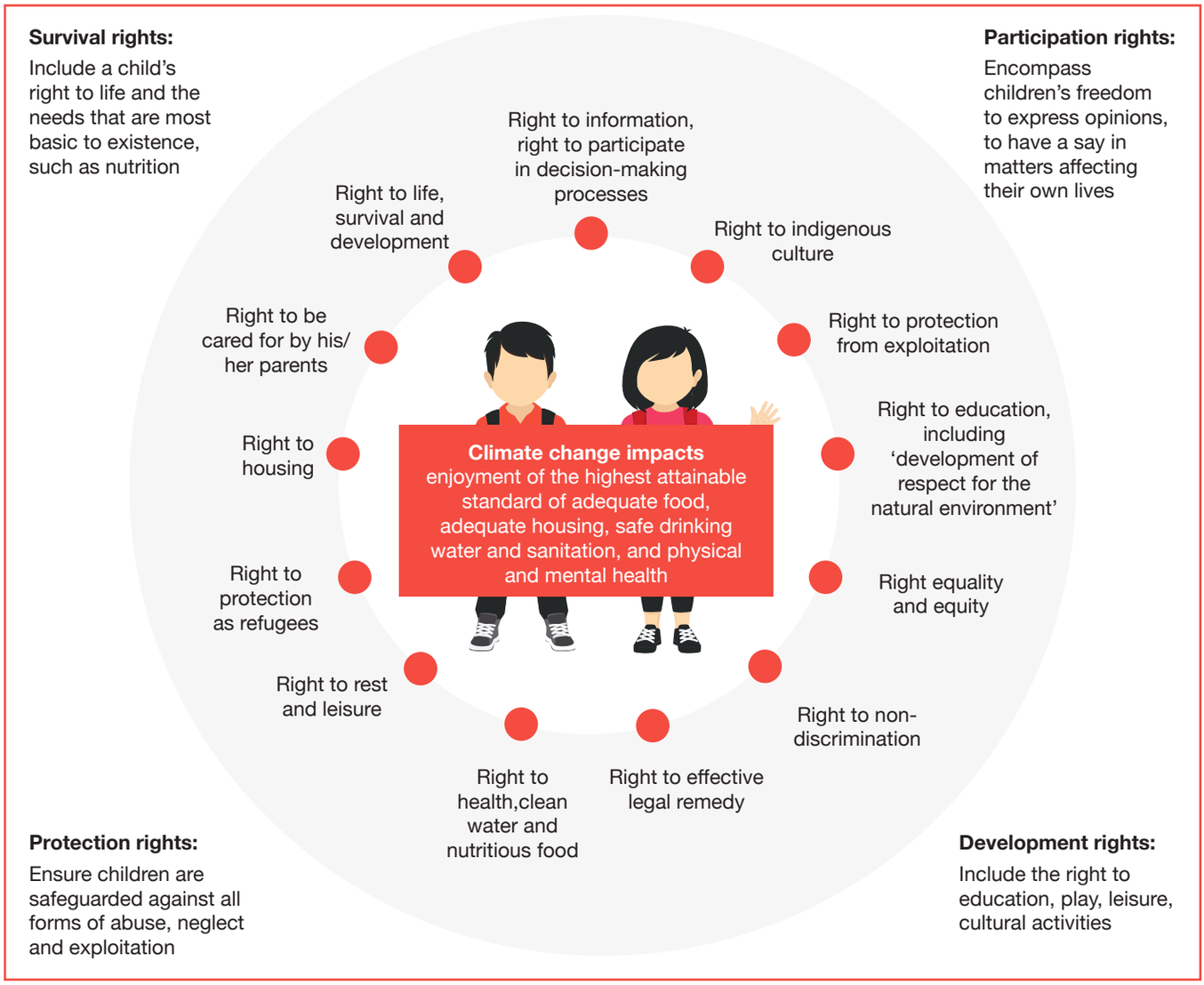
Limited livelihood opportunities, poor socio-economic and institutional resilience, and increasing biophysical vulnerabilities were the key causes for the overall increased risk of the districts. These districts have maximum vulnerabilities/ risks and have the potential to be adversely affected by climate change; thus, focused adaptation measures are immediately needed. The lowest-risk households are mostly well-connected to cities/towns, which results in greater advantages in terms of livelihood opportunities and access to frontline services.

Climate change and child rights

Climate change impacts the key articles related to the rights to survival, protection, development and participation of the UNCRC directly or indirectly, ranging from the right to non-discrimination to the right to a voice and from the right to protection as refugees to the right to protection from exploitation. Most importantly, climate change affects the enjoyment of adequate food and nutrition, adequate housing, safe drinking water and sanitation, physical and mental health, and access to education. Based on the findings from the analysis using the IPCC's AR5 framework and UNCRC, a framework on the best interests of the child in the context of climate change was constructed to establish the impact of climate change on children. The best interests of the child framework summarises the key children's interests as per the four themes of the UNCRC that are impacted by climate change (Figure C).

Figure C: Best interests of the child in the context of climate change

Child rights potentially impacted by climate change



Source: Save the Children analysis

Summary of recommendations – roadmap to climate resilience

Based on the understanding of climate change impacts, vulnerability of children to climate change and their adaptation needs, recommendations for climate resilience are identified as part of the study. The recommendations cover specific measures to a) build resilience through adaptive strategies b) mainstream climate change through transformative strategies. Further, a few generic strategies that will reduce socio-economic vulnerability of the communities across regions are proposed.

Building resilience through adaptive strategies

Adaptive strategies focus on making intentional incremental adjustments in anticipation of or in response to changes to create more flexibility in the future. Based on the findings of the survey, six adaptation strategies are proposed:

Figure D: List of strategies proposed

Leveraging existing childcare and welfare schemes

Reducing the socio-economic vulnerability of children is critical to enhancing their resilience to climate change. Hence, interventions to ensure basic needs such as water, sanitation, food and nutrition, access to education, healthcare, and social security measures, as well as child-centric disaster preparedness, response and recovery need to be undertaken. These include:

- strengthening the implementation of existing childcare and welfare schemes
- leveraging child frontline workers towards building climate resilience of children
- child-sensitive alignment of national policies and strategies and plans for disasters and resilience.

Enabling delivery of health services through ICT

During climate-related disasters or extreme weather events, health infrastructure or basic infrastructure such as roads and bridges, which are critical to access health infrastructure, facilities or emergency support, are often severely damaged. As a result, access to healthcare services and infrastructure is a common concern among the communities in the surveyed regions. Moreover, there are regions which face other issues related to accessing healthcare services. To address these problems, information and communication technology (ICT) enabled delivery of health services such as mHealth has been proposed as an adaptation strategy.

Ensuring child protection in disaster-prone areas

Regions such as South 24 Parganas and Uttarkashi are prone to extreme weather events, and children are extremely vulnerable and require special care and support in overcoming the impact and associated trauma. The National Disaster Management Plan (NDMP) lays down several child-centric measures towards the well-being of children, including setting up of child protection units as per the Integrated Child Protection Scheme (ICPS), India. Based on this context, the setting up of child-centric relief and rehabilitation spaces has been proposed as an adaptation strategy to specifically address the issues faced by children in the project regions due to the impact of climate change. The key measures can be as follows:

- establishing and managing child-friendly spaces (CFSs)
- children's collectives to work with children to understand their vulnerabilities and develop informed solutions.

Climate proofing of basic infrastructure

In all the three states surveyed for the study, damage to basic infrastructure due to floods, landslides, storms or cyclones was common. Such disasters led to property damage and even loss of life due to accidents in some cases. They also hindered movement during emergency situations. Climate-resilient infrastructure reduces the risk of climate-related disruptions by improving the ability of the infrastructural assets to cope with the impact of such disruptions.

Some of the key measures to implement this strategy are:

- developing guidelines for climate- and disaster-resilient infrastructure
- climate proofing of critical infrastructure to climate variability and extreme events in the present and future
- development of real-time monitoring and early warning system for landslides in Uttarakhand.

Ensuring livelihood and food security through climate-smart agriculture (CSA) practices and alternative livelihoods

Diversification of livelihoods beyond agriculture, allied activities and other climate-sensitive occupations at the household and the community level is an important way to reduce climate change risks. Non-climate sensitive work such as crop processing, livestock production, wage labour, salaried work, business activities, land rental and remittances at the household level is an important way to reduce livelihood risks. Ensuring availability and accessibility of agriculture, horticulture and veterinary services to all people is also critical. Livelihood and food security can be ensured by:

- engaging farmers in capacity-building programmes for climate-sensitive agriculture and alternative livelihoods
- providing effective tools and creating an enabling environment for practising climate-sensitive agriculture.

Promoting sustainable water management

Water quality and quantity were identified as issues in all the three regions studied. Water resources, already under pressure due to the growing water demand vis- à -vis finite supply, will be under even greater pressure in the future as a result of climate change. This is a result of (but not limited to) three factors – the projected decrease in rainfall and erratic rainfall patterns, decreased availability resulting from over extraction, and the combined effect on the overall ecosystem. The study showed that the different regions face different water-related problems and their adaptation needs accordingly vary. This is due to the very large temporal and spatial variation of rainfall in India. Hence, adaptation planning based on the geography and demography is critical. Keeping in mind all these factors, specific adaptation measures are proposed for the project regions:

- developing water security plans (WSPs) at the community level in semi-arid regions of Madhya Pradesh and Uttarakhand
- constructing/renovating water harvesting, conservation and ground recharge structures.
- promoting efficient use of water for household and agricultural purposes
- implementing subsurface water technologies to avoid saltwater intrusion in South 24 Parganas.

Mainstreaming climate change through transformative strategies

Transformative adaptation planning should result in the development of a portfolio of climate change adaptation opportunities that can be mainstreamed in the policies, plans and programmes of the country. This is crucial to ensure the best use of investment needs, given the limited resources available and competing needs. The framework for mainstreaming child-related climate change considerations should be built on the following eight pillars.

Multidimensional resilience

Adaptation strategies have the potential to generate economic, social and environmental benefits. Investment decisions should consider direct and indirect benefits and multisectoral implications while evaluating the suitability of adaptation strategies. This will help in considering climate risks while designing large-scale or small-scale programmes.

Participatory and decentralised planning

Ensuring inclusivity and equitable access to all stakeholders should be the underlying principle of climate change adaptation in India. The key to addressing this aspect is ensuring participatory planning and continuous dialogue between communities, policymakers and implementing agencies.

Collaborative climate action ecosystem

A multitude of actors play critical roles in climate action and child development in India. It is important that the framework identifies the current and potential roles of these actors in climate action and leverages the synergies for greater impact. An integrated approach based on interdisciplinary and multisectoral thinking needs to be promoted.

Convergence with existing policies and actions

The National Rural Employment Guarantee Act (MGNREGA), 2005, National Health Mission (NHM), National Social Assistance Programme (NSAP), Pradhan Mantri Fasal Bima Yojana (PMFBY), etc., are some of the key policies and schemes implemented in India with a focus on socio-economic development. Additionally, there are a few initiatives focusing on children such as the Midday Meal Scheme (MDMS), Integrated Child Development Scheme (ICDS) and Sarva Shiksha Abhiyan (SSA). Convergence or integration with existing government policies and actions will help in optimising efforts and synergising the different policies/actions and sectors by converging funds, institutional technical expertise, social mobilisation or other aspects related to planning and implementation.

Pooling of funds

Budgetary outlays are often insufficient for effective climate interventions. Therefore, there is a need to identify and leverage different funding sources.

Sustainable interventions and last mile delivery

Adaptation interventions are not one-time investments and often involve recurring costs. Sustainability of interventions and last-mile delivery will reduce the risk of investments that may otherwise hinder private sector participation.

Private sector participation

The private sector can be a key player in addressing the adaptation finance gap. In addition to contributing financially, the private sector can provide technical expertise, management experience and professionalism, thereby bringing in efficiency in the system.

Development and use of decision support tools for adaptation planning

The availability of authentic secondary data has been a bottleneck for the current study. There is a need for a proper geo-referenced database for researchers to carry out extensive climate-vulnerability assessments so that policymakers can take informed decisions based on such assessments. A geographical information system (GIS) based decision support system (DSS) may be deployed to fill this gap.

In addition to specific adaptation strategies, a few generic strategies may be implemented across geographical areas for communities affected by climate change.

Ensuring access to education

Providing financial assistance to children in families affected by climate risks and skills training opportunities to the youth and adolescents, especially women and girls, and establishing vocational educational training institutes at block or panchayat levels would provide access to education and enhance employability of those affected by climate change.

Ensuring livelihood security and social protection

Basic livelihood services at the community level, formal and informal gender-sensitive social protection and safety net programmes and financial inclusion are important to absorb the effects of climate change on livelihoods. Efforts should be undertaken to provide last-mile service delivery.

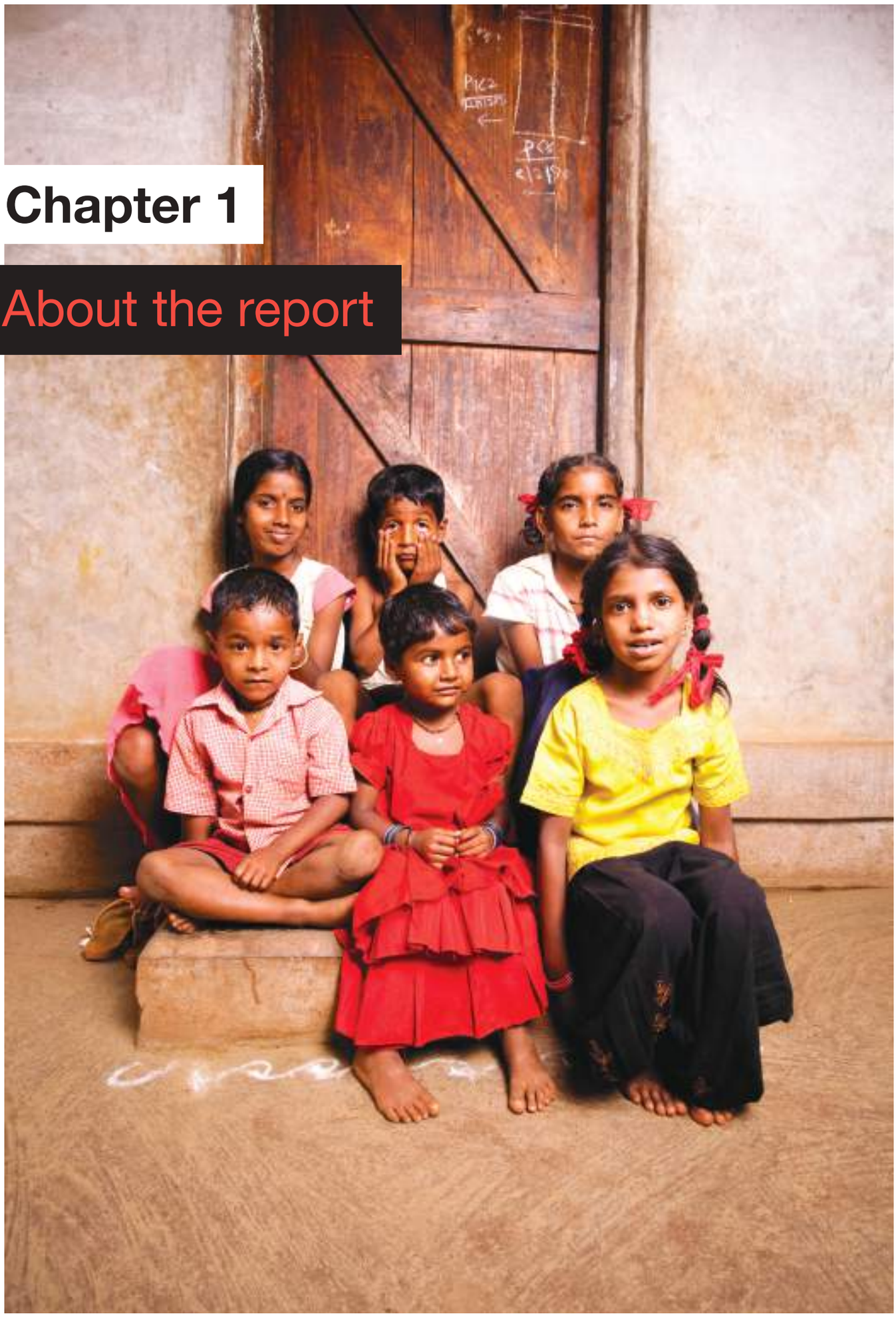
Building knowledge and awareness of climate change and its impact

There is a need to undertake awareness-generation initiatives for all key stakeholders – policymakers, government institutions (especially local government bodies), civil society and community organisations, NGOs, etc. – regarding climate change, its impact on communities and implications for children. Customised activities should be designed and undertaken for building awareness and sensitisation among each of the key stakeholders. Formation of eco/nature clubs could be helpful in imparting knowledge and awareness to children. Disaster and climate risk education may be integrated into the formal curriculums of educational institutes.

To conclude, adaptation strategies for climate change should ensure the rights of children – survival rights, development rights, protection rights and participation rights, as enshrined in the UNCRC. Planning and implementation for adaptation should follow a multipronged approach that is contextual to communities and geographies based on identified climate risks and impact and therefore, must be more localised than centrally driven. Further, the development process should be long term and stakeholder driven rather than isolated from the local context and needs. Implementation of such strategic interventions will help India achieve the commitments made to children under the Constitution as well as under the UNCRC.

Chapter 1

About the report



The PwC India Foundation and Save the Children, India conducted a year-long study on the vulnerability of children to the impact of climate change in some of the regions in India that are most vulnerable to climate change and climate-related hazards. The study aimed to provide a broader understanding of how climate change impacts children and its specific objectives were as follows:

a. to identify the key effects of climate change on children in geographic regions where they are exposed to frequent and intense climatic hazards

b. to assess the intrinsic socio-economic conditions that make children vulnerable to climatic hazards

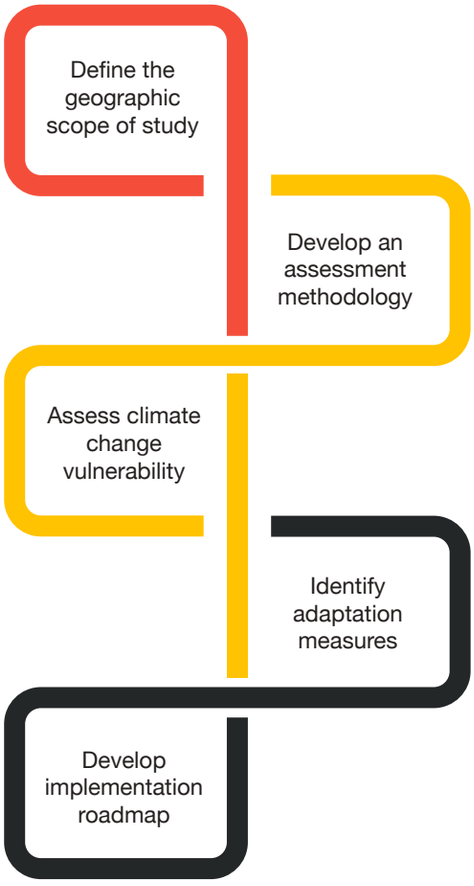
c. to identify risk mitigation and adaptation measures in the short, medium, and long term in order to reduce the impact of climate change on children

d. to propose a roadmap for the implementation of identified climate change adaptation strategies.

1.1. Conceptual framework of the study

The study was conducted using a rigorous, multi-staged and multi-pronged approach (Figure 1.1).

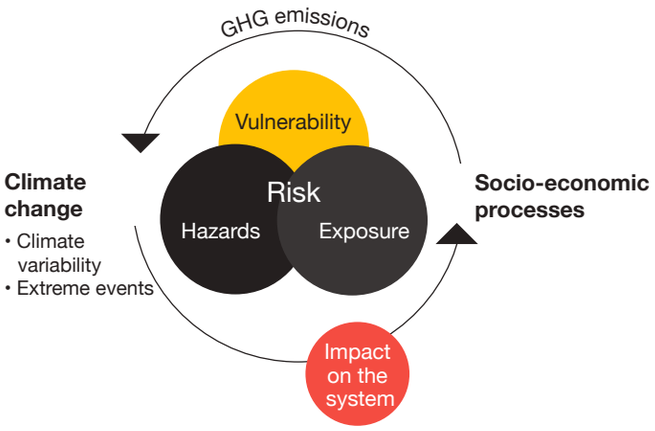
Figure 1.1.: Methodology of the study



1.1.1. IPCC AR 5 impact-risk framework

The risk/impact framework laid out in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), which defines climate change risk or impact as a function of three components (hazard, exposure, and vulnerability) forms the basis of the risk assessment methodology adopted in this study.[11]

Figure 1.2: PwC analysis of IPCC AR 5 impact-risk framework



Source: IPCC, 2014

As per this impact-risk framework (Figure 1.2), impact is the measurable outcome of a hazard interacting with a vulnerable system. Hence, impact is a factor of the vulnerability of a system, the nature of a hazard, and the chances of such a hazard occurring at the place where the system is located. Vulnerability is defined as a system property arising out of its sensitivity and adaptive capacity.

1.1.2. The United Nations Convention on the Rights of the Child (UNCRC)

In order to demonstrate how climate change impacts children and why they are particularly at risk, the findings from the vulnerability assessment using the IPCC's AR5 framework were studied through the lens of child rights. The UNCRC framework, commonly known as the Rights Framework for Children, was used for this purpose. The UNCRC is an international legal framework that defines the fundamental rights of children and responsibilities of governments towards protecting those rights.

11 *IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp.*

The UNCRC defines the child as a person under 18 years of age and specifies 54 articles on children's rights that may be grouped together under four themes – survival rights, development rights, protection rights, and participation rights of the child.[12] These rights are not ranked in order of importance; instead, they interact with one another to form one integrated set of rights. The essence of the four themes is presented in Figure B.

Figure 1.3: Rights of children enshrined in the UNCRC

Climate change has not yet been adequately integrated into the UNCRC framework or other larger human rights approaches and frameworks on child rights. However, as an international legal framework, it can be a powerful tool for climate action. The framework includes references to the environment and requires governments to act on environment-related issues and impact on children.[13]

1.2. Structure of the report

This report discusses the vulnerability of children to climate change and related disasters based on the findings from a literature review and primary surveys conducted in six districts of India (Khargone and Morena in Madhya Pradesh, Haridwar and Uttarkashi in Uttarakhand, and Purulia and South 24 Parganas in West Bengal). The report proposes potential risk mitigation and adaptation strategies and argues for their implementation based on an economic analysis. The report also suggests the implementation of child-centric adaptation strategies in the country along with the integration of a child focus into the general climate change adaptation and disaster resilience efforts of the country.

In alignment with the approach followed for the study (Figure 1.1), the report is divided into seven chapters.

Chapters	Content
Chapter 1: About the report	Introduces the report and summarises the overall approach of the study.
Chapter 2: Climate change and children	Sets the context on climate change in India as well as the need for studying the vulnerability of children to climate change.
Chapter 3: Vulnerable regions in India impacted by climate change and related disasters	Discusses the approach followed to define the geographic scope of the study and summarises the outcomes of the process for the selection of the study regions.
Chapter 4: Climate change vulnerability of children	Elaborates on the frameworks followed to assess the vulnerability of children to climate change as well as the methodologies used for data collection and analysis. Also presents the findings in terms of (1) projected change in the climate of the study regions and how it affects the frequency and intensity of extreme weather events, (2) the exposure of children and communities to climate change, and (3) the significant impact of climate change on vulnerable communities, especially children, and factors that contribute to their vulnerability.
Chapter 5: Planning for adaptation	Summarises adaptation planning processes, and presents proposed adaptation strategies, an economic analysis of these strategies, and barriers to implementation.
Chapter 6: Roadmap for child-focused climate change adaptation	Lists out the recommendations of the study for: • mainstreaming of climate change through transformative strategies • building resilience through adaptive strategies. Concludes the report by summarising the key outcomes of the study and presents an implementation plan for the adaptation strategies proposed in Chapter 5.

12 *Assembly, U.G., 1989. Convention on the Rights of the Child. United Nations. Treaty Series, 1577(3).*

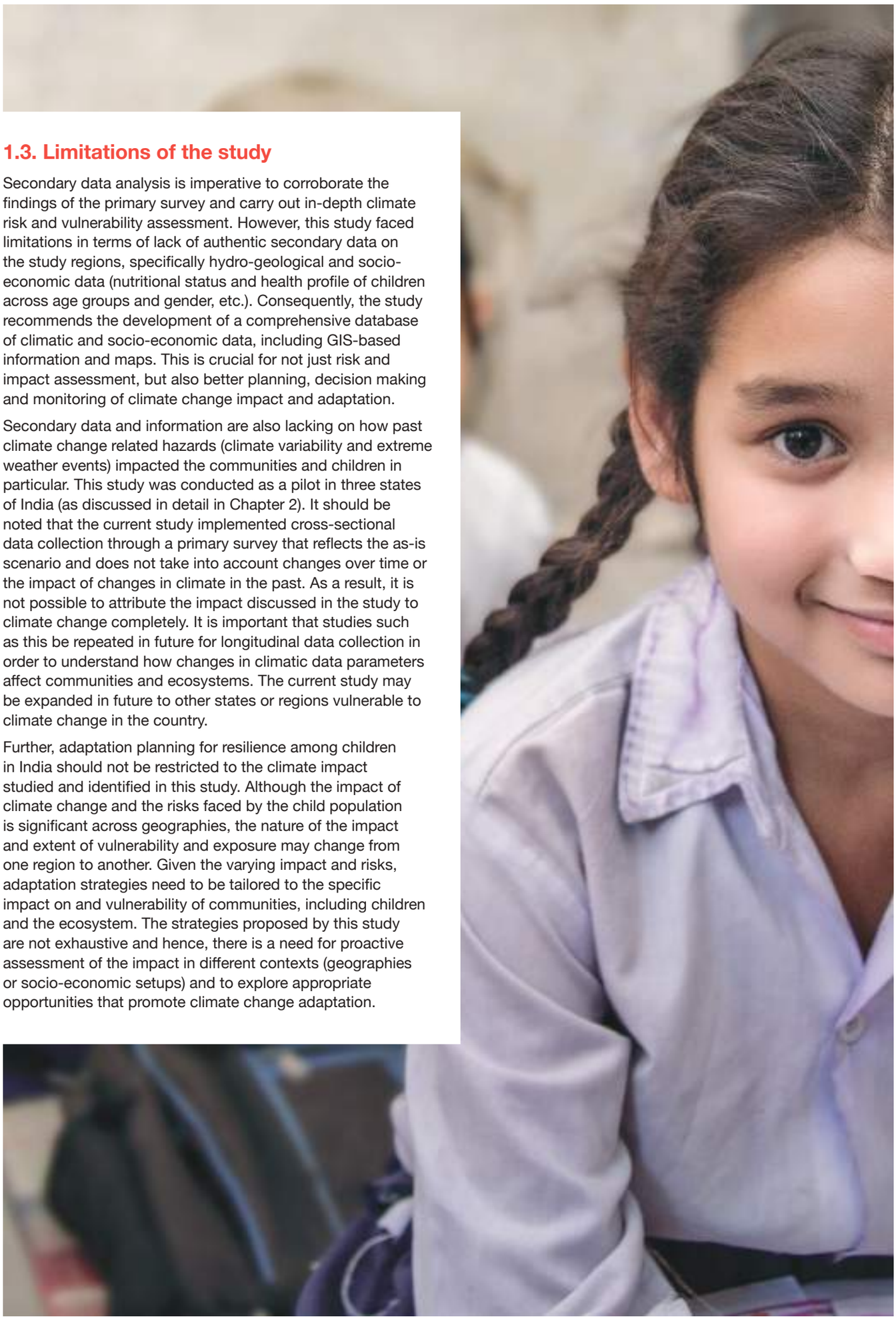
13 *Ibid.*

1.3. Limitations of the study

Secondary data analysis is imperative to corroborate the findings of the primary survey and carry out in-depth climate risk and vulnerability assessment. However, this study faced limitations in terms of lack of authentic secondary data on the study regions, specifically hydro-geological and socio-economic data (nutritional status and health profile of children across age groups and gender, etc.). Consequently, the study recommends the development of a comprehensive database of climatic and socio-economic data, including GIS-based information and maps. This is crucial for not just risk and impact assessment, but also better planning, decision making and monitoring of climate change impact and adaptation.

Secondary data and information are also lacking on how past climate change related hazards (climate variability and extreme weather events) impacted the communities and children in particular. This study was conducted as a pilot in three states of India (as discussed in detail in Chapter 2). It should be noted that the current study implemented cross-sectional data collection through a primary survey that reflects the as-is scenario and does not take into account changes over time or the impact of changes in climate in the past. As a result, it is not possible to attribute the impact discussed in the study to climate change completely. It is important that studies such as this be repeated in future for longitudinal data collection in order to understand how changes in climatic data parameters affect communities and ecosystems. The current study may be expanded in future to other states or regions vulnerable to climate change in the country.

Further, adaptation planning for resilience among children in India should not be restricted to the climate impact studied and identified in this study. Although the impact of climate change and the risks faced by the child population is significant across geographies, the nature of the impact and extent of vulnerability and exposure may change from one region to another. Given the varying impact and risks, adaptation strategies need to be tailored to the specific impact on and vulnerability of communities, including children and the ecosystem. The strategies proposed by this study are not exhaustive and hence, there is a need for proactive assessment of the impact in different contexts (geographies or socio-economic setups) and to explore appropriate opportunities that promote climate change adaptation.



Chapter 2

Climate change and children

The IPCC confirms with 95% certainty that the human influence on the climate system is growing and this is the main cause of global warming. Human activities are estimated to have caused approximately 1.0° C of global warming above pre-industrial levels, with a likely range of 0.8° C to 1.2° C.[14] Global warming is likely to reach 1.5° C between 2030–2052 if it continues to increase at the current rate. The increase in global mean surface temperature by the end of the 21st century (2081–2100) could be as high as 4.8° C relative to 1986–2005. Heat waves are predicted to occur more often and last longer, and extreme precipitation events will become more intense and frequent in many regions. Acidification and warming of oceans will continue and the global mean sea level will rise. All the predicted changes to the climate in the immediate and long term will have a widespread impact on human and natural systems and landmark agreement for global climate action, the Paris Agreement 2015 acknowledges this urgent and potentially irreversible threat to all.[15]

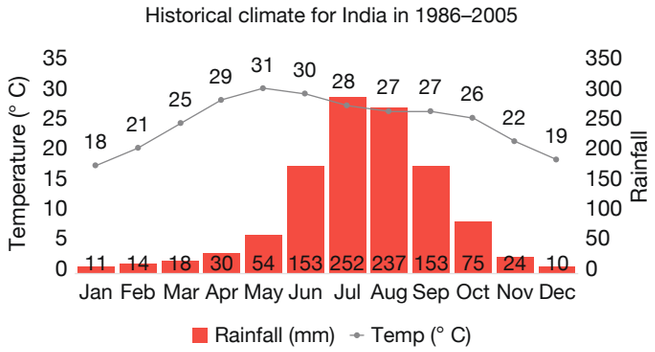
2.1. Changing climate in India

According to the Global Climate Risk Index 2020, India is the fifth most vulnerable country in the world to the impact of climate change.[16] This is evident from the historical climate data of the country which shows the current variability in temperature and precipitation. The mean annual temperature in India has increased by around 0.59° C between 1901–2007 with an accelerated warming trend during 1971–2007. The mean winter season temperature increased by 0.70° C, while that of the post-monsoon season increased by 0.52° C over the last 100 years.[17] The past two decades (2001–2010 and 2010–2019) were the warmest on record for India since 1901.[18]

There was a slight decrease in precipitation over the period of 1871–2009. It is also reported that the frequency of wet days declined across most of the country, especially in central and northern India.[19] The year 2018 saw the sixth lowest monsoon rainfall and it was also the sixth warmest year since 1901.[20] The historical trend of rainfall and temperature in India is presented in Figure 2.1.

> "Investing in climate action makes sense for the global environment, improved public health, new markets, new jobs and new opportunities for sustainable prosperity. Failing to act will simply consign all of humanity to ever-worsening climate calamity."
>
> – **António Guterres,** UN Secretary General

Figure 2.1: Historical trend of rainfall and temperature in India



Source: World Bank, 2014

14 *IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.*

15 *Agreement, P., 2015. United nations. United Nations Treaty Collect, pp.1-27.*

16 *Eckstein, D., Künzel, V., Schäfer, L. and Winges, M., 2019. Global Climate Risk Index 2020. Bonn: Germanwatch.*

17 *World Bank, n.d. Climate Change Knowledge Portal for Development Practitioners and Policy Makers. Available at https://climateknowledgeportal.worldbank.org/country/india/climate-data-historical# (Accessed October 2019)*

18 *India Meteorological Department, n.d. Statement on Climate of India during 2019. Available at https://mausam.imd.gov.in/backend/assets/press_release_pdf/Statement_on_Climate_of_India_during_2019.pdf (Accessed October 2019)*

19 *World Bank, n.d. Climate Change Knowledge Portal for Development Practitioners and Policy Makers. Available at https://climateknowledgeportal.worldbank.org/country/india/climate-data-historical# (Accessed October 2019)*

20 *India Meteorological Department, n.d. Statement on Climate of India during 2019. Available at https://mausam.imd.gov.in/backend/assets/press_release_pdf/Statement_on_Climate_of_India_during_2019.pdf (Accessed October 2019)*

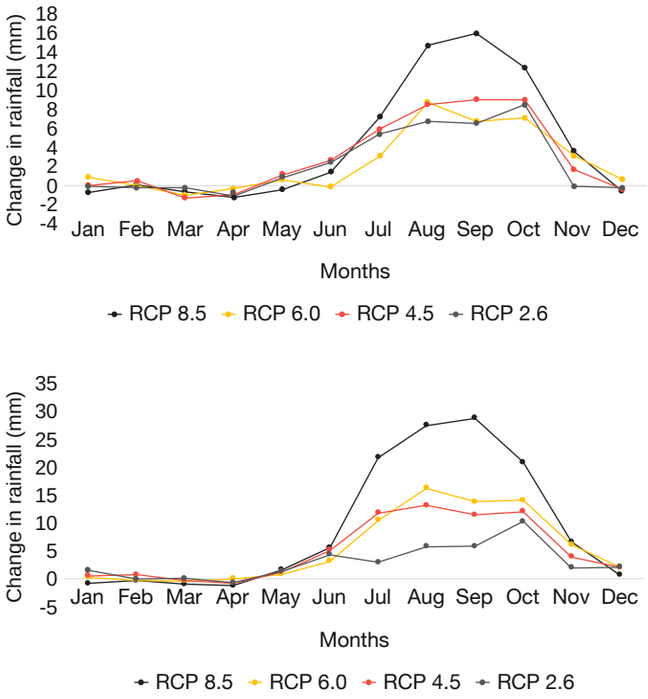
Past records show that the frequency and intensity of hydro-meteorological or weather-related hazards have increased in the country.[21] During 2018–2019, more than 3,000 Indians lost their lives due to major extreme weather events such as floods, cyclones, heat waves and cold waves, lightning, and thunderstorms, and approximately 2 million people were displaced by disasters associated with monsoons.[22,23] Many parts of India were affected by droughts and dry spells, and the country is considered to be extremely water stressed.[24]

However, the worst is yet to come. Climate projections indicate that the surface air temperature over India is set to increase between 2° C and 4° C. Annual minimum temperatures are expected to increase by approximately 20% by 2100, which is higher than the predicted rise in average temperatures. Also, there is a clear and growing scientific evidence that establishes the likely increase of frequency of extreme weather events such as heavy rainfall, floods, droughts, and heatwaves in the country.[25]

Future climate projections for India

As per the projections of future climate scenarios for different emission levels, the temperature will rise by approximately 4° C by 2080–2099 under the RCP8.5[26] emissions pathway, and by around 1.1° C under the RCP2.6 emissions pathway. The annual minimum temperature is projected to be 18–21% higher than the rise in average temperatures. Projections show considerable uncertainty in the local long-term precipitation trends; however, there is consensus on increases in the intensity of extreme precipitation events in many parts of the country. Figures 2.2 and 2.3 present the projected change in monthly mean temperature and rainfall in India for the periods 2040–2059 and 2080–2099.

Figure 2.2: Projected change in rainfall in India in 2040–2059 and 2080–2099 under the different climate change scenarios



Source: World Bank, 2014

20 *India Meteorological Department, n.d. Statement on Climate of India during 2019. Available at https://mausam.imd.gov.in/backend/assets/press_release_pdf/Statement_on_Climate_of_India_during_2019.pdf (Accessed October 2019)*

21 *United Nations Office for Disaster Risk Reduction, 2013. The Hyogo Framework of Action in Asia and the Pacific 2011–2013. Available at www.unisdr.org/files/32851_hfaregionalsynthesisreportasiapacif.pdf (Accessed October 2019)*

22 *Press Information Bureau of India, 2019. Studies on Impact of Climate Change*

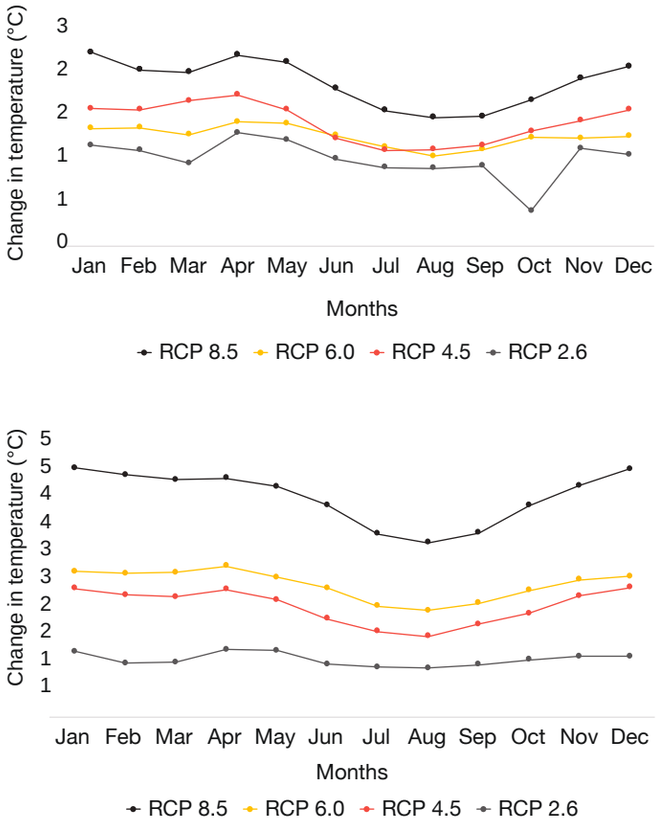
23 *Internal Displacement Monitoring Centre, 2019. Global report on internal displacement (2019))*

24 *World Resources Institute, 2019. 17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress (Accessed October 2019)*

25 *World Bank, n.d. Climate Change Knowledge Portal for Development Practitioners and Policy Makers. Available at https://climateknowledgeportal.worldbank.org/country/india/climate-data-historical# (Accessed October 2019)*

26 *A Representative Concentration Pathway (RCP) is a greenhouse gas concentration (not emissions) trajectory adopted by the IPCC for its fifth Assessment Report (AR5) in 2014. Four RCPs produced from Integrated Assessment Models were selected from the published literature and are used in the Fifth IPCC Assessment as a basis for the climate predictions and projections presented in WGI AR5 Chapters 11 to 14. 1) RCP2.6 One pathway where radiative forcing peaks at approximately 3 W m-2 before 2100 and then declines (the corresponding ECP assuming constant emissions after 2100); 2) RCP4.5 and RCP6.0 Two intermediate stabilisation pathways in which radiative forcing is stabilised at approximately 4.5 W m-2 and 6.0 W m-2 after 2100 (the corresponding ECPs assuming constant concentrations after 2150); 3) RCP8.5 One high pathway for which radiative forcing reaches greater than 8.5 W m-2 by 2100 and continues to rise for some amount of time (the corresponding ECP assuming constant emissions after 2100 and constant concentrations after 2250).*

Figure 2.3: Projected change in temperature in India in 2040–2059 and 2080–2099 under the different climate change scenarios



Source: World Bank, 2014

2.2. Impact of climate change on children

The environmental, social and economic impact of climate change can be lasting and significant in a developing country like India with a population of more than 1.3 billion. The lives and livelihoods of a significant proportion of the population may be affected, especially those dependent on climate-sensitive sectors such as agriculture, forestry, tourism, animal husbandry and fisheries. India's economy is heavily dependent on agriculture, with about 58% of the population dependent on agriculture for livelihoods.[27] Studies predict a decrease in annual agricultural incomes by 15–18% and in agriculture yield by as much as 2.9% due to climate change.[28] In India, 268 million people survive on less than USD 1.90 a day.[29] While the impact of climate change will be spread across India, it will be pronounced in rural areas and among the marginalised and socio-economically backward communities, aggravating the existing vulnerabilities.

According to the United Nations Children's Fund (UNICEF), climate change will increasingly and disproportionately affect children.[30] The main effects include increased morbidity and mortality amongst children due to extreme weather events and subsequent disasters; water scarcity and food insecurity; air pollution, vector- and water-borne diseases; and impact on mental health.[31] Other potential consequences are orphanhood, trafficking, child labour, loss of education and development opportunities, separation from family, homelessness, poverty, trauma, emotional disruption, illness, etc.[32]

2.3. Need for the study

From the perspective of children, climate change is not just an issue of equity and intergenerational justice, but also one of survival and well-being. The UNICEF's report 'Unless we act now: The impact of climate change on children states that although children are the least responsible for climate change, they will bear the brunt of its impact and face a future with increasingly extreme climate change effects, posing challenges to sustainable development and human rights.[33] The issue is one of intergenerational justice as the human activities of today are changing the climate, thereby impacting the environment and society in drastic ways and leading to repercussions for future generations. Climate change deals with the potentially irreversible threat to future generations caused by the current generation. It is a matter of human rights as it is the fundamental right of children to live on a safe planet and to be protected from chronic vulnerabilities and risks of disaster, as well as to have access to newer and innovative opportunities to realise their full potential. The intrinsic vulnerability of the children puts them at a disadvantage and impedes their right.

27 *Govt. of India, 2011. Census of India 2011*

28 *Govt. of India, 2018. The Economic Survey 2018*

29 *Gupta, S., 2019. New data may show big cut in number of poor, The Times of India. Available at https://timesofindia.indiatimes.com/india/new-data-may-show-big-cut-in-number-of-poor/articleshow/67705787.cms (Accessed 2019)*

30 *UNICEF, 2015. Unless We Act Now: The Impact of Climate Change on Children*

31 *OHCHR, 2017. Analytical study on the relationship between climate change and the full and effective enjoyment of the rights of the child - Report of the Office of the United Nations High Commissioner for Human Rights*

32 *OHCHR, 2017. Analytical study on the relationship between climate change and the full and effective enjoyment of the rights of the child - Report of the Office of the United Nations High Commissioner for Human Rights*

33 *UNICEF, 2015. Unless We Act Now: The Impact of Climate Change on Children*

The importance of protecting the rights of children and ensuring intergenerational equity is acknowledged in the Paris Agreement 2015. The United Nations (UN) also acknowledges the same through Resolution 32/33 of the Human Rights Council (HRC) of the UN (UNHRC) on human rights and climate change. The resolution emphasises the importance of addressing the adverse consequences of climate change, especially on children from disadvantaged backgrounds as a human rights obligation.[34]

The issue of climate change and its impact on children is of utmost importance in a country like India, which has a significant child population. As per the Census of India conducted in 2011, children in the age group of 0–15 years comprise 33% of the total population, with 73% of the child population living in rural areas. The population density is the highest in the country for those under 18 years of age. More than 120 million children live in extreme poverty across the world, with the highest number in South Asia.[35] Further, India is vulnerable to a wide range of extreme weather events – mostly flooding, cyclones, drought and heat waves – with different regions prone to different hazards of varying intensity depending on their geography and climate. A recent study found that children in disaster-prone areas in India are twice as likely to be living in chronic poverty than to escape poverty. They were also three times as likely to become impoverished.[36]

Given this context, there is an urgent need for a children-centric assessment of climate change in India in order to understand the magnitude of risks to and impact of climate change on children as well the factors contributing to their vulnerability. This will help in climate change and disaster resilience planning and safeguarding the future of children from the threat posed by climate change to their life, growth and development, health, and well-being.

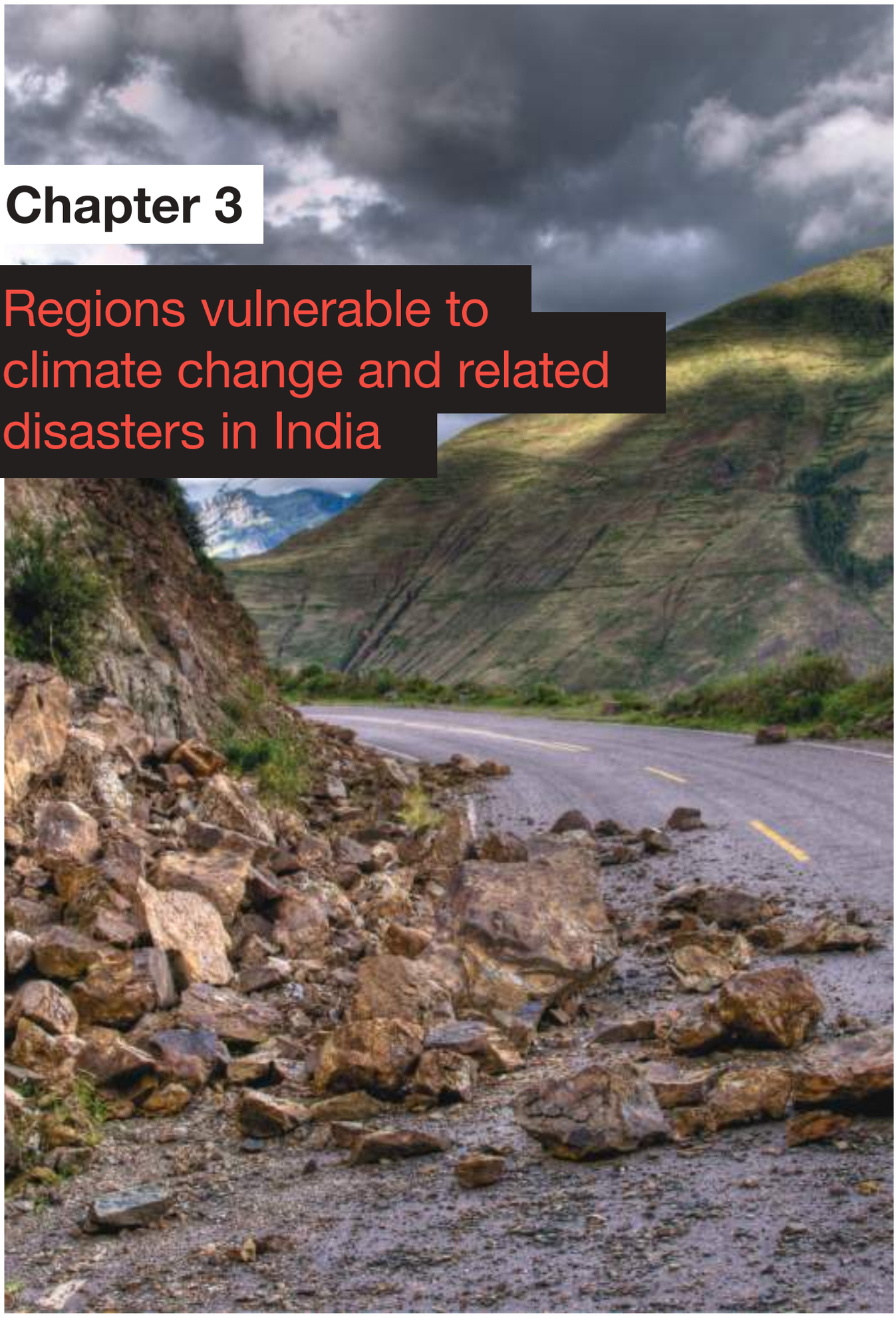
34 Human rights Council (HRC), 2016. Resolution adopted by the Human Rights Council on 1 July 2016 - 32/33. Human rights and climate change

35 World Bank and UNICEF, 2013. Ending Extreme Poverty: A Focus on Children

36 Diwakar, V., Lovell, E., Opitz-Stapleton, S., Shepherd, A. and Twigg, J., 2019. Child poverty, disasters and climate change.

Chapter 3

Regions vulnerable to climate change and related disasters in India



As the first step in the study, the geographic scope was defined based on historical data about the unique features of different regions of India and their vulnerability to climate-related hazards. This involved a two-stage process: (1) identification of states and (2) selection of districts in the identified states as study regions. The outcomes of this exercise are discussed in the following sub-sections.

3.1. Identification of states

Firstly, states were identified based on parameters: (1) distinctiveness in terms of the type of ecosystem and (2) exposure to climate hazards. The key aspects considered under the above-mentioned parameters are presented in Figure 3.1.

India is classified into 10 biogeographic zones: (1) Trans-Himalayan zone, (2) Himalayan zone, (3) Desert zone, (4) Semi-arid zone, (5) Western Ghat zone, (6) Deccan plateau zone, (7) Gangetic plain zone, (8) North east zone, (9) Coastal zone, and (10) Islands. This classification was used as the basis for ecosystem-based selection.[37] For each of the zones, child population, common climate hazards and their impact on the region was studied. The key findings are summarised in Table 3.1.

Figure 3.1: Process of identification of states

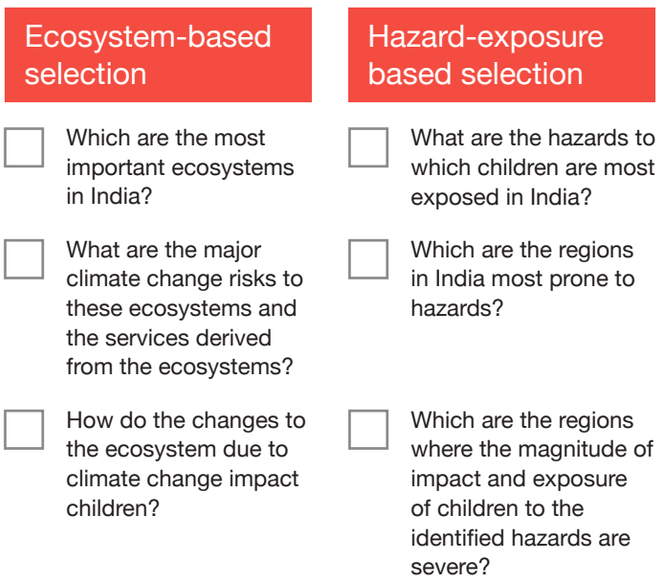


Table 3.1: Findings related to ecosystems and common climate hazards

Ecosystem type: Deccan peninsular zone

- Telangana
- Maharashtra
- Andhra Pradesh
- Karnataka
- Tamil Nadu
- Madhya Pradesh
- Chhattisgarh
- Jharkhand
- Orissa

- **Child population:** 14.11 crore (population of children below 15 years is high in Madhya Pradesh, Maharashtra and Andhra Pradesh)
- **Common climate hazards:** Flood, drought and heat wave
- **History of climate hazards in the past 3 years and impact:**
  - Mortality, morbidity, loss of crop yield and loss of livelihood due to riverine floods are major impacts.
  - Droughts and heat waves were reported in many of the states in this region.

Ecosystem type: Desert zone

- Thar desert in Rajasthan
- Kachchh desert in Gujarat

- **Child population:** 4.12 crore (Rajasthan has a larger child population)
- **Common climate hazards:** Flood, drought and heat wave
- **History of climate hazards in the past 3 years and impact:**
  - High mortality due to heat waves and high morbidity due to water stress
  - The two states were affected by droughts and heat waves.

37 *Singh, J.S. and Chaturvedi, R.K., 2017. Diversity of ecosystem types in India: A review. Proc Ind Natl Sci Acad–INSA, 83(3), pp.569-594.*

Ecosystem type: Trans-Himalayan zone

- Jammu and Kashmir
- Sikkim

- **Child population:** 0.44 crore
- **Common climate hazards:** Flash flood, flood, drought, landslide, heat waves, glacial lake outburst flood (GLOF)
- **History of climate hazards in the past 3 years and impact:**
  - Meltwater from Himalayan glaciers and snowfields increases the flood risk during the wet season and strongly reduces the dry-season water supply.

Ecosystem type: Himalayan zone

- Himachal Pradesh
- Uttarakhand
- Arunachal Pradesh

- **Child population:** 0.54 crore
- **Common climate hazards:** Flash flood, flood, drought and landslide
- **History of climate hazards in the past 3 years and impact:**
  - Meltwater from Himalayan glaciers and snowfields increases the flood risk during the wet season and strongly reduces the dry-season water supply.

Ecosystem type: Coastal zone

- Coastal areas of West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Maharashtra, Gujarat, Puducherry, and Goa

- **Child population:** 0.54 crore
- **Common climate hazards:** Flash flood, flood, drought and landslide
- **History of climate hazards in the past 3 years and impact:**
  - Melt water from Himalayan glaciers and snowfields increases the flood risk during the wet season and strongly reduces the dry-season water supply.

Ecosystem type: Western Ghat zone

- Maharashtra, Karnataka, Kerala

- **Child population:** 5.38 crore (child population is high in Maharashtra)
- **Common climate hazards:** Cyclone, flood, drought, and heat wave
- **Recent history of climate hazards:**
  - Chiplun and Ratnagiri districts were affected by floods in July 2019 due to heavy rainfall and dam breach.
  - Karnataka and Kerala were affected by floods in July and August.

Ecosystem type: Gangetic plain zone

- Uttar Pradesh
- Bihar
- Parts of Jharkhand and West Bengal

- **Child population:** 14.97 crore (child population is high in Uttar Pradesh)
- **Common climate hazards:** Flash floods, flood, drought and heat wave
- **History of climate hazards in the past 3 years:**
  - Bihar was affected by floods in July 2019 and 33 people are reported dead.

Ecosystem type: North east zone

- Assam
- Manipur
- Mizoram
- Meghalaya

- **Child population:** 1.26 crore (Assam and Meghalaya have a higher child population)
- **Common climate hazards:** Flash flood, flood, drought, landslide and forest fire
- **History of climate hazards in the past 3 years:**
  - Floods affected Assam in June 2019 and 700 people were moved to a relief camp.
  - In July 2019, heavy rainfall caused flooding and landslides in in 530 villages in Assam and Mizoram, displacing about 2 lakh people.

Ecosystem type: Semi-arid zone

- South-eastern Rajasthan
- Gujarat
- Punjab

- **Child population:** 0.54 crore
- **Common climate hazards:** Flash flood, flood, drought and landslide
- **History of climate hazards in the past 3 years and impact:**
  - Melt water from Himalayan glaciers and snowfields increases the flood risk during the wet season and strongly reduces the dry-season water supply.

Ecosystem type: Islands

- Andaman and Nicobar
- Lakshadweep

- **Child population:** 0.01 crore
- **Common climate hazards:** Cyclone, flood, drought, and heat wave
- **History of climate hazards in the past 3 years:**
  - None

Source: Census 2011; National Institute of Disaster Management (NIDM), 2014; National Family Health Survey (NFHS) 4, 2014-15; District Information System for Education (DISE)

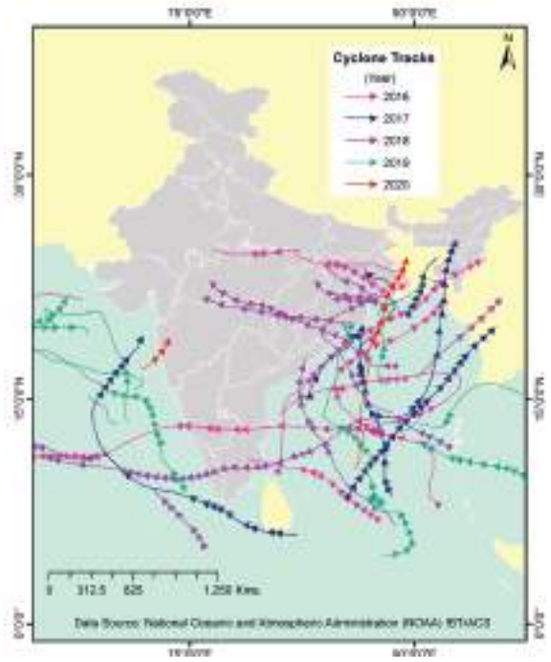
Table 3.2: Findings related to ecosystems and common climate hazards

Hazard: Cyclones

- Injuries
- Morbidity/mortality due to infectious diseases, water-borne diseases such as diarrhoea
- School dropout
- Psychosocial stress
- Child labour
- Child trafficking

- Approximately 5,700 km out of the 7,516-km long coastline is prone to cyclones.
- Around 100 million children are affected by storm surges and cyclones in Asia.
- In India, the most affected areas are the coasts of West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Maharashtra, Gujarat, Puducherry and Goa.
- Amongst these states, West Bengal, Odisha, Maharashtra have a high child population density.

Figure 3.2: Wind and cyclone map of India



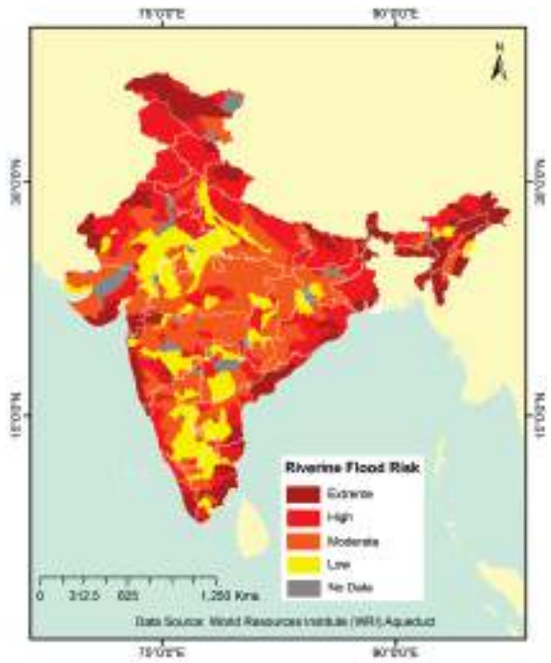
Source: PwC analysis of National Oceanic and Atmospheric Administration (NOAA) IBTrACS data

Hazard: Floods

- Drowning
- Injuries
- Morbidity/mortality due to infectious diseases, water-borne diseases such as diarrhoea
- School dropout
- Psychosocial stress
- Child labour
- Trafficking
- Orphanhood

- More than 12% of the total land (40 million hectares) is prone to floods and river erosion.
- A majority of the 340 million children in the Indian subcontinent affected by floods are from India.
- Parts of Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Odisha, Tripura, Meghalaya, and the coastline of West Bengal have medium to high frequency of floods and have a significantly high child population density.
- Landslides and avalanches cover about 15% of the landmass in the hilly areas.

Figure 3.3: Flood occurrence in India



Source: PwC analysis of World Resources Institute (WRI) Aqueduct data

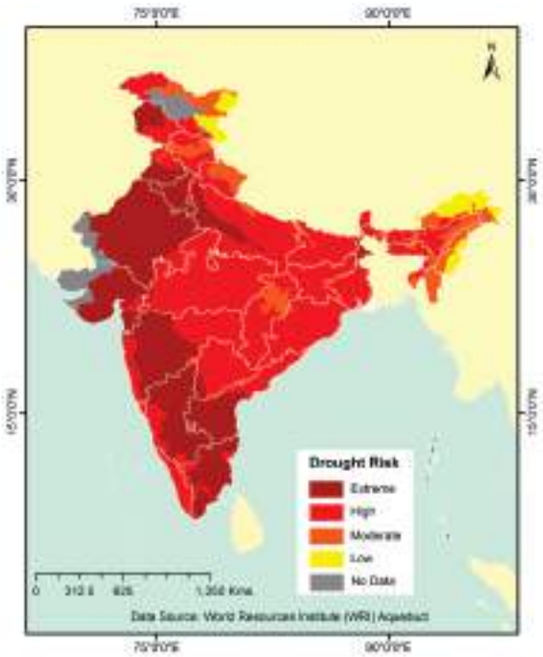
Hazard: Droughts

- Malnutrition
- Dehydration
- Infectious diseases
- Vector-borne diseases
- School dropout
- Child labour
- Psychosocial stress
- Orphanhood
- Trafficking

- About 68% of the cultivable area is vulnerable to droughts.
- 10 and 97 districts out of the total 640 districts fall under the 'very high' and 'high' risk categories, respectively, of heat vulnerability indices (HVIs).
- Around 27 million children in Asia are exposed to severe drought and water stress. A significant proportion of this child population is in the states of Rajasthan, Gujarat and Madhya Pradesh, which have medium to high drought severity.

Source: Census 2011; NIDM, 2014; NFHS-4, NFHS IV is 2015-16 DISE

Figure 3.4: Drought severity in India



Source: PwC analysis of World Resources Institute (WRI) Aqueduct data

Based on the analysis of hazards and ecosystems, states with a significant child population and greater vulnerability to climate hazards were identified. The states that were identified through this exercise underwent prioritisation and three states – West Bengal, Uttarakhand, and Madhya Pradesh – were selected. The four parameters considered for prioritisation were (1) child sex ratio, (2) school dropout rates, (3) prevalence of diarrhoea, and (4) percentage of children under 5 years who are stunted.

A brief profile of the states identified is presented in Tables 3.3 and 3.4.

Table 3.3: Profile of selected states

Ecosystem and hazards			
Particulars	**Madhya Pradesh**	**Uttarakhand**	**West Bengal**
Ecosystem type	Deccan plateau zone	Himalayan zone	Arid zone and Coastal zone
Common climate hazards	Droughts, floods, and heat waves	Floods, landslides, droughts	Floods, cyclones, droughts

Source: Primary survey done by PwC and Save the Children in 2019

Table 3.4: Parameters for selection and prioritisation of states

Parameters	India	Madhya Pradesh	Uttarakhand	West Bengal
Population (in crores) (Census 2011)	121	7.27	1.01	9.13
Child population (%) calculated from data on 0–19 year population from Census 2011	41%	44%	42%	37%
Child sex ratio (Census 2011)	908	912	898	949
Annual dropout rate at primary level (%) (Source: Rajya Sabha session - 245 Unstarred question no. 742, 2014-15)	4.13	6.59	4.04	1.47
Prevalence of diarrhoea (reported) among children in the last 2 weeks preceding the survey (%) NFHS-4	9.2	9.5	17.0	5.9
Children under 5 years who are stunted (height-for-age) (%) NFHS-4	38.4	42.0	33.5	32.5

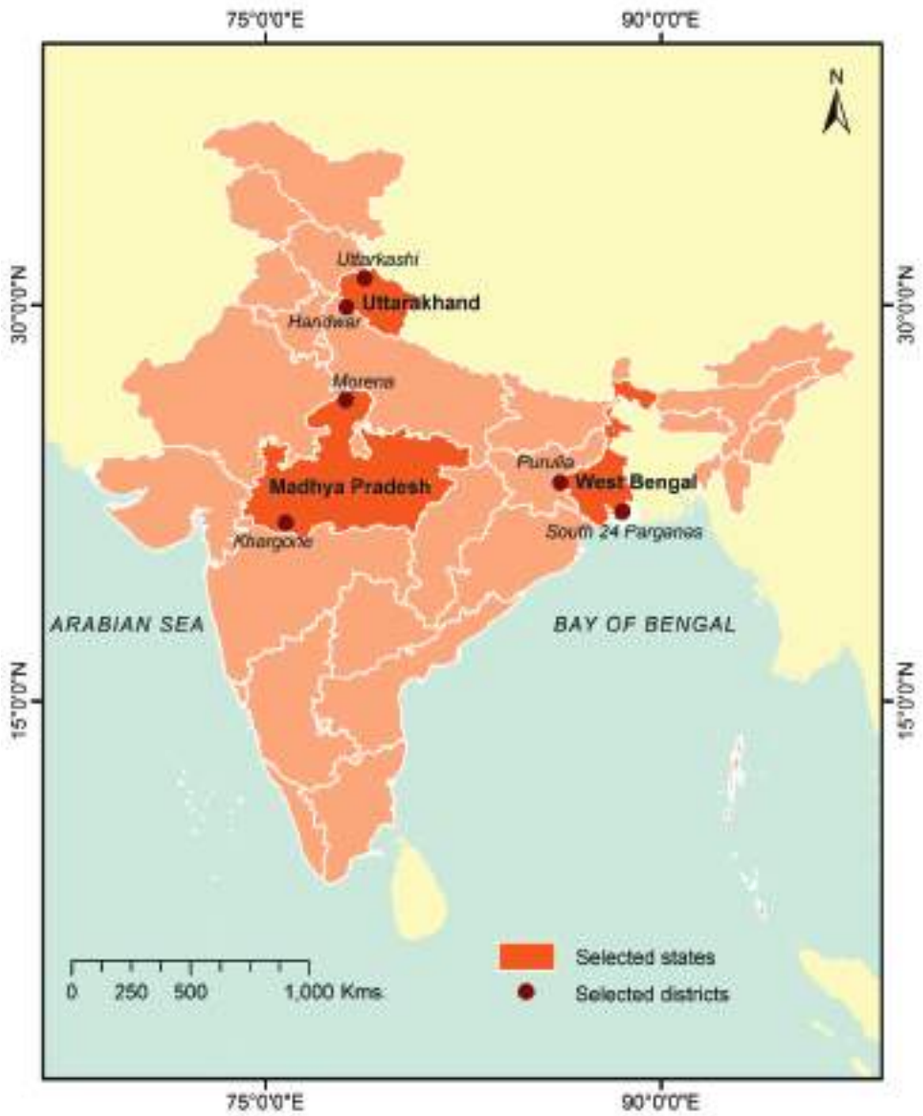
3.2. Identification of districts

From each of the identified states, districts were prioritised based on five parameters: (1) child sex ratio, (2) school dropout rates, (3) prevalence of diarrhoea, (4) percentage of children under 5 years who are stunted, and (5) reported issues related to climate hazards, disease outbreak/health issues, farmer suicides, and migration.

Two districts from each of the states were finalised for the study based on this analysis:

- Khargone and Morena in Madhya Pradesh
- Haridwar and Uttarkashi in Uttarakhand
- Purulia and South 24 Parganas in West Bengal.

Figure 3.5: Representation of study regions



Source: Primary survey done by PwC and Save the Children in 2019

A brief profile of the districts identified is presented in Table 3.5 and a map is provided in Figure 3.5.

Table 3.5: Parameters considered for selection and prioritisation of states

	Districts					
	Madhya Pradesh		Uttarakhand		West Bengal	
Parameters	Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
Population (in crores)	0.19	0.18	0.18	0.03	0.29	0.81
Child population (<18 years)	822,811	785,071	766,079	131,642	1,074,482	2,830,290
Child sex ratio (per 1,000)	813	956	870	925	937	957
Ecosystem type	Deccan plateau zone	Deccan plateau zone	Himalayan zone	Himalayan zone	Arid zone	Coastal zone
Common climate hazards	Drought, heat wave flood	Drought, heat wave	Flood, flash flood, drought, heat wave river erosion	Flood, flash flood, drought, heat wave	Drought, heat wave	Cyclone, flood, heat wave, drought
Annual dropout rate at the primary level (%)	32.21	25.14	46.02	38.05	36.07	33.29
Prevalence of diarrhoea (reported) in the last 2 weeks preceding the survey of children (%)	11.3	12.4	18.0	21.9	6.3	5.9
Children under 5 years who are stunted (height-for-age) (%)	47.7	48.3	39.1	35.2	45.5	27.3

Source: Census 2011; NIDM, 2014; NFHS-4, NFHS IV is 2015-16 DISE

Chapter 4

Children's vulnerability to climate change and its impact

This chapter discusses the methodology and findings of the assessment. After the selection of the study regions, the impact of climate change and related disasters and vulnerability of children to climate change were assessed. This assessment was carried out based on the risk/impact framework of the IPCC's AR5 (section 1.2) and the components of the framework – hazard, exposure and vulnerability (sensitivity and adaptive capacity) – were studied from the perspective of four groups of rights enshrined in the UNCRC (section 1.3).

4.1. Methodology

4.1.1. Research methods used for data collection

Primary and secondary data was collected to conduct this study. A mixed method approach was used to collect primary data, which involved the use of a combination of quantitative methods like a household survey and qualitative methods like focus group discussions (FGDs) and key informant interviews (KIIs) with stakeholders and key duty bearers. Secondary data was gathered through a literature review. The household survey, which involved a set of structured questions, formed the backdrop of the study and qualitative methods helped in understanding critical nuances which could not be captured though quantitative methods. Together, the primary survey and secondary research provided a holistic picture of study outcomes.

All the tools used for data collection were tested through a pilot survey and the feedback received was used to refine the tools. During the pilot survey, feedback on the household survey and FGD tools was obtained by engaging various respondents of different age groups and gender. In the case of the KII tool, stakeholders at different levels were involved during pilot interaction.

Household surveys: To conduct the primary survey of households, the sample size of 106 households per district in each of the study regions was calculated using the stratified random sampling approach:

$$N = \frac{z^2 p\,(1-p)}{e^2 + \frac{z^2 p\,(1-p)}{N}}$$, where

e = desired margin of error of ± 8%,

z = 1.65 corresponding to 90% level of confidence,

N = the size of the population (from census),

p = estimate of proportion of 50%.

Two blocks per district across the three states of Madhya Pradesh, Uttarakhand and West Bengal were selected in consultation with the local non-governmental organisations (NGO), based on the history of climate-related disasters in the region. A total of 636 households were surveyed in the 12 selected blocks (53 households per block). Households were selected according to population, spatial distribution (e.g. riverbanks, high hills and mid-hills) and socio-economic variations (e.g. caste, income) across the villages in the selected blocks.

Most of the respondents were in the age group of 31–60 years. The percentage of respondents below the age of 30 years was also high in South 24 Parganas (33%) and Haridwar (34%). More than 90% of the respondents were married, and in Uttarkashi, 6% of the respondents were widowed, which was the highest percentage among all the six districts. Almost 48% of the total respondents belonged to the scheduled caste (SC) category. However, the percentage of STs was negligible, in all the study regions except Purulia, where the ST population constituted 28% of the total population. A brief profile of the respondents surveyed is presented in Table 4.1.

Table 4.1: Profile of the respondents

		Madhya Pradesh		West Bengal		Uttarakhand	
Characteristics of respondents		Morena (%)	Khargone (%)	Purulia (%)	South 24 Parganas (%)	Haridwar (%)	Uttarkashi (%)
Household size	<5	20	37	22	45	13	21
	5–10	64	60	74	55	79	78
	>10	16	3	4	0	7	1
	Mean household size	8	6	6	5	7	6
Age (years)	≤30	26	25	23	33	34	24
	31–60	59	65	72	58	61	71
	> 60	15	10	4	9	6	4
	Mean age	43	39	41	39	39	40
Marital status	Unmarried	2	3	0	1	3	2
	Married	95	95	97	96	92	92
	Widowed	3	2	3	2	4	6
	Divorced/ separated	0	0	0	1	0	0
Caste	General	33	19	8	3	13	10
	Scheduled caste	31	19	23	81	37	23
	Scheduled tribe	13	5	28	15	0	15
	Other backward caste	24	57	42	1	50	52

Source: Primary survey done by PwC and Save the Children in 2019

FGDs: During the course of this study, a total of 108 FGDs were conducted involving the target segments of adolescent girls, adolescent boys and parents. A total of 18 FGDs were conducted per district (9 in each block). Adolescents (children in the age group of 10–18 years were considered as adolescents for this study) were chosen as it was felt that they would be more vocal and would participate in the discussion more proactively. Discussions with girls and boys were held separately at all the locations to keep the discussion free-flowing and non-judgemental. To gain a complete picture and to validate the findings of each group of people, parents were also spoken to. The information gathered was helpful in the triangulation of the findings from the primary survey.

KIIs: In addition to FGDs, KIIs were undertaken to triangulate the data from primary surveys. KIIs helped in understanding climate change from the perspective of the stakeholders who play an important role in the community as well as that of the key duty bearers from the health, education, police and women and child departments in the state. State-level and district-, block- and panchayat-level officials were consulted as part of KIIs. KIIs also helped in filling data gaps thrown up by household interviews. The stakeholders who were interviewed included the following:

- functionaries/officials from various government departments and agencies, including women and child development, forest department, health department, education department, police department

- district disaster management authorities (DDMAs)
- frontline workers (Accredited Social Health Activists [ASHAs]) and Anganwadi Workers [AWWs])
- heads and other teachers of schools
- local self-government officials
- functionaries from NGOs
- experts dealing with climate change issues related to children.

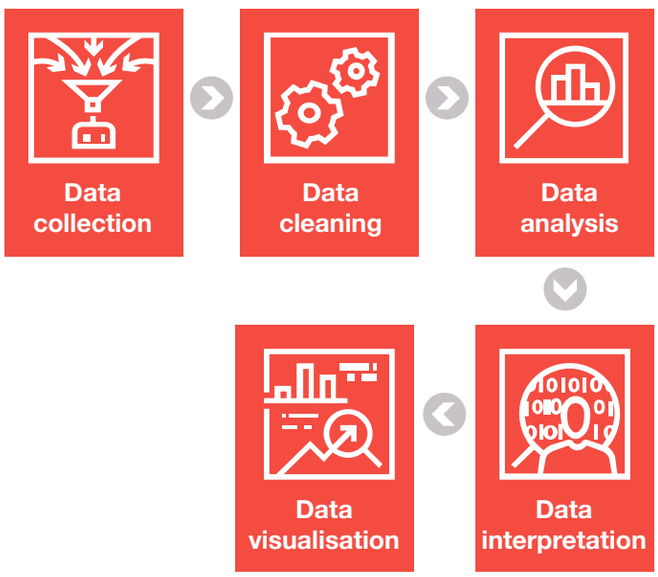
It is possible that all of the above stakeholders may not have been covered in all the blocks and district of the three states due to time constraints.

Due to paucity of time, all the methods (household survey, FGD and KII) were used concurrently. However, data was exchanged between the teams collecting quantitative data and qualitative data throughout the period of data collection. This helped in digging deeper into some issues which emerged from the household survey. Many of the FGDs and KIIs threw up several thought-provoking insights and these have been shared in the findings and analysis.

4.1.2. Data analysis

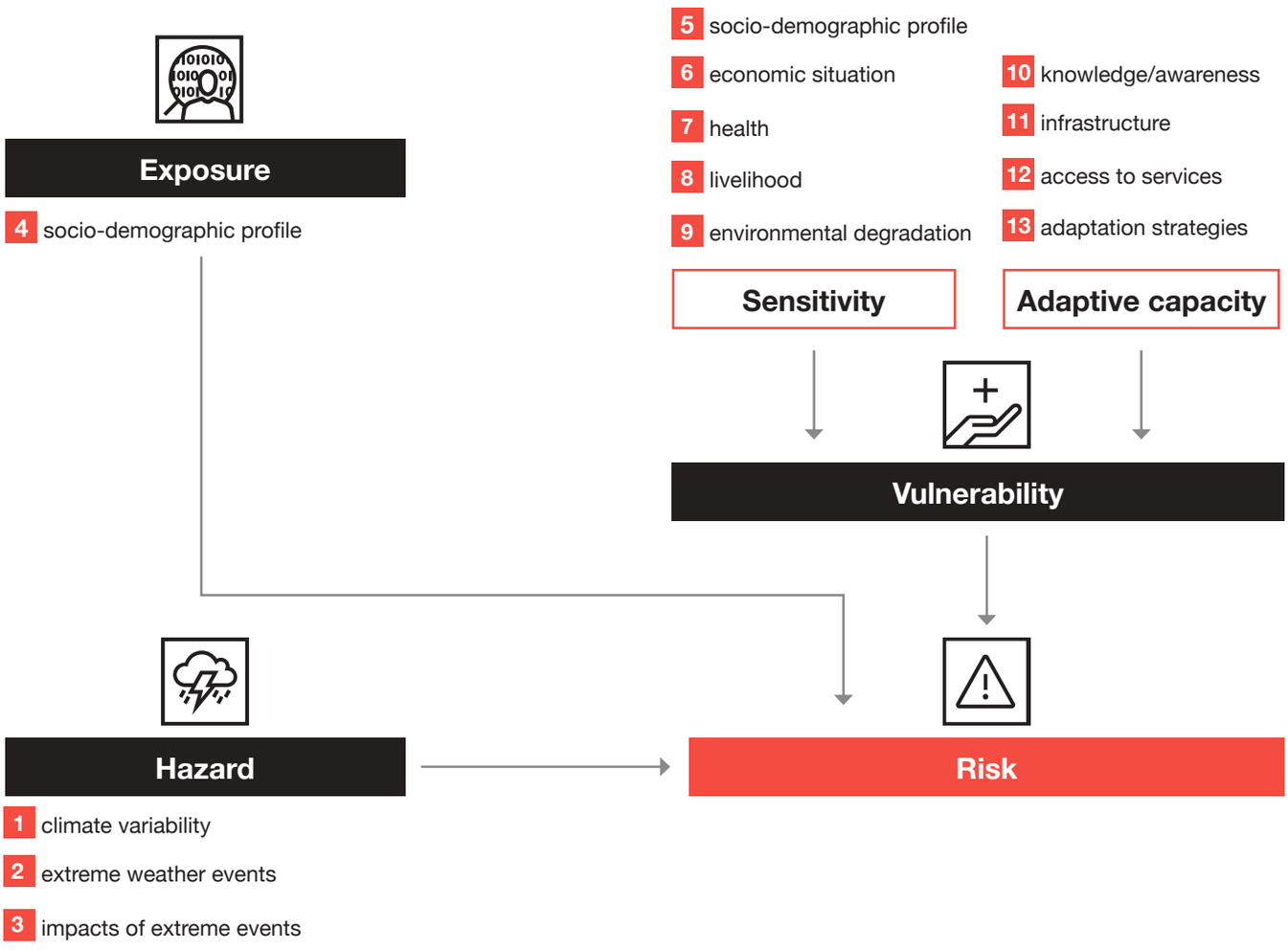
The analysis of data collected through household surveys, FGDs, and KIIs consisted of five steps (Figure 4.1). The Statistical Package for the Social Sciences (SPSS) software was used to analyse the basic features of the survey data.

Figure 4.1: Data analysis process



The analysis of data included study of the basic features of the survey using descriptive statistics. Further, a risk analysis was conducted following the IPCC's AR5 framework. Based on the literature review and available primary data sets, a total of 57 theoretically important and policy-relevant bio-physical and socio-economic variables (sub-components) were selected under 13 major components for each of the factors of risk in the framework. The methodological approach used for this assessment is presented in Figure 4.2.

Figure 4.2: Methodology for risk assessment



Source: Primary survey done by PwC and Save the Children in 2019

According to the IPCC's working definitions, the first three major components belong to the external dimension, which is climate-related stress (e.g. weather extremes) and represent hazards. The other major components are internal and comprise exposure and vulnerability. All the variables had a positive (+) functional relationship with the major components, except those under adaptive capacity (-).

The first step of the analysis was to derive the value for each major component using the concept of simple arithmetic mean:

$$AI = \sum Si/N \quad \ldots\ldots\ldots\ldots (1),$$

where AI is the value of the average index for each major component, Si represents the subcomponents (i denotes the ith subcomponents), and N is the total number of subcomponents in each major component.

The contributing factors indicated by the IPCC were determined by using the concept of weighted arithmetic mean:

$$CF = \sum (Wi.\ AIi)/\sum Wi \quad \ldots\ldots (2),$$

where CF stands for the contributing factors, Ali stands for the major components indexed by i, and Wi is the weight of each major component (number of subcomponents).

The risk index (RI), which is the combination of hazard (H), exposure (E) and vulnerability (V), was calculated using the formula below:

$$R = H \times E \times V \quad \ldots\ldots\ldots (3)$$

$$R = H \times E \times (S/AC) \quad \ldots\ldots\ldots (4)$$

4.2. Findings

Several important aspects that point to the risk and vulnerability of the communities living in the study regions emerged from the analysis of the general socio-economic profiles of the study regions. The key findings are presented in the following sub-sections, which correspond to the hazard, exposure, vulnerability (sensitivity and adaptive capacity), and risk-impact aspects of the IPCC's AR5 framework.

Each subsection answers the following questions:

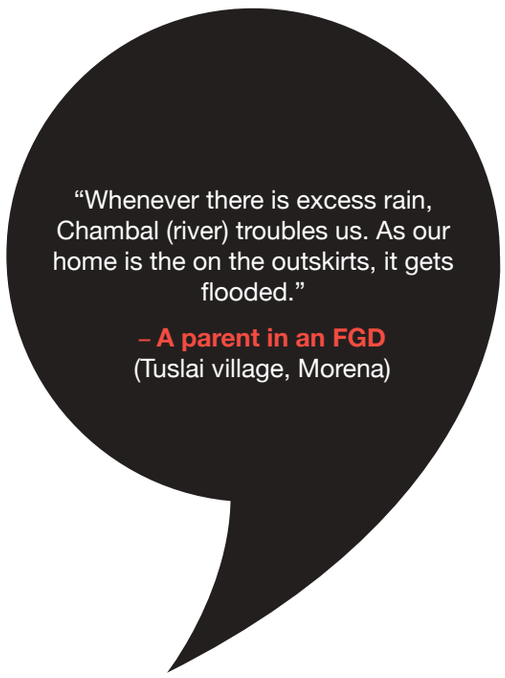
Subsection	Questions
Hazard	What are the **hazards** that have a bearing on households and thereby on children?
Exposure	Why are children more **exposed** to climate change?
Sensitivity	What are the factors that make households and children **sensitive** to climate change?
Adaptive capacity	What are the factors that increase the **adaptive capacity** to the impacts of climate change?
Risk/impact	Which are the communities or populations of children at **risk** to or impacted most by climate change?

4.2.1. Hazard – increase in frequency and intensity

To perform an assessment of climate change risk and impact on communities and children, it is important to first identify the hazard – a natural or human-induced physical event or trend or physical impact.[38] A likely increase in the frequency, intensity and duration of weather-related events is predicted as a result of climate change.[39] Through the household survey, respondents were asked if they noticed any changes in rainfall, temperature, seasons and the monsoon over the past five years and if the patterns of occurrence of extreme events such as floods, droughts and heat waves had changed during the same period in their region.

Temperature: As indicated in Figure 4.3 more than 70% of the households across all states agreed that the temperature had increased over the past five years. Nine out of ten households in the study regions in West Bengal and seven out of ten in the study regions of the other two states reported that the duration of the summer season had increased in the past five years. Further, most of the respondents said that winter, which usually lasted for over three months, had shrunk to one month, Temperatures were very low only for 10–15 days.

Rainfall: Three out of four households in all districts except Uttarkashi (54%) said that rainfall had decreased in the past five years. It was understood that monsoons had shifted from June–September to August–October over the years. A majority of the households across the states reported that the monsoon did not arrive on time. Due to cyclones or depressions, rainfall had become erratic.[40]

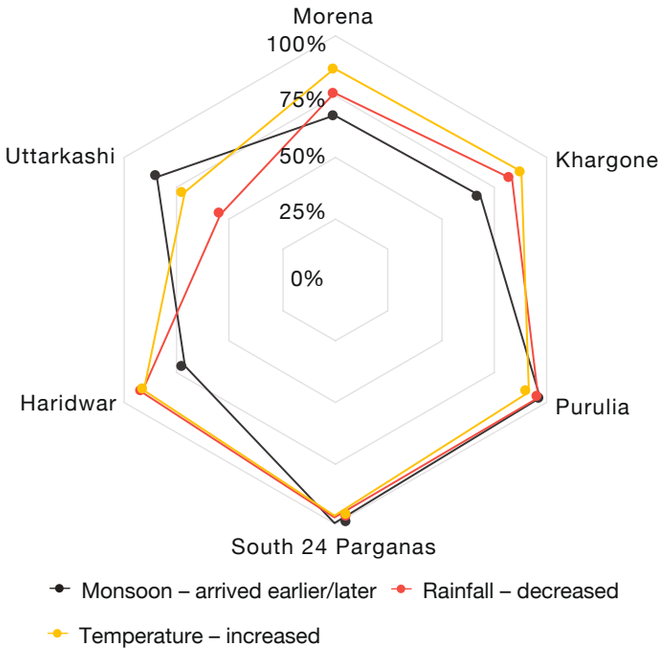


38 *Oppenheimer, M., Campos, M., Warren, R., Birkmann, J., Luber, G., O'Neill, B., Takahashi, K., Brklacich, M., Semenov, S., Licker, R. and Hsiang, S., 2015. Emergent risks and key vulnerabilities. In Climate Change 2014 Impacts, Adaptation and Vulnerability: Part A: Global and Sectoral Aspects (pp. 1039-1100). Cambridge University Press.*

39 *Global Facility for Disaster Reduction and Recovery, n.d. Available at https://www.gfdrr.org/en/india (Accessed October 2019)*

40 *Lal, M., 2003. Global climate change: India's monsoon and its variability. Journal of Environmental Studies and Policy, 6(1), pp.1-34.*

Figure 4.3: Perception of climate variability



Source: Primary survey done by PwC and Save the Children in 2019

In addition to temperature and rainfall variability over the years, extreme climatic events and their frequency were also explored from the community's perspective. More than 50% of the households reported that extreme weather events like floods, cyclones and erosion had become more hazardous and more frequent in the last 10 years.

Floods: South 24 Parganas had experienced significant flooding in the last 10-15 years.[41] Further, 90% of the households in the study region reported that occurrence of these events had increased substantially in the last 10 years. Haridwar is located on the banks of the River Ganges and is prone to river erosion. During monsoons, heavy rains regularly flood villages on the riverbanks. In 2013, a major flood that lasted for a week inundated the villages near the banks and it took them about two to three months to return to normalcy. One of the villages in the Gangdaspur district was inundated seven times in the past 30–40 years. In this study region, 76% of the households in Haridwar reported that riverine erosion had increased and 90% reported increased occurrence of floods. In Uttarkashi, 62% of the households also reported increased occurrence of floods.

Droughts: The alarming increase in the frequency of droughts is a common trend in all the three drought-prone districts – Khargone, Morena, and Purulia. More than 90% of the households in these study regions said that the frequency of droughts had increased significantly in the last 10 years. In addition, the respondents also noted that the situation had intensified due to the increased severity of heat waves in these regions.

Cyclones: Almost all the households in South 24 Parganas said that their household was more frequently affected by cyclones in the last 10–15 years.[42] This district has been a cyclone-prone area for more than a century and around 3,500 km of earthen embankments protect this region from daily onslaughts of the sea. On 20 May 2020, cyclone Amphan struck West Bengal and caused widespread damage throughout the South 24 Parganas district. Wind speeds of up to 190 kmph were recorded and heavy rains destroyed several river embankments across the Sundarbans. Houses and infrastructure rebuilt after cyclone Aila (2009) have sustained extensive damage due to cyclone Amphan.[43] The geographical characteristics of this region make it highly susceptible to erosion, which is aggravated by cyclones and floods. Moreover, 84% of the households reported increased coastal erosion and 96% said that they were more frequently affected by issues such as salt-water intrusion, which damaged crops and the quality of drinking water.

Landslides: Landslides are a common disaster in Uttarkashi,[44] and 64% of the households in Uttarkashi stated that the frequency of landslides had increased in the last 10 years. Further, 32% of the respondents in Haridwar also identified landslides as a common problem.

Other hazards: Instances of lightning and forest fires were reported by many of the households interviewed. The local communities in Morena mentioned hailstorms as a common hazard in the region.

4.2.2. Exposure – children will bear the brunt of climate change

Children have unique metabolic, physiological, and developmental needs, owing to which they are highly dependent on adults for their survival and development.[45] This greater reliance on adults can contribute to disproportionate vulnerability to climate change, including climate variability and extreme weather events. The 636 households surveyed had a population of 1,588 children (53% were male and 47%, female) with an average age 5–9 years. More than one-fourth of the households in all the districts had more girls than boys. The average number of children per household in Morena and Haridwar was three, which is higher than that in South 24 Parganas.

41 *Rudra, K., 2018. Flood in the GBM Delta. In Rivers of the Ganga-Brahmaputra-Meghna Delta (pp. 125-136). Springer, Cham.*

42 *Aila in 2009, Bulbul in 2019 and Amphan in 2020*

43 *Das, S., Ghosh, A., Hazra, S., Ghosh, T., de Campos, R.S. and Samanta, S., 2020. Linking IPCC AR4 & AR5 frameworks for assessing vulnerability and risk to climate change in the Indian Bengal Delta. Progress in Disaster Science, p.100110.*

44 *Sati, V.P., 2020. Increasing Events of Disasters. In Himalaya on the Threshold of Change (pp. 79-99). Springer, Cham.*

45 *Bartlett, S., 2008. Climate change and urban children: impacts and implications for adaptation in low-and middle-income countries. Environment and Urbanization, 20(2), pp.501-519.*

4.2.3. Vulnerability – vulnerabilities of households and children to climate change

Vulnerability is the propensity to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm, and lack of capacity to cope and adapt. Socio-demographic profile, health, livelihood, knowledge, infrastructure, access to services and adaptation strategies are important areas in this study for determining the vulnerability of households to climate change in terms of sensitivity and adaptive capacity.

A summary of the present socio-economic status of the study region is provided below:

Table 4.2: Simple distribution of the socio-economic characteristics of respondents (N = 636)

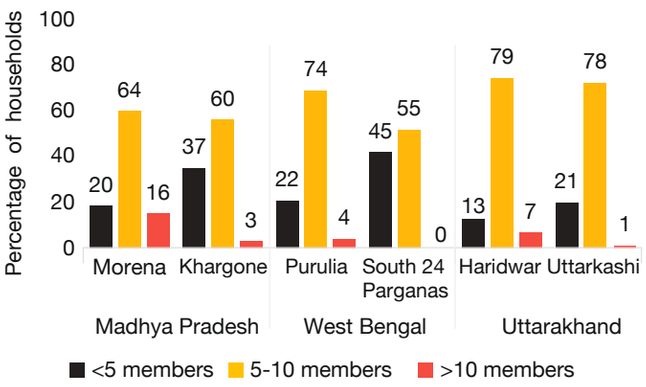
		Madhya Pradesh		West Bengal		Uttarakhand	
Characteristics of respondents		**Morena (%)**	**Khargone (%)**	**Purulia (%)**	**South 24 Parganas (%)**	**Haridwar (%)**	**Uttarkashi (%)**
Formal education	No education	29	16	31	25	20	12
	Primary education	26	40	31	27	51	33
	Secondary education	24	27	26	37	21	16
	Higher education	20	17	12	11	8	38
Main livelihood	Agriculture and allied activities	50	62	50	48	47	56
	Daily labour	31	26	23	21	37	11
	Regular salaried employee	6	3	3	2	0	8
	Small business owner	1	6	18	11	13	15
	Retired	5	2	2	3	0	3
	Unpaid home worker	8	1	3	16	2	6
Monthly income (INR)	No income	5	4	3	18	3	11
	≤3000	21	27	64	58	8	10
	3,001–6,000	26	30	23	15	39	37
	>6,000	48	39	10	8	50	41
Total observations		**106**	**106**	**106**	**106**	**106**	**106**

Source: Primary survey done by PwC and Save the Children in 2019

Sensitivity – factors that make households and children sensitive to climate change

Household size and type: Household size is one of the key factors that may contribute to the sensitivity of households to climate change. Households with a large number of dependents often have inadequate resources, and hence limited resilience to and ability to recover from hazards.[46] The size of the households surveyed in this study was rather large. In all the study regions except South 24 Parganas, it was more than five. In Morena, more than 15% of the households had more than 10 family members.

Figure 4.4: Household size

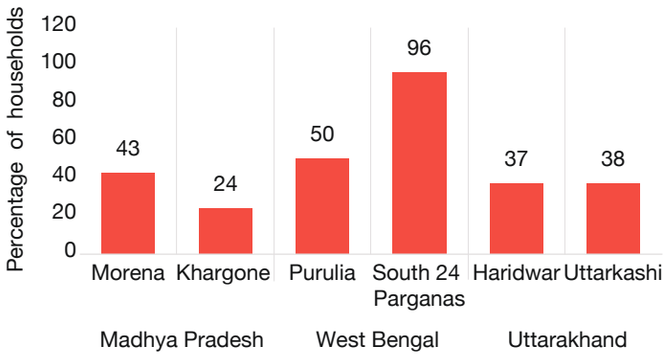


Source: Primary survey done by PwC and Save the Children in 2019

Further, 84% of the households were headed by a male family member and 16% were headed by females. A higher percentage of female-headed households was observed in South 24 Parganas (40%). A majority of the males from this region have migrated to other places for better livelihood opportunities. The higher percentage of female-headed households may increase sensitivity to climate change as women face challenges in terms of limited employment opportunities, lower wages and family care responsibilities, especially during disasters.[47]

Social composition: In India, caste is an important indicator of the social and economic status of households. SC and ST communities are economically backward and socially disadvantaged. These households are sensitive to the impact of climate change as they have limited resources and are mostly dependent on natural resources.[48,49] Of the total households surveyed, more than 50% of those in Purulia and more than 95% in South 24 Parganas belonged to SCs and STs and hence, the sensitivity of these study regions may be higher than that of the other regions.

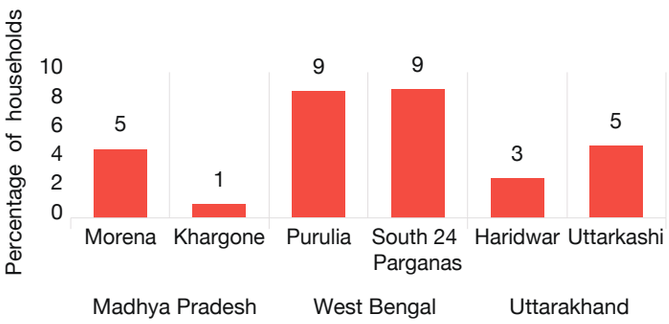
Figure 4.5: SC and ST households



Source: Primary survey done by PwC and Save the Children in 2019

Disability: Disabled people face a greater risk of vulnerability and are the most sensitive groups during natural hazards.[50] Survey data shows that disability was more prominent in Purulia and South 24 Parganas (9%).

Figure 4.6: Disability



Source: Primary survey done by PwC and Save the Children in 2019

46 *Adger, W. N., and Kelly, P. M., 1999. Social Vulnerability to Climate Change and the Architecture of Entitlements. Mitigation and Adaptation Strategies for Global Change, vol. 4, no. 3, pp. 253-266.*

47 *Armas, I. and Gavris, A., 2013. Social vulnerability assessment using spatial multi-criteria analysis (SEVI model) and the Social Vulnerability Index (SoVI model)–a case study for Bucharest, Romania. Nat. Hazards Earth Syst. Sci, 13(6), pp.1481-1499.*

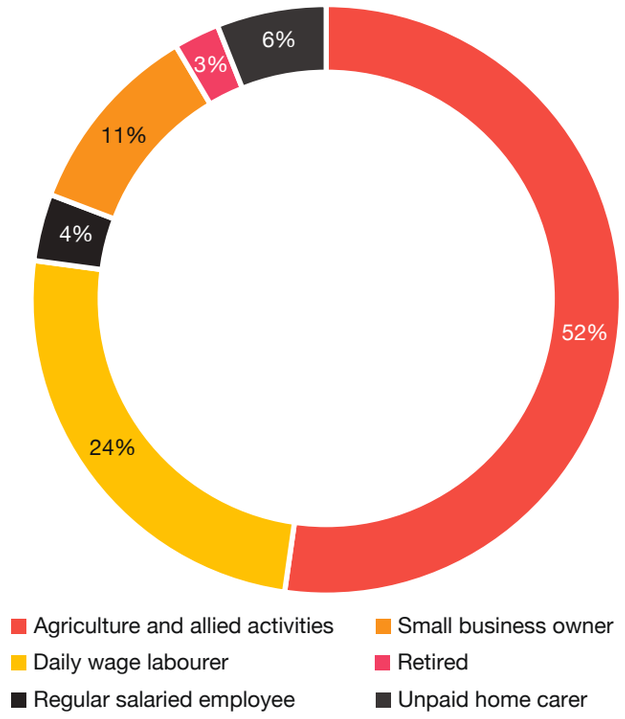
48 *Mehta, A.K. and Shah, A., 2003. Chronic poverty in India: Incidence, causes and policies. World Development, 31(3), pp.491-511.*

49 *Samanta, B., Das, S. and Hazra, S., 2017. Micro level vulnerability assessment of a community living in mousuni island in the Indian sundarban: An integrated study employing geoinformatics. In Environment and earth observation (pp. 195-213). Springer, Cham.*

50 *Gaskin, C.J., Taylor, D., Kinnear, S., Mann, J., Hillman, W. and Moran, M., 2017. Factors associated with the climate change vulnerability and the adaptive capacity of people with disability: A systematic review. Weather, Climate, and Society, 9(4), pp.801-814.*

Livelihood: The male respondents mostly reported their livelihoods as associated with agriculture and allied activities (52%) and daily labour (24%), whereas females were mainly unpaid home workers (Figure 4.7).

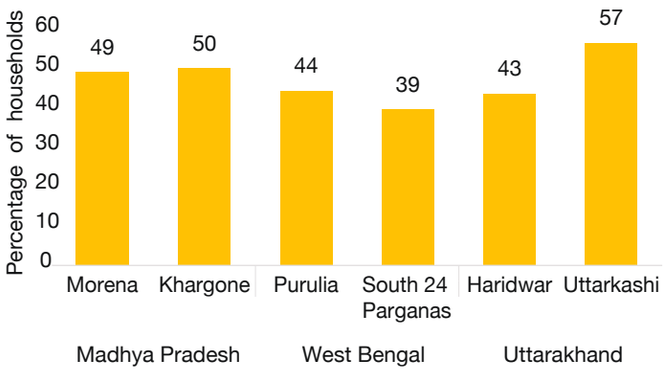
Figure 4.7: Main livelihoods of the respondents



Source: Primary survey done by PwC and Save the Children in 2019

Almost 43% of the households were mainly dependent on agriculture, which makes them more sensitive to climate change owing to their dependence on monsoons for crop production.[51] In most of the areas, a single cropping system is practised as the main source of livelihood, supported by seasonal vegetable production in a few pockets.

Figure 4.8: Dependence of households on agriculture



Source: Primary survey done by PwC and Save the Children in 2019

Economic situation: Economically disadvantaged people face greater risks due to lack of resources and information.[52] As a result, their nutrition intake, access to and affordability of healthcare facilities are affected, making them sensitive to hazards.[53] A considerable proportion of the respondent households (more than 25%) hold Below Poverty Line (BPL) ration cards in the districts of Purulia, Khargone and South 24 Parganas, which indicates their poor and marginalised condition.

"Many people are very poor in Khargone District. Poverty, lack of work and lack of awareness are the factors behind people sending their children as far as Maharashtra and Gujarat to work."

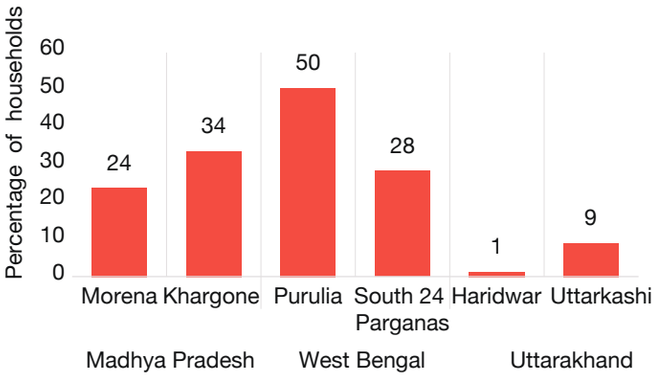
– **Chairperson,** Child Welfare Committee (CWC), Khargone

51 *Khatri, D., Arunachalam, A. and Arunachalam, K., 2018. Agriculture Dependence on Monsoon. Climate Change and Environmental Sustainability, 6(1), pp.85-87.*

52 *Vincent, K., 2004. Creating an index of social vulnerability to climate change for Africa. Tyndall Center for Climate Change Research. Working Paper, 56(41), pp.1-50.*

53 *Nguyen, C.V., 2015. Development and application of a Social Vulnerability Index at the local scale.*

Figure 4.9: BPL households

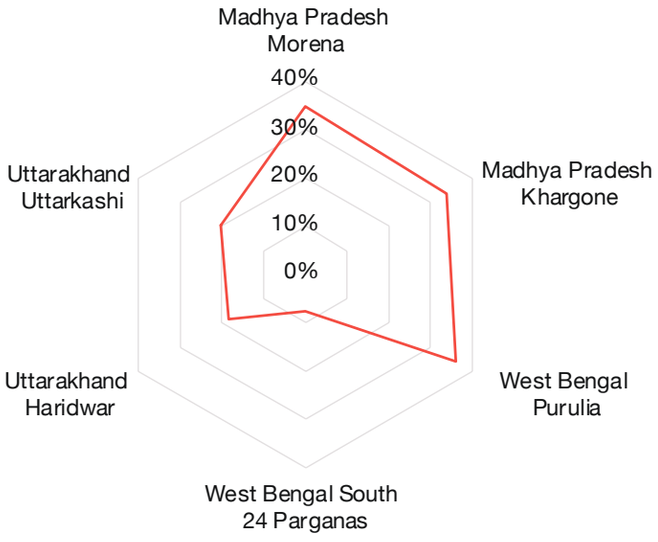


Source: Primary survey done by PwC and Save the Children in 2019

Though a monthly income of 5,000 is insignificant given the size of the families, a considerable proportion of households was earning even less than that amount. In South 24 Parganas and Purulia, more than 50% of the households have an income of less than INR 5,000 per month. However, in Morena and Khargone, only 25% of the households reported that their monthly income was less than INR 5,000 per month.

The household monthly incomes across the six districts in the three states show significant differences. The mean monthly income of respondents was INR 6,406, whereas it was only INR 3,404 in Purulia and INR 3,072 in South 24 Parganas (INR 1 = USD 0.014). More than 30% of the respondents earned less than INR 3,000 per month and 7% had no income. The low income directly corresponds to low food and nutrition intake in Khargone, Morena and Purulia. More than 35% of the households said that the members in the household were able to afford only one meal per day or even less at times highlighting the economic sensitivity of the households.

Figure 4.10: Instances of insufficient nutrition (one or fewer meals consumed per day)

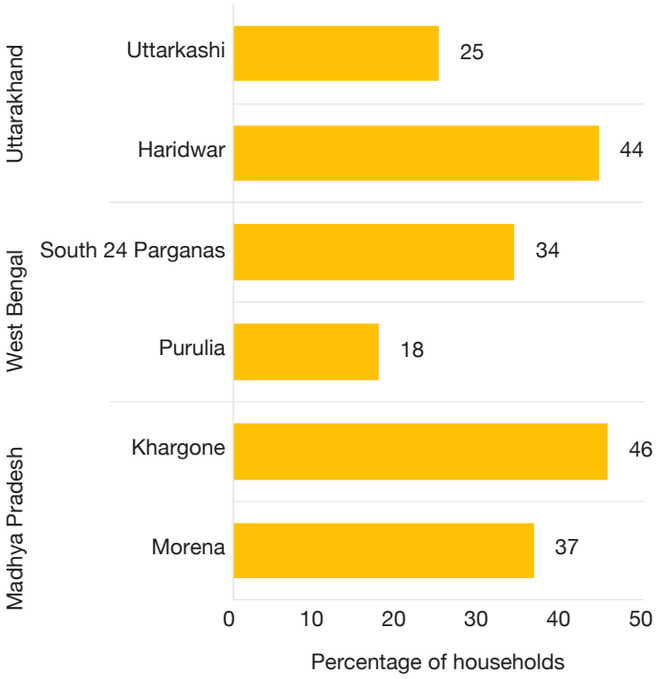


Source: Primary survey done by PwC and Save the Children in 2019

Issues related to insufficient nutrition were more prominent in landless households since they largely depend on casual labour work where remuneration is highly irregular. In Khargone, 58% of the respondents who reported insufficient nutrition were landless farmers. This situation was worse for ST households in Purulia. In Morena, Khargone and Purulia, households that did not have access to alternative livelihoods were more affected by nutrition insecurity (33%).

Indebtedness was one of the major consequences of the economic vulnerability of the households. The highest number of households reporting this issue was noted in Haridwar (44%). In Khargone, many households reported outstanding loans as a major problem, especially households that were BPL (42%). Further analysis showed that most of the indebted households had a loan amounting to more than INR 1 lakh (52%).

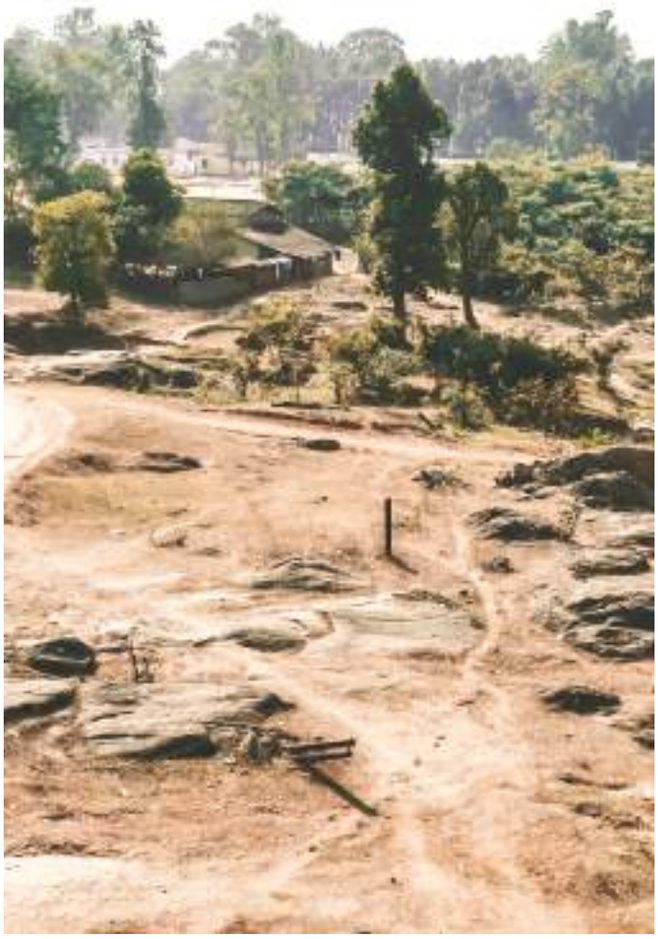
Figure 4.11: Percentage of households having outstanding loans



Source: Primary survey done by PwC and Save the Children in 2019

"Earlier we used to get various types and varieties of small fish, vegetables, leafy vegetables, etc. which we used to eat regularly. Nowadays these are not grown and are not available to us".

– Child Development Project Officer (CDPO), Jhalda II, Purulia



The study shows that the majority of the respondents had small houses with an area of less than 50 sq m, and almost 35% of the respondents had no farmland.

Common issues: Some of the key issues reported as key issues affecting socio-economic wellbeing in the study regions are food and nutrition insufficiency, water unavailability, health issues, lack of education and unemployment.

Table 4.3: Common problems in selected districts

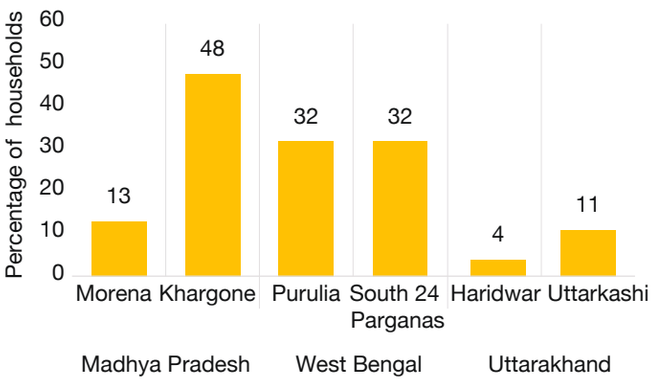
Subsection	Haridwar (%)	Khargone (%)	Morena (%)	Purulia (%)	South 24 Parganas (%)	Uttarkashi (%)
Insufficient nutrition	18	34	35	36	7	20
Water crisis	49	62	51	97	68	38
Health issues	56	34	41	93	98	44
Lack of education	37	17	37	64	61	52
Unemployment	54	20	53	88	94	56

Source: Primary survey done by PwC and Save the Children in 2019

In Purulia, 97% households reported water crisis. The decrease in groundwater level has affected the availability of drinking water in the area. Contaminated sources of drinking water lead to diarrheal diseases such as cholera, dysentery and typhoid. Most of the households mentioned that there are few job opportunities in the villages.

Health: The prevalence of malnutrition among children and anaemia (mild to moderate) among adolescents and women was evident in Purulia and South 24 Parganas (>20%). This can be attributed to poor nutritional intake. Malnutrition was observed more commonly in households where there was no proper support system for the care of children whose parents were working.[54] In around 30% of these households, and especially in Morena, South 24 Parganas and Haridwar, where children were diagnosed with malnutrition, the primary caregiver was absent. In West Bengal, predominantly SC/ST households reported primary caregivers absent, since women get involved in outdoor/income-generating activities. The absence of a primary caregiver is expected to adversely impact children's education, health and food security, which increases the households' sensitivity towards climate change adversities.[55]

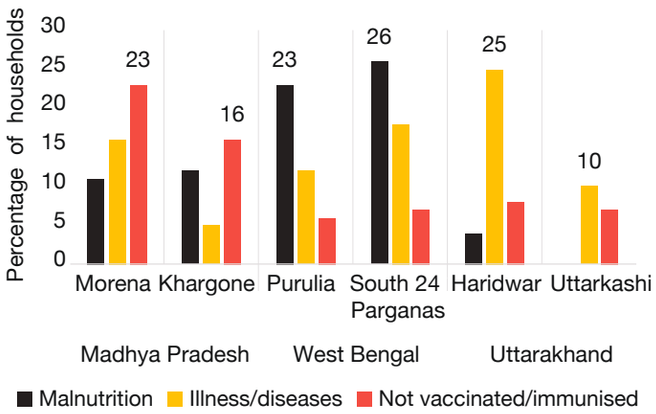
Figure 4.12: Absence of primary caregiver



Source: Primary survey done by PwC and Save the Children in 2019

In Madhya Pradesh and West Bengal, the girl child was found to be more severely affected by malnutrition. In Morena, the data revealed that a large majority (72%) of the households having a greater number of girl children were mostly affected by malnutrition. This figure was around 34% in Khargone, Purulia and South 24 Parganas. It was also found that children in SC/ST households and female-headed households suffered from insufficient food consumption and malnutrition to a greater extent than those in general households. This confirms the vulnerability of households living in acute poverty, having a greater number of girl children, headed by females, belonging to socially deprived groups like SCs and STs, and where the primary caregiver is absent.

Figure 4.13: Health-related issues



Source: Primary survey done by PwC and Save the Children in 2019

"We drink water from the hand pump in our school. It is very salty, but we have no option but to drink this water at the cost of our health."

– An adolescent boy in an FGD
(Tuslai, Porsa, Morena)

54 *Saxena, N.C., 2018. Hunger, under-nutrition and food security in India. In Poverty, Chronic Poverty and Poverty Dynamics (pp. 55-92). Springer, Singapore.*

55 *Manning, C. and Clayton, S., 2018. Threats to mental health and wellbeing associated with climate change. In Psychology and climate change (pp. 217-244). Academic Press.*

Parents going out in search of work leaves the responsibility of household chores to young girls. In Khargone and Purulia, there were girls in the age group of 10–12 years who cook food, clean the house and take care of younger siblings when both the parents go to work.

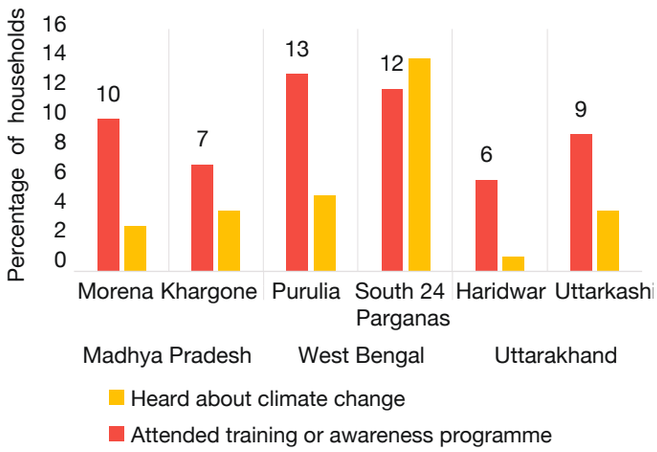
> "God does it. His will. How can human beings know why disasters happen?"
>
> **– A parent in an FGD**
> (Bhansadi village, Uttarkashi)

Adaptive capacity – factors that increase resistance to climate change

Education: Education increases the adaptive capacity and reduces vulnerability. It was observed that the number of respondents with primary education (35%) was higher than that of respondents with secondary and higher education. Further, the education level of male respondents was much higher than that of female respondents. This increases the social vulnerability of the study area.

Knowledge: This refers to general levels of education and awareness about climate change related issues.[56] Although the respondents were aware of changes in the climate, they lacked knowledge about the broader consequences and mitigation strategies. About 10% of the respondents across the three states had heard about climate change and 5% of the respondents had attended training on climate-smart agriculture. Less than 25% of the respondents had some knowledge of seasonal preparedness to face a disaster situation.

Figure 4.14: Awareness about climate change



Source: Primary survey done by PwC and Save the Children in 2019

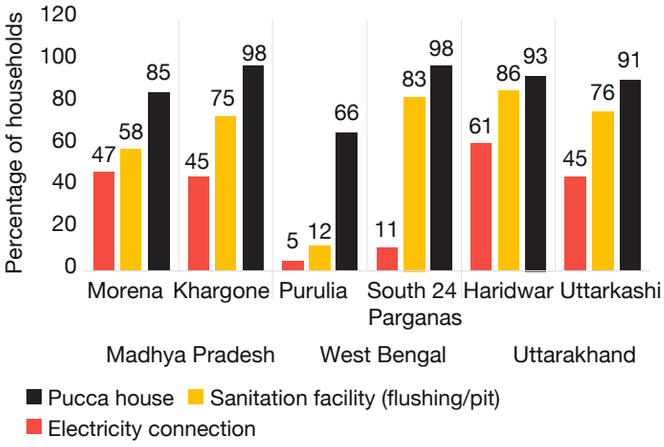
Infrastructure: Infrastructure is one of the important dimensions of adaptive capacity.[57] The weaker the infrastructure (pucca houses, sanitation, electricity, road networks), the lower is the adaptive capacity towards any climate change adversities. Considering the importance of infrastructure in determining the adaptive capacity of households, the study explored the availability of infrastructure to households.

56 *Adger, W.N., Brooks, N., Bentham, G., Agnew, M. and Eriksen, S., 2005. New indicators of vulnerability and adaptive capacity. Norwich: Tyndall Centre for Climate Change Research.*

57 *Cinner, J.E., Adger, W.N., Allison, E.H., Barnes, M.L., Brown, K., Cohen, P.J., Gelcich, S., Hicks, C.C., Hughes, T.P., Lau, J. and Marshall, N.A., 2018. Building adaptive capacity to climate change in tropical coastal communities. Nature Climate Change, 8(2), pp.117-123.*

About 55% of the houses in Haridwar, Khargone, Morena, and Uttarkashi were observed to be kutcha houses. The situation was worse in the districts of Purulia and South 24 Parganas, where more than 90% of the houses were of kutcha type. The kutcha structures are not well-equipped and strong enough to withstand devastating climatic events like floods, cyclones and landslides. This increases the sensitivity of households to climate change adversities.

Figure 4.15: Household infrastructure

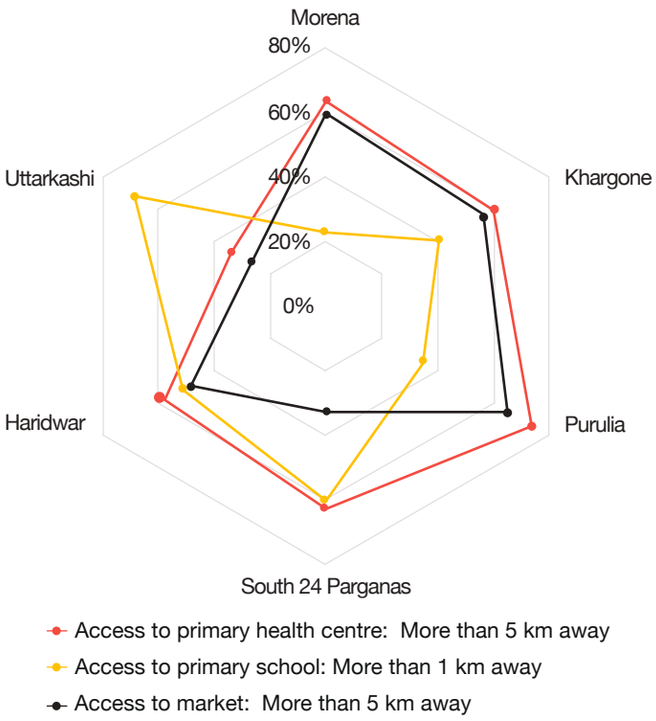


Source: Primary survey done by PwC and Save the Children in 2019

More than 70% of the respondents in Haridwar, Khargone, South 24 Parganas, and Uttarkashi had sanitation facilities, whereas only 12% of the households in Purulia and about 50% of the households in Morena had access to these facilities. The water crisis in Purulia is a key factor that contributes to wide-spread open defecation. Water crisis is major cause of poor utilisation of sanitation facilities even in households having toilets. Three out of four households in Khargone, Morena and South 24 Parganas have reported having an electricity connection and most houses have access to cooking gas. Purulia fares worse in terms of electricity connection and cooking gas as well. Slightly over 50% of the households in Purulia have access to grid electricity. Also, wood is widely used as cooking fuel.

Access to basic services: The distance between households and health and educational facilities is an important indicator for assessing the adaptive capacity.[58]

Figure 4.16: Access to basic services



Source: Primary survey done by PwC and Save the Children in 2019

"Every day we walk 8 km to reach school. We get very tired."

– An adolescent girl in an FGD
(Kurufa, Uttarkashi)

58 *Brooks, N. and Adger, W.N., 2005. Assessing and enhancing adaptive capacity. Adaptation policy frameworks for climate change: Developing strategies, policies and measures, pp.165-181..*

Most of the study areas only had primary health centres (PHCs) in the village, with limited medical facilities. In West Bengal and Madhya Pradesh, over 6 out of every 10 respondents reported that the PHC was located more than 5 km away from their house. This figure was 34% percent in the case of Uttarkashi. Only private doctors (mostly untrained medical professionals) are available to treat patients. Access to health services is also an issue due to poor connectivity of many interior villages like Tuslai and Barbai in Morena and Dumanpuri in Haridwar. These villages face the problem of last-mile connectivity. Ambulance services are provided to pregnant women or anyone who is seriously ill. But sometimes that too is a challenge. Often, patients are carried either on cots or a similar arrangement to the nearest hospital.

"We do want to send our children to school – who doesn't? But filling up the stomach is a more urgent need than education, that's why we are forced to make our children work."

– A parent in an FGD
(Narayanpura village, Khargone)

With regard to access to school, in Morena and Purulia, more than half of the respondents reported that the primary school was located within 1 km from their house. In Khargone and Haridwar, more than one-third of the respondents reported that their primary school was located within 1 km of their houses. In the South 24 Parganas and Uttarkashi districts, the percentage of respondents reporting access to a school within 1 km was 19% and 11% respectively. In some villages of Uttarkashi, upper primary and secondary schools are located very far and children have no option but to walk these long distances. For instance, in Kurufa village, children walk about 7 km every day to access schooling beyond grade 8.

In the SC and ST pockets of villages in Khargone and Purulia, it was found that children were not going to school and were instead involved in income-generating activities owing to chronic poverty.

Existing coping strategies: Climate change implications on livelihoods are more pronounced in the case of agriculture[59] and people adopt different strategies to adapt their livelihoods to the changing climate.[60] Change in crops sown by farmers is one of the important strategies being adopted by some farmers across the study region. Many farmers are using increased quantities of fertilisers or investing more in irrigation to cope with the effects of climate change. Most of the households lacked knowledge about the response strategies that need to be adopted to deal with climate change.

59 *Olsson, L., Opondo, M., Tschakert, P., Agrawal, A., & Eriksen, S. E. (2014). Livelihoods and poverty. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*

60 *Heltberg, R. and Bonch-Osmolovskiy, M., 2011. Mapping vulnerability to climate change. The World Bank.*

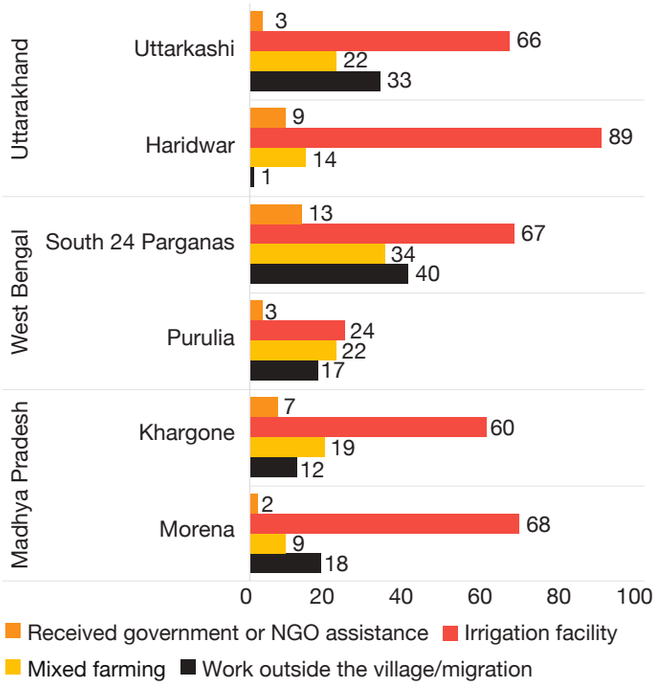
Table 4.4: Change in cropping pattern

Adaptive strategy	Morena (%)	Khargone (%)	Purulia (%)	South 24 Parganas (%)	Haridwar (%)	Uttarkashi (%)
Cultivated new species	15	45	29	40	21	33
Diversified crops	13	54	10	40	14	34
Climate-tolerant crops	6	43	13	8	25	21
Average	**11**	**47**	**17**	**29**	**20**	**29**

Source: Primary survey done by PwC and Save the Children in 2019

The most common response strategies were increased fertiliser use and irrigation. About 70% and 62% of the households reported using fertilisers and implementing irrigation systems. Adaptation measures such as mixed farming, cultivation of climate-tolerant crops, crop diversification, etc., were not commonly practised by households. Respondents were unaware of crop insurance schemes that enable farmers to make up for their losses due to crop damage. Work outside the village provides additional income to households, which increases their adaptive capacity.

Figure 4.17: Response strategies



Source: Primary survey done by PwC and Save the Children in 2019

Images 1 and 2: Autonomous adaptation – water filtration and crab collection

Image 3: Autonomous adaptation – solar energy and raised floor height

Institutional support: The West Bengal Government has launched 'Bangla Shashya Bima Yojana', a new scheme which will provide crop insurance coverage to farmers, especially for the kharif season. But this coverage is dependent on declaration of drought or loss of crop production. Low productivity due to dry spells during the monsoon season is not always covered. Further, a mini kit is provided by the block-level administration to eligible farmers where seeds, fertilisers, pesticides and medicine are provided at subsidised rates. However, farmers have raised a concern that these kits often do not reach them as distribution is delayed due to departmental processing issues. If the seeds are not sown during the season, the yield is low. Often, seeds are destroyed with no yield at all.

As highlighted by the District Disaster Management Office (DDMO) and State Disaster Management Office (SDMO), Purulia, the Disaster Management Department makes an annual plan (block, district to state level) based on the vulnerability and hazard-specific matrix. In Purulia, apart from drought, lightning, etc., flash floods have occurred in a few blocks. Likewise, planning (e.g. pre-monsoon preparedness meetings) is done with every functioning line department (administration, health, public health engineering, animal husbandry, agriculture, irrigation, education, civil defence, electricity, telecommunication, police, fire etc.). Rain patterns are also recorded and analysed by the agriculture department. The release of water from dams under the Damodar Valley Corporation (DVC) is coordinated with the state government's Disaster Management Department. Inter-departmental planning and coordination are also carried out during the relief and response phase for distribution of relief materials (food, shelter and garments) to vulnerable families and victims of disaster. Initiatives like community-level installation of solar pumps and rainwater harvesting are also taken up as per the directives.

"Whenever there is a crisis, we attempt to help."

– Senior Superintendent of Police (SSP), Haridwar

The Disaster Management Officer (DMO) in Haridwar mentioned creating 12 baadchowkis (flood control centres) in the district. These centres will be functional 24x7 during the monsoon (15 June to 30 September). The centre will have at least three people at any point of time (one each from the education, health and food departments). Police personnel will also be present with wireless walkie-talkies. Equipment like ropes, searchlights, public address system and life jackets will also be available. Tehsil control rooms will operate during the monsoon. These control rooms will be located near or above the baadchowkis. The DMO also mentioned that 200 aapdamitra (flood volunteers) have been trained. These volunteers will act as lifeguards during floods and create awareness among villagers. The food and control department will arrange for food during floods.

> "Weather monitoring, dissemination of information and coordination with key government departments are some of our key responsibilities to manage disasters and we have been working on these very sincerely."
>
> – **Akash Joshi,** Sub-Divisional Magistrate (SDM), Dunda, Uttarkashi

The DMO of Haridwar has initiated a school safety programme. Through this programme, they are reaching out to all schools to prepare a school safety plan. Infrastructure of schools is a serious issue as the strength of enrolled students is very high in each school due to shifting of families from the hills to Haridwar.

In Khargone, to address the challenge of an anticipated disaster, a meeting is usually held with all departments under the leadership of the district collector. Alerts are issued to blocks and villages if a disaster is expected. For instance, the District Project Officer (DPO) – National Health Mission (NHM) in Khargone mentioned that when the temperature touched 47.5° C in 2019, the collector called for a meeting with leaders from departments. At that meeting, the health department discussed health-related issues such as heat strokes due to extreme heat. Following the meeting, an advisory was issued to the blocks and further down to ASHAs to make them aware about heat strokes and take precautions. As heat strokes also cause mental health issues for some people, Mann-Kaksha in the district helped in dealing with this issue in Khargone. Under the Mann-Kaksha model, the Government of Madhya Pradesh has established a room dedicated to mental health in all 51 district hospitals in the state.

The Madhya Pradesh state government announced the Nutrition Smart Village scheme, under which the problem of malnutrition will be addressed in villages. The idea behind the scheme is to connect modern agriculture and food systems to nutrition-sensitive programmes and policies. According to the DPO for Integrated Child Development Services (ICDS) scheme in Morena, this scheme has the potential to connect agriculture and nutrition in villages and address the issue of climate change to some extent. This scheme involves collaboration among different departments. According to the DPO, in an identified village, a micro plan is formed as per the agro-climatic environment of the area. A nutrition test is also conducted in the village to identify the nutrient needs of people. By matching the nutrient needs of village with the agro-climatic zone, crops are suggested to people. However, according to the DPO for ICDS, inter-departmental coordination is key to the success of this scheme, and this aspect needs to be strengthened.

In Uttarkashi, the MGNREGS is a huge relief to families, especially when their crops get affected due to any disaster or problems like change in the pattern of rainfall. People feel that MGNREGS is very helpful as it gives them much needed economic cushion in difficult times. In Bhansadi village, small 'naalis' were constructed to bring water from the mountains to the fields under the scheme. During FGDs, the community suggested that different asset-creation works such as building small walls for controlling soil erosion can be undertaken.

It was found that in the last five years, more than 90% of the households hadn't received any assistance from government sources for livelihood diversification. Most of the children did not benefit from any social security or welfare programmes (health, education, etc.). This could negatively influence their performance at school and decrease the adaptive capacity of the household.

Civil society organisations: In a few pockets of Purulia, PRADAN, a civil society organisation, is training farmers on drought-resistant agricultural crops, which is beneficial to the community. An NGO from Meerut has left an aapda control number (on the walls of an anganwadi centre which can be contacted in times of crisis. They have also provided resilience training to some of the centres.

4.2.4. Risk/impact – increasing influence on livelihood, health and children

Extreme weather events, including heavy rainfall, heat waves, droughts, floods, cyclones contribute to injury, illness, hunger, malnutrition, displacement, and death of children.[61] Climate variability impacts agriculture, livelihoods and availability of water, and this affects the health and well-being of communities and children. The direct and indirect impact of these changes on the environment and socio-economic sectors like water resources, agriculture and human health as well as the implications for children are presented in Table 4.5.[62]

Table 4.5: Climate-related hazards and impact

Potential impact on natural and human systems and implications for children due to climate change			
Hazards	**Impact on key socio-economic sectors**	**Impact on household health and well-being**	**Implications for children**
Heat waves	Reduced crop yields, water crisis, wider range of disease vectors	Increased risk of heat-related mortality and morbidity, more vector-borne diseases, food shortages, income loss	Heat stress for young children, vector-borne diseases, malnutrition, reduced options for play outside, have to remain indoors
Flooding	Crop damage, soil erosion, waterlogging, contamination of water	Death and injuries, increase in water-borne diseases, vector-borne diseases, decreased mobility, food shortages, mental health issues, economic loss	Risk of death and injury, more vulnerable to water-borne and vector-borne diseases, acute malnutrition, reduced options for play and social interaction, unable to attend school, school dropout, involvement in income-generating activities
Cyclones	Crop damage, damage to tree cover, disruption to water supply, livestock deaths		
Drought	Land degradation, lower crop yields, livestock deaths, increased risk of forest fire, water stress	Food and water shortages, malnutrition, water-borne diseases, increased risk of mental health issues, loss of livelihood/income	Health risk from inadequate drinking water supply, risk of malnutrition, involvement in income-generating activities
Salinisation	Salinisation of soil, reduced crop yields, saline/salty groundwater	Food and water shortages, malnutrition, loss of livelihood/ income	Health risks from salinisation of water supply
Landslides	Damage to crops and trees, disruption to water supply	Decreased mobility, food shortage, water scarcity, risks to mental health, economic loss	Risk of injury, unable to attend school, school dropout

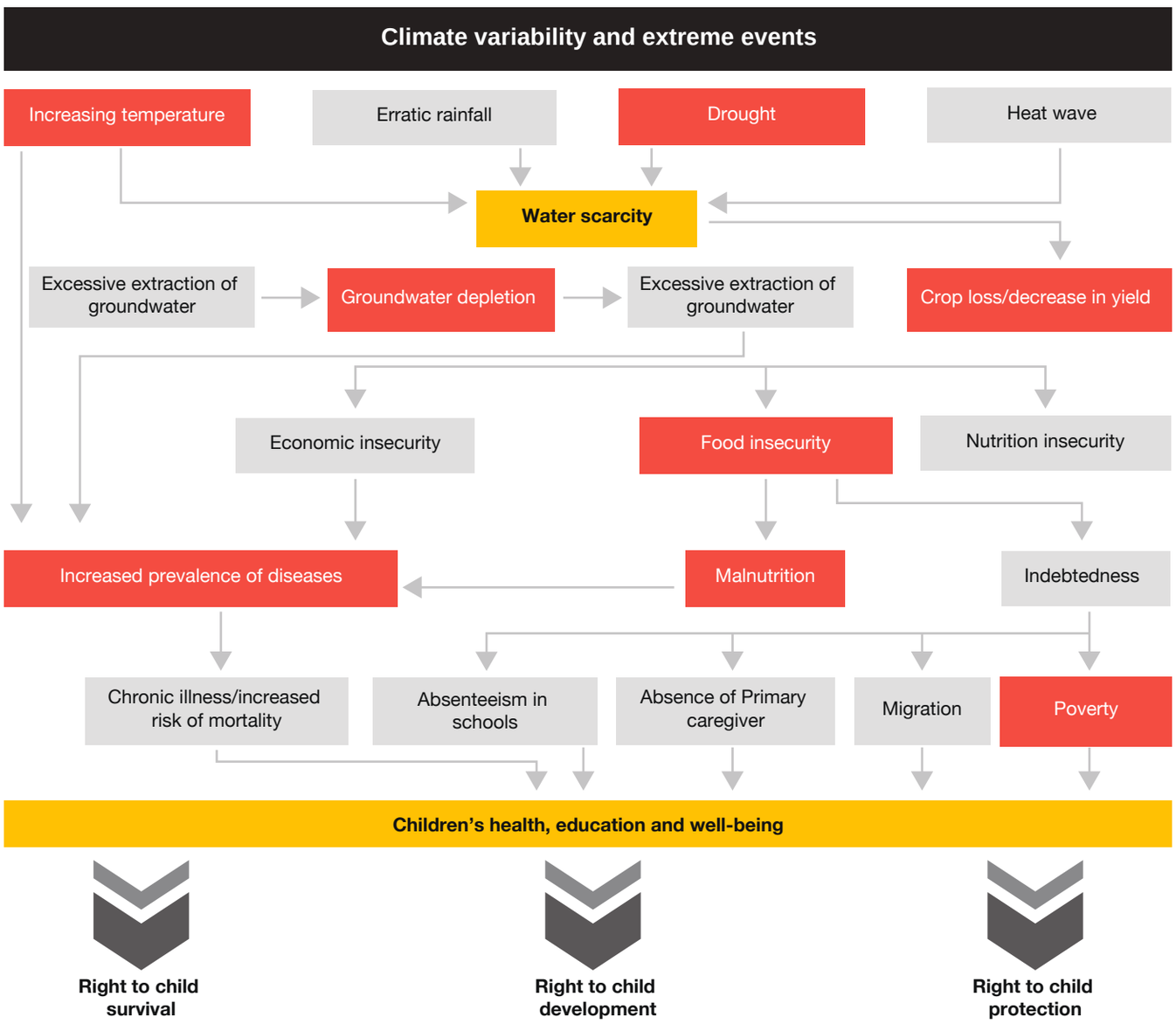
Source: Primary survey done by PwC and Save the Children in 2019

61 *Xu, Z., Sheffield, P.E., Hu, W., Su, H., Yu, W., Qi, X. and Tong, S., 2012. Climate change and children's health—A call for research on what works to protect children. International journal of environmental research and public health, 9(9), pp.3298-3316.*

62 *United Nations Framework Convention on Climate Change, 2007. Climate change: impacts, vulnerabilities and adaptation in developing countries. Bonn, Germany: United Nations Framework Convention on Climate Change.*

The key indirect and direct impacts as well as implications for children are illustrated in 4.18, 4.19 and 4.20. Details are discussed in the subsequent sections. The key district-wise observations from our primary survey are presented in the Annexure 1.

Figure 4.18: Impact of climate change on children in Madhya Pradesh



Morena, Madhya Pradesh

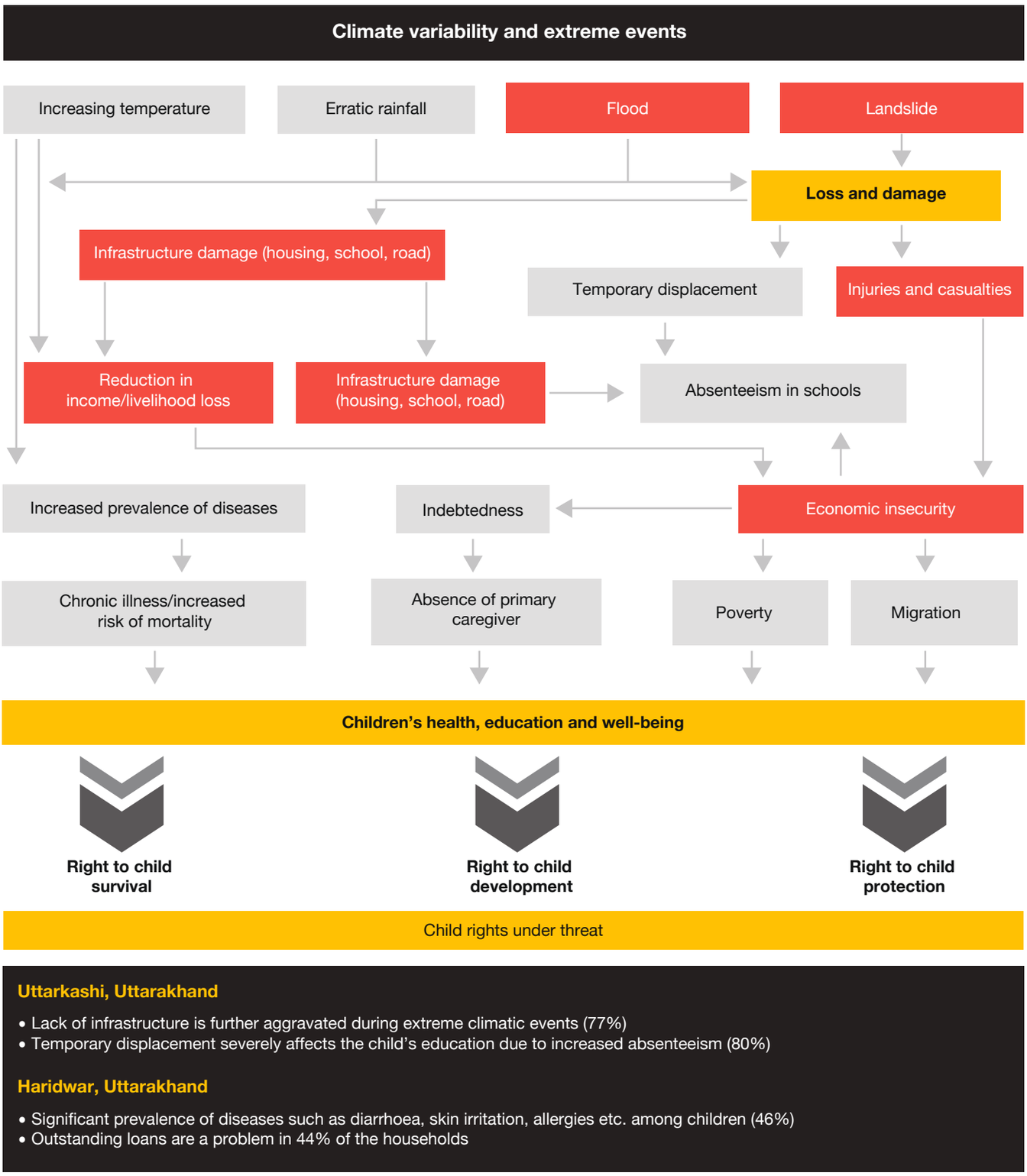
- High susceptibility of children to water- and vector-borne diseases (~36%)
- Indebtedness of the household forced children to leave schools (~12%)

Khargone, Madhya Pradesh

- 50% of the primary care givers work as crop farmer or daily wage labourers
- Households below poverty line (42%) are found to be highly indebted (loan >1 lakh, 52%)

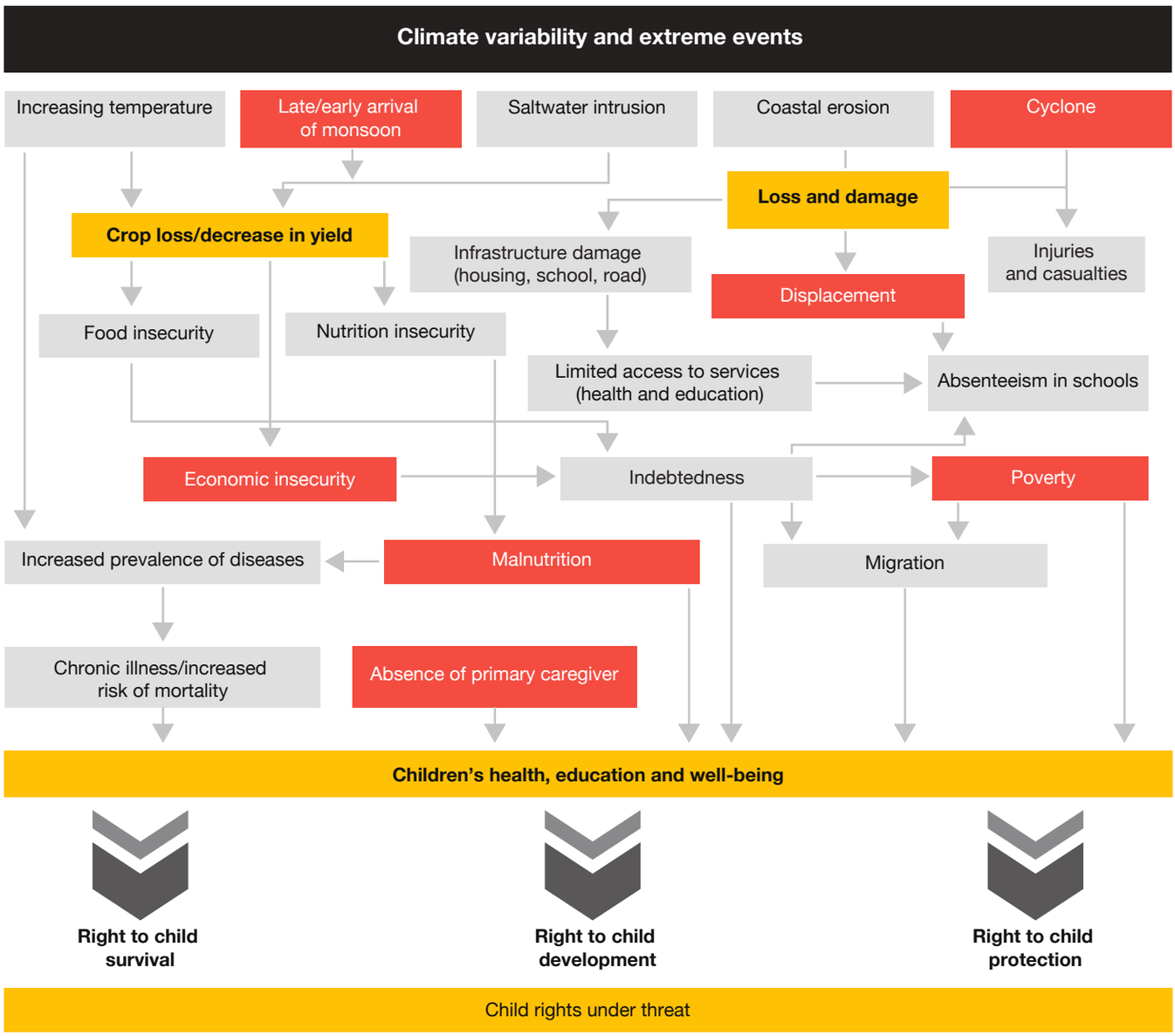
Source: Primary survey done by PwC and Save the Children in 2019

Figure 4.19: Impact of climate change on children in Uttarakhand



Source: Primary survey done by PwC and Save the Children in 2019

Figure 4.20: Impact of climate change on children in West Bengal



South 24 Parganas, West Bengal

- Widespread out-migration (~50%); primarily among scheduled caste (~60%), especially men (~80%)
- Lack of alternative/secondary livelihood options increases vulnerability of local people and exposes them to extreme events (~50%)
- Resource poor communities like scheduled tribe are more vulnerable to food and nutrition insecurity (~55%)

Purulia, West Bengal

- Acute poverty in more than 50% of the households
- Decrease in crop productivity and loss of livelihoods leads to food insecurity (~60%)

Source: Primary survey done by PwC and Save the Children in 2019

Loss of livelihood and economic insecurity

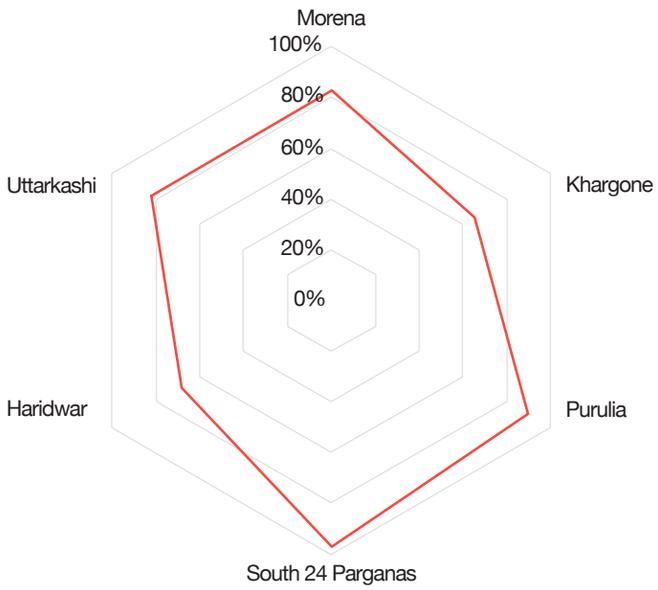
Climate variability and related hazards pose a serious threat to people's lives through the impact on livelihoods and economic security due to decreased crop yield, crop damage and loss of livestock. The impact on economic security has serious consequences for children as it can lead to poverty and increased indebtedness, thereby affecting children's education, health and food security. Absence of alternative sources of livelihood aggravates the problem.

43% of the households in the study regions were dependent on agriculture and are directly impacted by changes in temperature and rainfall patterns. At least 60% of the households in all the study regions acknowledged the negative impact of climate change on economic security, with the highest impact reported by about 93% of the households in Purulia and South 24 Parganas. Extreme events (flood, drought, cyclone) have negatively impacted crops and livestock in at least 75% of the households in Morena, Uttarkashi, Purulia and South 24 Parganas.

"We are working hard to stop road accidents due to landslides. We conduct a survey of all roads, identify danger zones, and share that information with the District Magistrate as well. We have placed 217 sign boards at important points on roads."

– **Pankaj Bhatt,** Superintendent of Police (SP), Uttarkashi

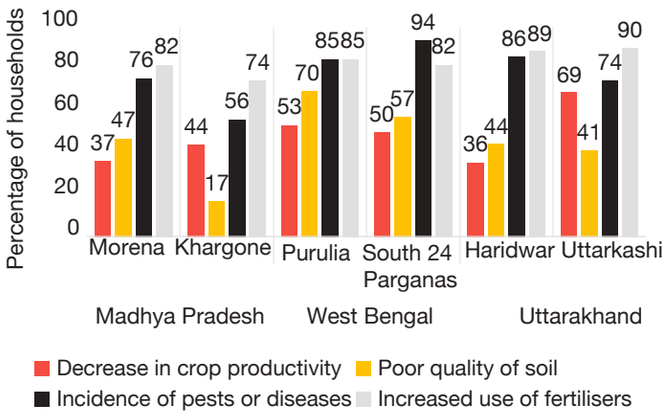
Figure 4.21: Impact of climate change on economic security



Source: Primary survey done by PwC and Save the Children in 2019

Increasing temperature, changes in precipitation, and the occurrence of extreme events have impacted agricultural production in the study regions as any deviation from the normal rainfall pattern can lead to reduction in crop production. In Khargone, Morena and Purulia, about 50% of the households reported that drought or lack of seasonal rainfall and depletion of groundwater have led to a decrease in crop productivity. Loss of crop productivity amounting to at least 20–30% in the last few years were reported by more than 50% of the households in Purulia and Uttarkashi. Though hybrid quality seeds requiring less water and fewer days to harvest (around 110–115 days as opposed to 140–150 days earlier) are used, the yield of paddy has reduced by around 60–70% in Purulia due to infrequent and insufficient rainfall. Another impact experienced by farming households was the reduction in the number of crops or delay in the sowing of crops because of delayed rainfall.

Figure 4.22: Observed changes in livelihood



Source: Primary survey done by PwC and Save the Children in 2019

Table 4.6: Impact of climate change on crop productivity

Districts	Monsoon/rainfall	Crop productivity (percentage of respondents)			
		Not sure	Decreased	Increased	Stayed the same
Morena	Monsoon – arrived late	0	37.5	25	37.5
	Rainfall – decreased	0	40	25	35
Khargone	Monsoon – arrived late	2.9	50	20.6	26.5
	Rainfall – decreased	5.6	50	22.2	22.2
Purulia	Monsoon – arrived late	2.3	55.8	32.6	9.3
	Rainfall – decreased	4.7	53.5	32.6	9.3
South 24 Parganas	Monsoon – arrived late	3.0	57.6	18.2	21.2
	Rainfall – decreased	3.0	57.6	18.2	21.2
Haridwar	Monsoon – arrived late	0	40	20	40
	Rainfall – decreased	0	36.4	22.7	40.9
Uttarkashi	Monsoon – arrived late	0	63.3	10	26.7
	Rainfall – decreased	0	66.7	16.7	16.7

Source: Primary survey done by PwC and Save the Children in 2019

In Chara village in Uttarkashi, agriculture productivity was affected in recent years. It was reported that the rice crop turns reddish very early, thereby affecting the yield. Reduced tomato cultivation was also reported because of insect attacks.

> "The plant grows out of the seed well, but after some time, the flower turns black, which means that it is affected by disease."
>
> – **A parent in an FGD** (Chhara village, Uttarkashi)

Purulia is also well known for lac cultivation, but for the last few decades, production of lac has decreased due to changes in weather conditions. Thus, the population dependent on the lac industry has also faced a major setback in terms of livelihoods and sustenance.

Hailstorms are one of the major problems affecting crops in Morena. Hundreds of acres of crops were destroyed by hailstorms last year. In Haridwar, villages that are located near the riverbanks experience seasonal erosion, which reduces soil quality. Additionally, farmlands tend to get submerged as the river changes its course after extreme events. Loss of farmland forces land-owning farmers to cut costs and engage in daily labour.

Livestock are also reported as affected due to climate related events. In Uttarkashi, according to people in Kufara village, lightning recently killed more than 150 goats and sheep in a nearby village. According to them, such losses are a huge burden on the households.

"Earlier, we were not required to use as much insecticide in the fields. Now, due to the increase in temperature, insects have also increased. We cannot grow any crop without relying on insecticides, which ultimately increases the production/input cost."

– A parent in an FGD
(Narayanpura village, Khargone)

Images 4 and 5: Crop disease

In most of the study regions, people were forced to change the crops they grow and the timing of crops due to the changing weather patterns. To increase yield, farmers tend to use of artificial irrigation, fertilisers, insecticides and pesticides increasingly leading to substantially higher input cost for agricultural production. Almost 80% of the households admitted to increased use of fertilisers and pesticides. However, this affects soil fertility in the long term and put pressure on the groundwater table, leading to further degradation of the environment.

Agricultural labourers are affected by the reduction in the number of crops or delay in sowing of crops due to delayed rainfall as they get less income-generating work. In almost all the villages, people from lower castes and class were the ones working predominantly as agricultural labourers. The problem of low and irregular rainfall also affects these landless agricultural labourers. As these sections are already vulnerable, decline in availability of work further compounds their problems. The fact that wages received by agricultural labourers for a day's work are extremely low makes lack of availability of work even more painful for their families.

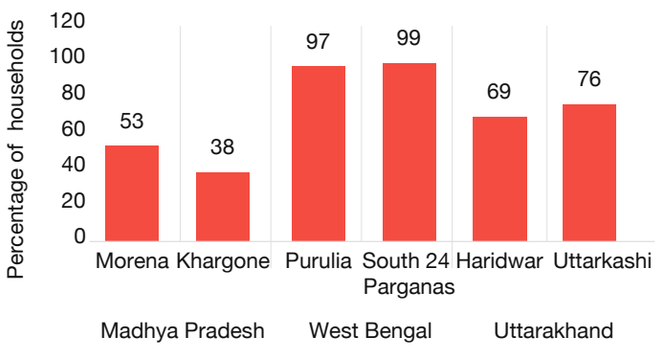
It was found that in Morena and Purulia, indebtedness of the household due to poor agriculture productivity had forced some children to leave school. In some households, it was observed that crop loss had led to economic insecurity and forced the primary caregiver to look for additional sources of income.

Water distress

Climate change impacts water resources by changing the flood or drought frequency, water availability, and seasonality of water discharge. Ground and surface water sources can get depleted due to drought. Sea level rise can cause saltwater intrusion into water bodies and groundwater. Cyclones and floods can affect clean water availability.

Water crisis is a common problem across all the states. This issue was more prominent in Khargone (>50%). Decrease in groundwater level had affected the availability of drinking water for children, causing dehydration (20%) in the district. Extreme events can contaminate sources of drinking water, which can lead to water-borne diseases such as cholera, dysentery and typhoid. A negative impact of climate change on drinking water was reported by 60–70% of the respondents in Uttarkashi and Haridwar and more than 90% in West Bengal. During the monsoons, the unavailability of doctors in the vicinity aggravates problems caused by water-borne diseases. In the survey region, 58% of the households fetched water from surface water/dug wells or tube wells. In Khargone, in households where it was the women's responsibility to fetch water, the absence of the primary caregiver was also an issue. In the near future, children can be expected to face the worst impact of water-borne diseases due to increase in temperature and water scarcity.

Figure 4.23: Impact of climate change on drinking water



Source: Primary survey done by PwC and Save the Children in 2019

In Purulia (in the two study blocks), there is scarcity of water for drinking, household and agricultural purposes. There is no irrigation system in this subdivision (out of 4) to meet the water requirement for agricultural purposes. The groundwater table has declined as tube wells dry up during the summers. The government has also restricted the construction (prior permission has to be sought) and extraction of water from dug wells using motor pumps for agricultural use as this depletes groundwater resources. People are dependent on pond water for bathing, cleaning, washing and other domestic water requirements. The riverbeds also dry up during the prolonged summers. People residing near the rivers have installed electric pumps to draw water from the rivers for agriculture. Those living in peripheral areas are the worst affected by this water scarcity. Due to the water crisis, the benefit of the Swachh Bharat Abhiyan has not been realised in Purulia, where open defecation is the norm even among households having toilets.

"Hailstorms occur almost every year. They cause tremendous damage to our crops."

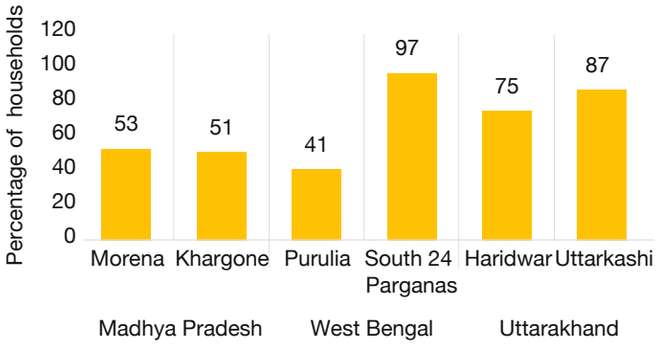
– **A parent in an FGD** (Morena village, Morena)

Loss and damage

Damage to houses and other infrastructure has a detrimental effect on education of children. Short-term relocation hampers school activities. Additionally, damaged roads and difficult terrain affects access of children to school.

Damage to housing due to extreme events was reported by more than 75% of the households in Haridwar, South 24 Parganas, and Uttarkashi. Kutcha houses, constructed mainly of mud, are more prone to damage due to extreme weather events. In Uttarkashi, extreme rainfall, coupled with instances of cloudbursts, made the homes on hillsides very susceptible to a mudslide/landslide. During the field visits, cracks were observed in the walls of the some of the houses in Chara village of Uttarkashi. Even the flooring in a few houses had cracks caused by heavy rains and landslides. Villages that are located near riverbanks in Uttarkashi were especially affected by floods. The people of Bhansadi in Uttarkashi mentioned that 12–13 houses were damaged in their village and some of the nearby villages in the floods in 2013. There is a lot of fear among all residents, including the children, and families relocate to safer places every monsoon.

Figure 4.24: Impact of climate change on housing (e.g. damage to buildings)



Source: Primary survey done by PwC and Save the Children in 2019

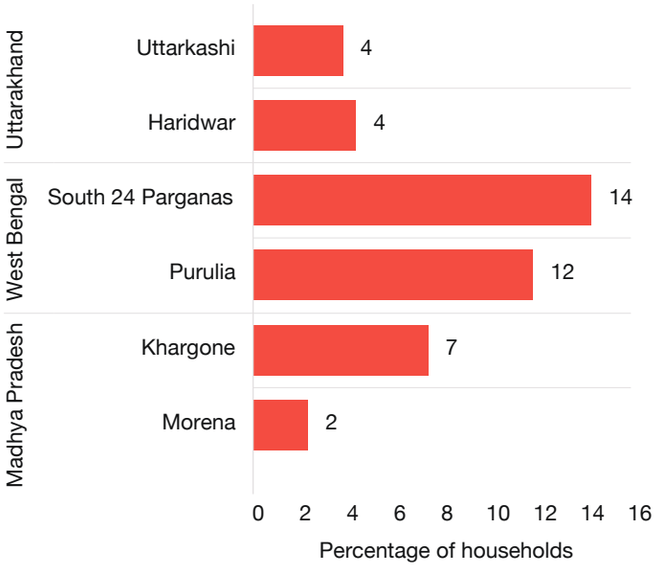
Access roads to quite a few villages in the region were either non-existent or in very poor condition and the villages often get cut off from the plains during landslides. In Uttarkashi, there have been many instances where children could not be taken to hospitals due to lack of access. In Morena, waterlogging is the main problem in village lanes due to poor drainage. Parents as well as children reported that children's education gets affected as children find it difficult to commute to schools.

Migration

The rising temperature and change in monsoon pattern and extreme events like floods, cyclones and erosion have impacted the livelihoods of local inhabitants, who are primarily dependent on agriculture and fisheries. This is forcing individuals/households to migrate to other parts of the country. This movement has a serious impact on children, including absence of primary caregiver, fragmented families and disrupted social networks. The negative effects of migration on children are low performance in school, absenteeism, illness and involvement in household activities (cooking, water collection, wood collection). Children's health, lives and futures will be hampered the most due to this increase in climate-induced migration.

Respondents were asked if any member of the family or the entire family had to migrate in the aftermath of a climate-related disaster. In Khargone, Uttarkashi and Haridwar, 4–7% of the respondents said this was the case, while in South 24 Parganas, this figure was 12–14%. Incidences of severe flooding have compelled people to move away from vulnerable areas in South 24 Parganas more frequently. Many have found employment in leather factories in Mumbai and Bengaluru. People of South 24 Parganas consider migration as a survival strategy against climate-induced stress/extreme events. Indebtedness is also a major driver of migration across the states.

Figure 4.25: Climate-induced migration



Source: Primary survey done by PwC and Save the Children in 2019

Due to migration, the number of youths in the village has decreased. As a result, local workers are unavailable in normal situations or during disasters. It was found that non-migrant households in South 24 Parganas and Purulia intended to migrate in the future (~20%). Children's health, lives and futures will be hampered the most due to this increase in climate-induced migration.

In-depth interviews in Purulia suggest that low agricultural production is acting as a push factor for migration of earning members of the family (either the father or both parents) to distant states like Kerala, Karnataka, Maharashtra and Gujarat, where they find employment in the unorganised sector as construction workers, factory workers (daily labour) and garment factory workers (daily labour). They also migrate to the neighbouring states of Bihar and Jharkhand as brick kiln workers (family migration). Some of the agricultural labourers also seasonally migrate to the neighbouring district of Bardhaman to work on paddy fields.

In Khargone, lack of work and low rainfall is leading to migration of labour. There are instances of whole families moving to Indore to work in soybean fields and to Gujarat. Education of children is affected due to this migration.

Insufficient nutrition: Considering the fact that there is a decline in agricultural productivity and agricultural labourers are struggling to get work, climate change may put further strain on children's nutrition. It was understood that due to the lack of alternative livelihood options, declining crop productivity has resulted in declining food security. Food insecurity majorly relates to food shortages, whereas nutrition insecurity or malnutrition is closely tied to unhygienic conditions and both affects children's health and wellbeing. When children are malnourished, their susceptibility to diseases is higher and this leads a vicious cycle of ill health and undernourishment. More than 50% of the respondents in all the districts except Uttarkashi mentioned that insufficient nutrition as a result of factors caused by climate variability and extreme events has led to malnutrition in children.

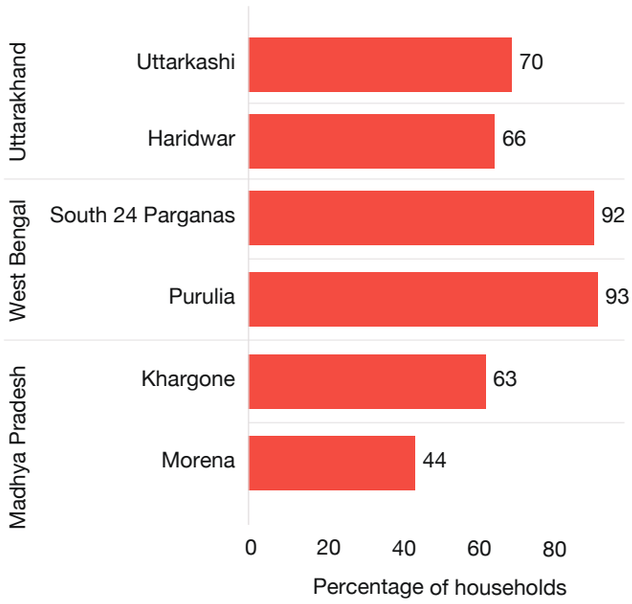
"Malnutrition is a problem here. We have made efforts from our side to address this issue – for instance, by working on schemes like Nutrition Smart Village."

– **DPO, ICDS,** Morena

As per the DPO of the ICDS, malnutrition is also a problem in Madhya Pradesh. The DPO – NHM in Khargone highlighted the problem of extreme weather conditions, which makes children vulnerable to various illnesses. As per NFHS-4 data, more than 48% of the children in Khargone are stunted and more than 44% are underweight, which highlights a huge undernutrition burden in the district. NFHS-4 data also shows that about half of all children below the age of five are stunted and more than half of those in this age group in Morena are underweight. Locally grown nutritious food items that the people used to eat are no longer produced, and this has lowered their immunity levels as per the local elders.

Insufficient nutrition is common among households with a monthly income of less than INR 5,000 and is a key contributing factor to malnutrition and chronic illnesses (~40%) across all the states.

Figure 4.26: Percentage of households impacted by food insufficiency



Source: Primary survey done by PwC and Save the Children in 2019

Health issues

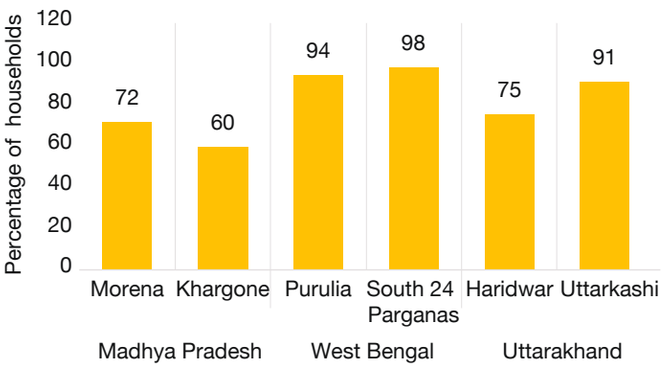
The health of the population is affected by shifts in weather patterns and other aspects of climate change as it increases incidence of vector- and water-borne diseases. Insufficient access to clean drinking water and proper sanitation facilities increases health risks especially of children. Contaminated sources of drinking water lead to diarrheal diseases such as cholera, dysentery and typhoid. Extreme weather events increase the incidence of vector- and water-borne diseases. After extreme events, due to contaminants in drinking water and sanitation, diarrhoeal illnesses can take more lives than the initial extreme event. Qualitative data revealed that diarrhoea also leads to higher levels of malnutrition, increased susceptibility to other illnesses, and effects on the overall development of children.

Majority of the households in the study regions reported that climate change has impacted heath. More than 90% of households in Purulia, South 24 Parganas and Uttarkashi reported health impacts of climate change.

"Often, leeches get stuck on our feet and suck blood. Even going to school has become risky. When I move to the temporary house, I am unable to attend school regularly."

– An adolescent girl in an FGD (Karuda village, Uttarkashi)

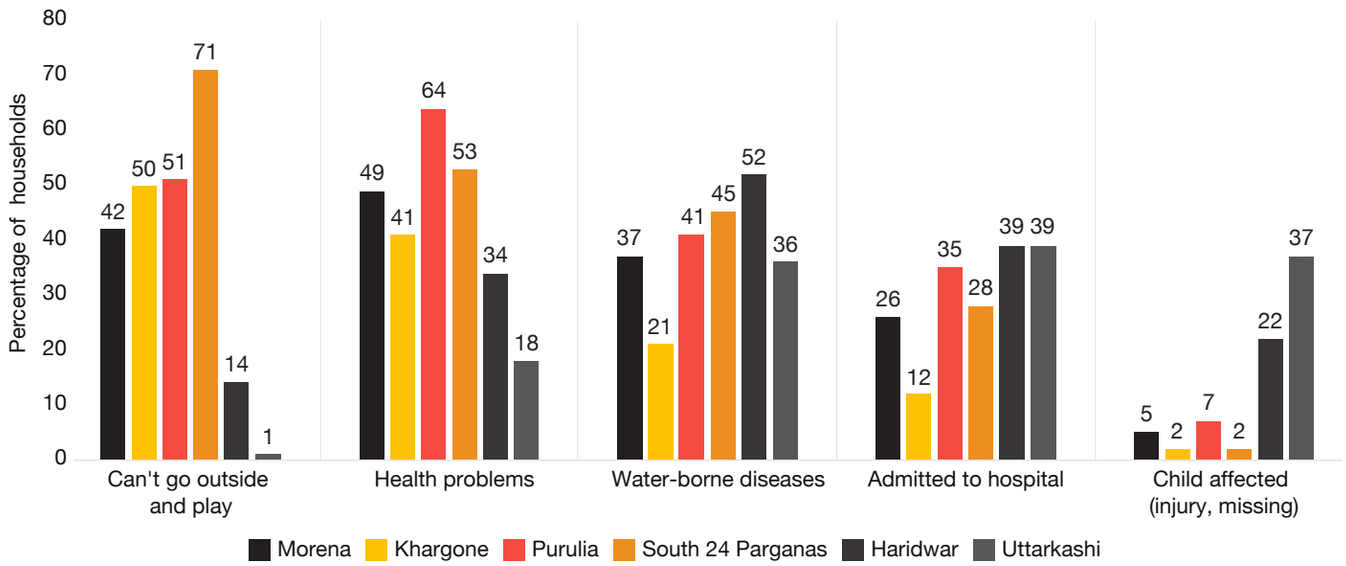
Figure 4.27: Impact of climate change on household health



Source: Primary survey done by PwC and Save the Children in 2019

Children in the study regions frequently fell victim to water-borne diseases such as jaundice and diarrhoea. In Raseelpur, Morena, a respondent mentioned that open drains had caused stomach-related issues such as diarrhoea in their village. More than half of the respondents in Haridwar said that their children's health was impacted by water-borne diseases following an extreme event, and around 39% in the study regions of Uttarakhand said that their children had been admitted to the hospital after such a disaster. Vector borne diseases such as malaria and dengue are also most common in the study regions. Children are more susceptible to mosquito and tick bites as they stay close to the ground and near stagnant water bodies, where these insects grow.

Figure 4.28: Impact of climate change on children's health



Source: Primary survey done by PwC and Save the Children in 2019

The elderly and children are more vulnerable to frequent and intense heat waves. In Purulia and South 24 Parganas, 58% of the respondents said that their children faced health issues such as dehydration, skin diseases and allergies due to rising temperatures. Around half of the respondents in Madhya Pradesh also had similar responses. It was understood that young children will be more susceptible in future.

> "We get only INR 140 for a day's work, which is insufficient. Cultivators do not give work when there is low rainfall and, in such seasons, it gets difficult to run the household. Now, in this kind of situation, how can we educate our children?"
>
> **– A parent in an FGD**
> (Siptan village, Khargone)

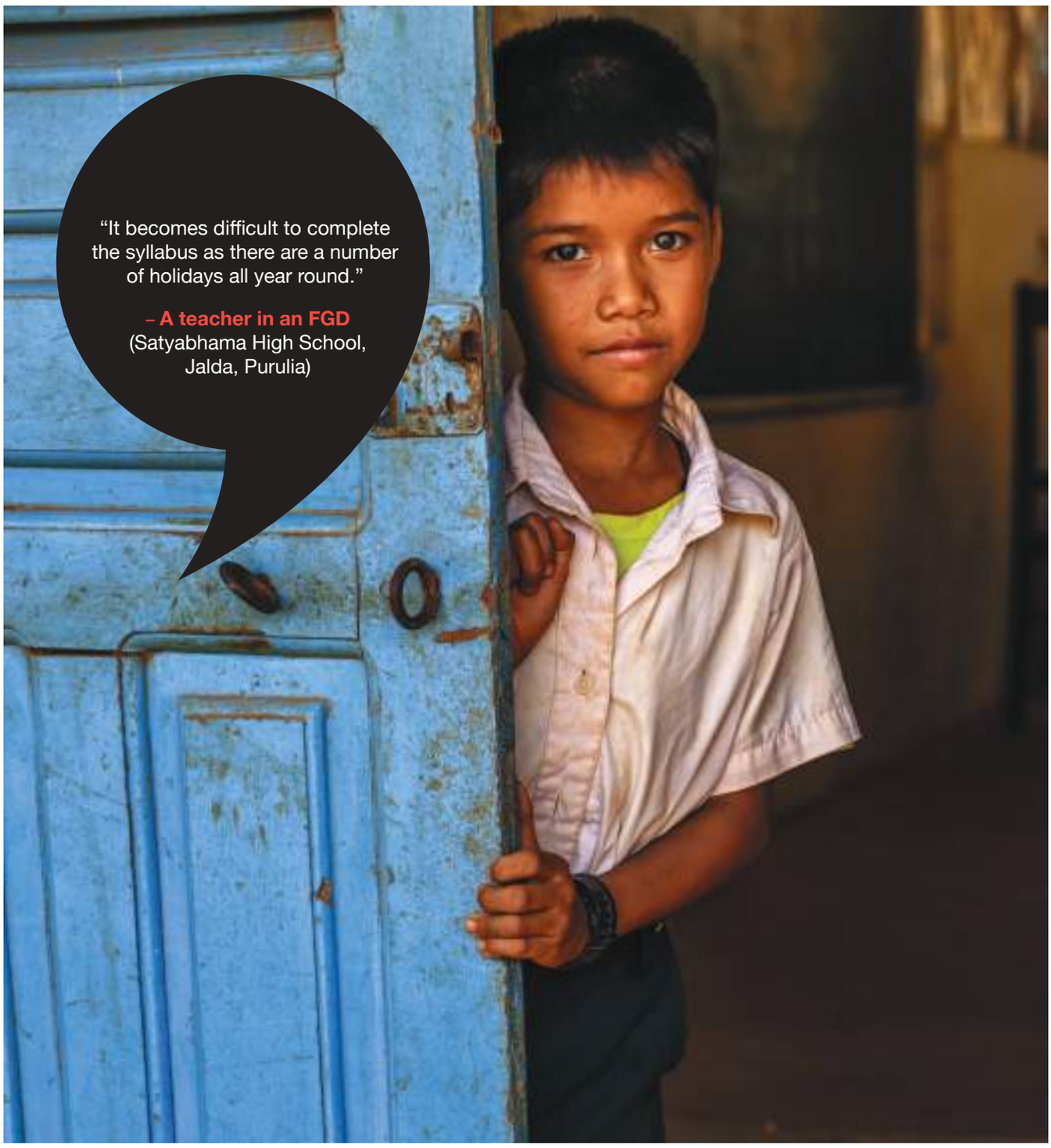
While leeches have always been common in Uttarkashi villages, they have now started appearing on the lower slopes, including houses. People feel that the rise in temperature is a major reason for this issue, which poses health risks for people, especially children.

Children are particularly vulnerable to injury during natural disasters. In Uttarakhand, 30% of the respondents said that their children had been affected (injured) due to climate-related disasters such as floods and landslides. In Morena, since most children walked to schools, a few were prone to injury due to waterlogging.

Impact on education

Children's education and performance are affected by extreme weather events such as floods and droughts. They may have to miss school when they are unable to travel to school or when they have fallen ill. In extreme cases, children are forced to drop out to support the household. In Purulia, 15% of the respondents said their child had to miss school for more than a month in the aftermath of a disaster. More than 40% of the respondents in Purulia and South 24 Parganas and 16% in other districts stated that their children's performance in school was affected. In Morena, children were not able to go to schools during the rainy season due to waterlogging. They also got stuck in school. Schools that were located far away from the village were even more difficult to reach.

Extreme heat during summers often leads to closure of schools for many days (extension of summer vacation). This hampers the completion of syllabus on time and gives students less time to prepare for examinations. Attendance is also lower during the summer, when temperatures soar.



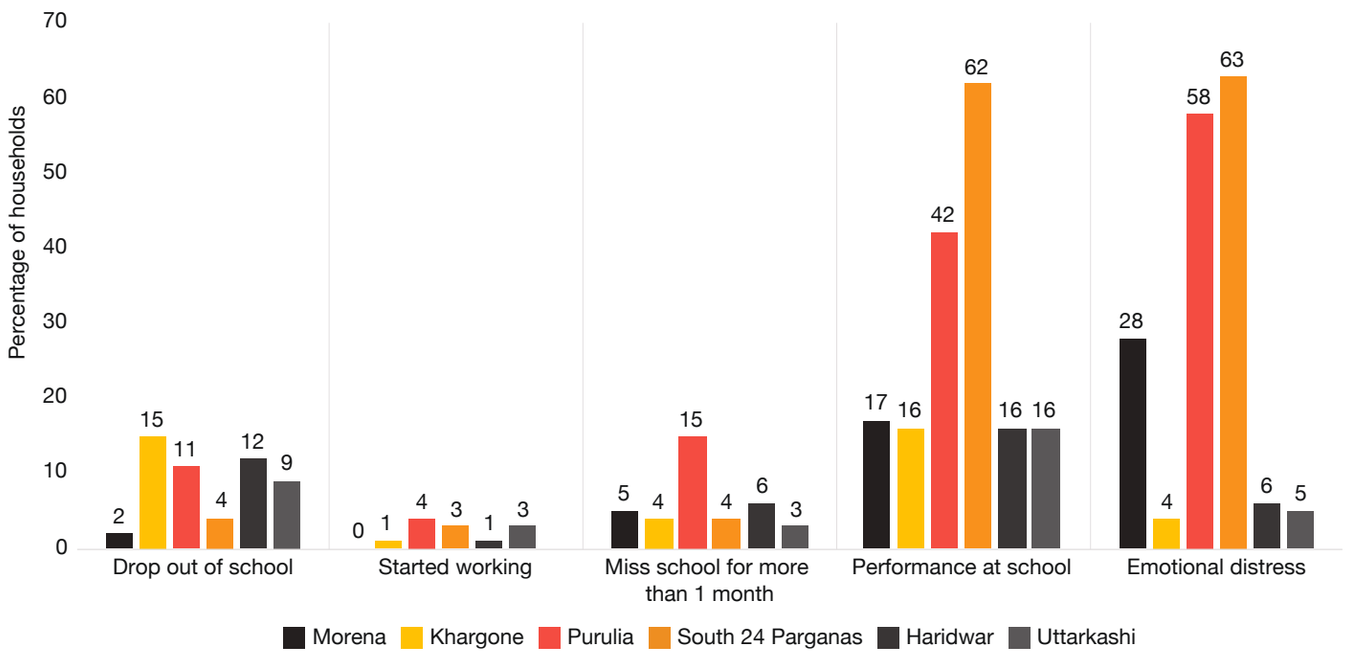
Young children in Haridwar are not able to attend school, as both parents often work far from their homes. It is also common for them to take their children to the fields. Hence, those children not only do not attend school on those days but also lag behind in class. Gradually, their interest decreases and some even drop out. In Khargone and Purulia, children in the SC and ST villages were found not attending school.

A further consequence of economic insecurity and high incidence of indebtedness was the involvement of children in income-generating activities. Child labour was found to be common in Madhya Pradesh and West Bengal in cases where the household head was less educated. In West Bengal, it was further observed that children were getting involved in income-generating activities to repay outstanding loans and reduce the debt burden. There have also been cases of intermediaries from the neighbouring states of Maharashtra and Gujarat coming to the outer areas of Khargone district and convincing families to send their children to work as labourers in these states for a duration of two to three years. The Chairman of the Children Welfare Committee (CWC) shared information about this trend. The CWC has rescued more than 100 such children in the last few years. In many cases, even if they are not involved in work outside the home, they are engaged in work at home. Children's rights to protection and development are hindered due to their involvement in labour instead of schooling.

"I make rotis, wash utensils and take care of my younger siblings when both my parents go out to work."

– An adolescent girl in an FGD (Lepa, Khargone)

Figure 4.29: Impact of climate change on children's education and well-being

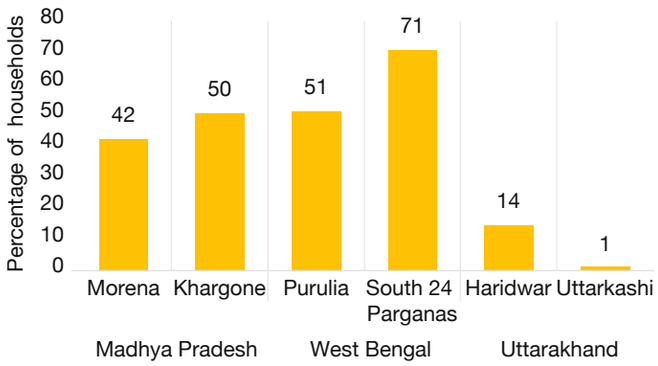


Source: Primary survey done by PwC and Save the Children in 2019

Inability to play

In Khargone, Purulia and South 24 Parganas, more than 50% of the respondents said that children were not able to play outside due to excessive heat. Further, the children in the regions covered under the study have no designated play areas like parks or gardens and their homestead plots are small. So, the only place they can play is outside their homes. Due to longer summers, they are no longer able to do so.

Figure 4.30: Inability to go outside and play due to more heat/heavy rainfall



Source: Primary survey done by PwC and Save the Children in 2019

"Teachers try to complete the syllabus in a hurry."

– **Students of Class 5 to 8 in an FGD** (Begunkodar High School, Purulia)

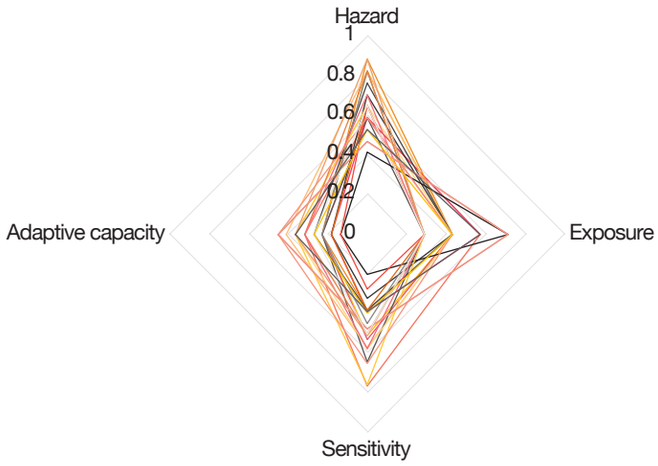
Risk profile of the study regions

Based on the IPCC's AR5 framework, the household-level risk was assessed to understand the impact of climate change on households and children (Table 4.7).

Table 4.7. Risk matrix showing percentage of households at risk (district-wise) (horizontal line adds to 100%)

Adaptive strategy	Very high	High	Medium	Low	Very low
Morena	19.8	22.6	18.9	18.9	19.8
Khargone	2.8	54	10	40	14
Purulia	41.0	19.7	14.5	15.4	9.4
South 24 Parganas	13.2	27.2	31.6	26.3	1.8
Haridwar	15.2	19.6	13.0	18.5	33.7
Uttarkashi	25.7	18.8	13.9	12.9	28.7

Figure 4.31: Influence of IPCC's contributing factors (hazard, exposure, sensitivity and adaptive capacity) on top 25 highest risk households



Source: Primary survey done by PwC and Save the Children in 2019

Purulia was found to have highest risk exposure based on the IPCC's AR5 framework, whereas South 24 Parganas was at high to medium risk. Limited livelihood opportunities, poor socio-economic and institutional resilience, and increasing bio-physical vulnerabilities combine to make these districts the most vulnerable and exposed to the highest risk. Focused adaptation measures are urgently needed in these districts to combat the impact of climate change. Households with the lowest risk were mostly found in Haridwar and Khargone. These households are closer and well-connected to cities/towns, which results in greater advantages in terms of livelihood opportunities and access to frontline services.

4.2.5. Child rights at risk in the study regions

Our analysis shows that 15 of the 54 articles of the UNCRC are directly or indirectly impacted by climate change (Table 4.8).

Table 4.8: Impact of climate change on children's right to life, survival, protection, and development

Child rights under CRC at risk	Climate risk and interface with climate change
Article 2: Right to non-discrimination	Climate change exacerbates inequity because its impact often hits children from poor families the hardest and for a long period of time. This right can be threatened if the special needs of affected children are not recognised and they are excluded from planning and decision making about emergency responses, including execution of such responses.
Article 3: Best interests of the child must be a top priority	Climate change is seen to work against the best interests of children. This right is threatened by the increasing frequency and intensity of natural disasters as a result of climate change, which put children at risk of health hazards and disruption in education, and adversely impact child protection.
Article 4: Protection of rights	Climate change impacts the lives of children in many ways, thereby infringing upon their rights. It affects livelihoods and this exposes children to child labour and exploitation, as well as violence. Extreme events affect physical safety and well-being of children. Without adequate policy response to climate threats at global, national and sub-national levels, the rights of children cannot be fulfilled. Action to tackle climate change is therefore essential.
Article 6: Right to survival and development	A child's right to survival is directly challenged by increasing climate-related disasters. Further, climate change and climate-related disasters increase risks of disease and hunger. Destruction of infrastructure such as houses, hospitals and school buildings and essential services such as WASH pose the most direct and immediate threat to a child's right to survival.
Article 12: Right to a voice	A child's right to a voice is under threat due to limited opportunities for them to voice their opinions and contribute solutions to problems of climate change and climate-induced disasters.
Article 22: Right to protection as refugees	Environmental disturbances due to climate change and climate-induced disasters are forcing millions to migrate from areas that have been rendered dangerous or uninhabitable. Climate change is making a child's right to refugee protection increasingly necessary.

Child rights under CRC at risk	Climate risk and interface with climate change
Article 24: Right to health and Right to health-sustaining conditions	A child's right to health is directly and indirectly threatened by climate change and natural disasters. The risks of water-borne diseases, vector-borne diseases and complications due to malnutrition are on the rise because of the changing climate. Children's right to health is infringed on when health-sustaining conditions such as clean water, sanitation, clean air and nutritious food are compromised by climate change and natural disasters.
Article 26: Right to social protection	Every child has the right to benefit from social security. Due to climate change, there is a need for resources to ensure children can cope. This right is increasingly at risk owing to slow progress in developed countries in providing additional funds for children to cope with and adapt to climate change.
Article 27: Right to an adequate standard of living	Climate-induced sea-level rise, flooding and extreme weather events such as storms and cyclones destroy houses and create unsafe living conditions for children for weeks and months.
Article 28: Right to education	Every child has the right to an education, but children are kept from attending school when family livelihoods and financial resources are negatively impacted by climate change. Furthermore, children's access to education can be disrupted when roads and schools are damaged or destroyed by climate-related disasters or shocks to the household economy.
Article 30: Right to indigenous culture and language	Living in highly climate-sensitive ecosystems, indigenous populations are often marginalised and among those most vulnerable to climate-related impacts. Loss of traditional species and land and migration can impact the right to identity (including language and culture) of a child from an indigenous minority community.
Articles 34, 35 and 36: Right to protection from exploitation	Climate change induced economic stress and unhealthy living conditions, including lifestyle changes, pose several risks to a child's right to protection from exploitation. The greater frequency and intensity of climate-related disasters are likely to increase the protection risks to children through increased child labour, abduction, recruitment into fighting forces, sexual violence and labour migration.

Source: Primary survey done by PwC and Save the Children in 2019

"This area is well-known for lac cultivation, but the extreme temperatures have reduced production significantly."

– **Villagers,** Purulia

Framework on best interests of the child in the context of climate change

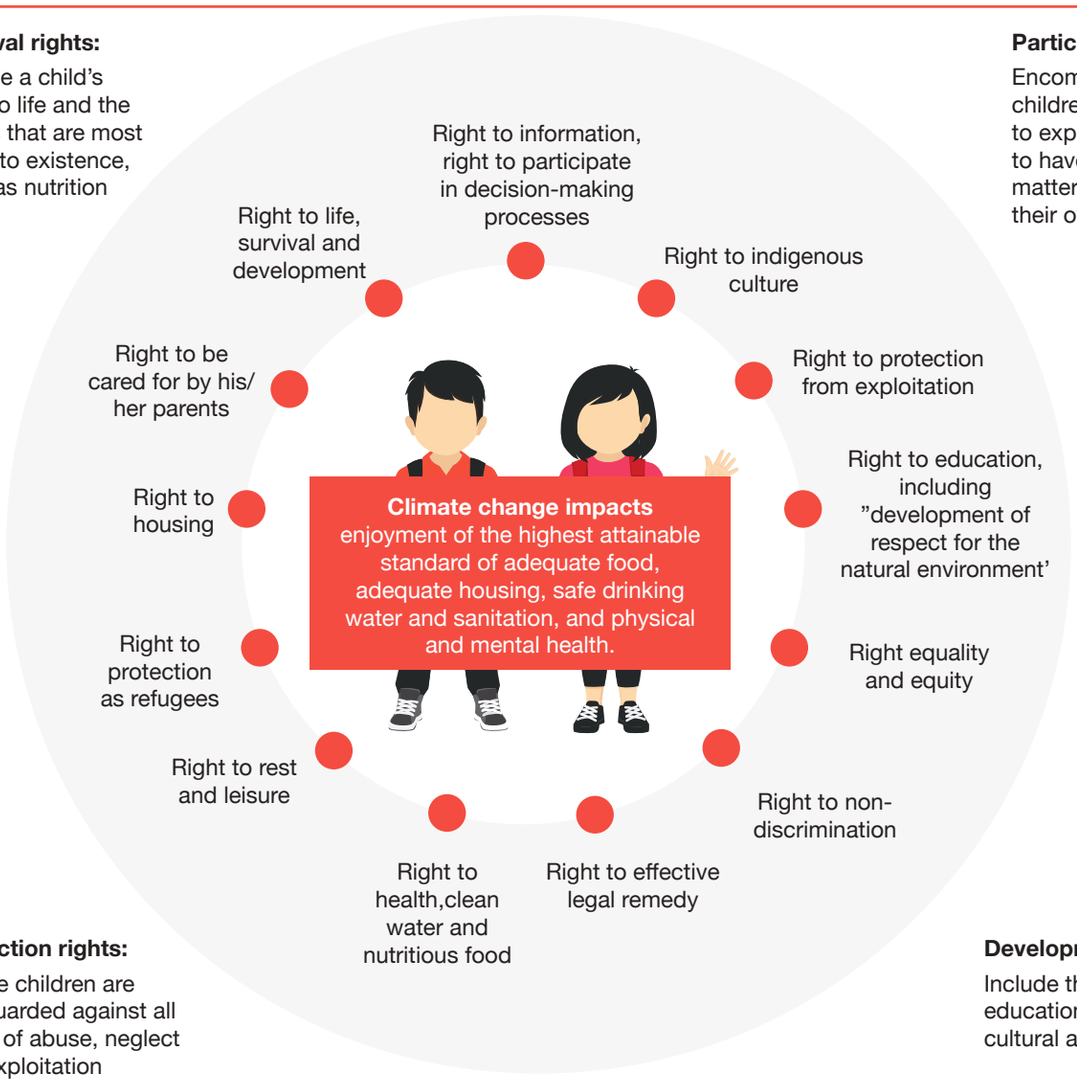
Based on the findings on the analysis using the IPCC's AR5 framework and UNCRC, a framework on the best interests of the child in the context of climate change was constructed to establish the impact of climate change on children. The Best interests of the child framework summarizes the key children's interests as per the four themes of UNCRC focusing specific rights of children in the context of climate change (Figure 4.32.)

Figure 4.32: Best interests of the child in the context of climate change

Child rights potentially impacted by climate change

Survival rights:
Include a child's right to life and the needs that are most basic to existence, such as nutrition

Participation rights:
Encompass children's freedom to express opinions, to have a say in matters affecting their own lives



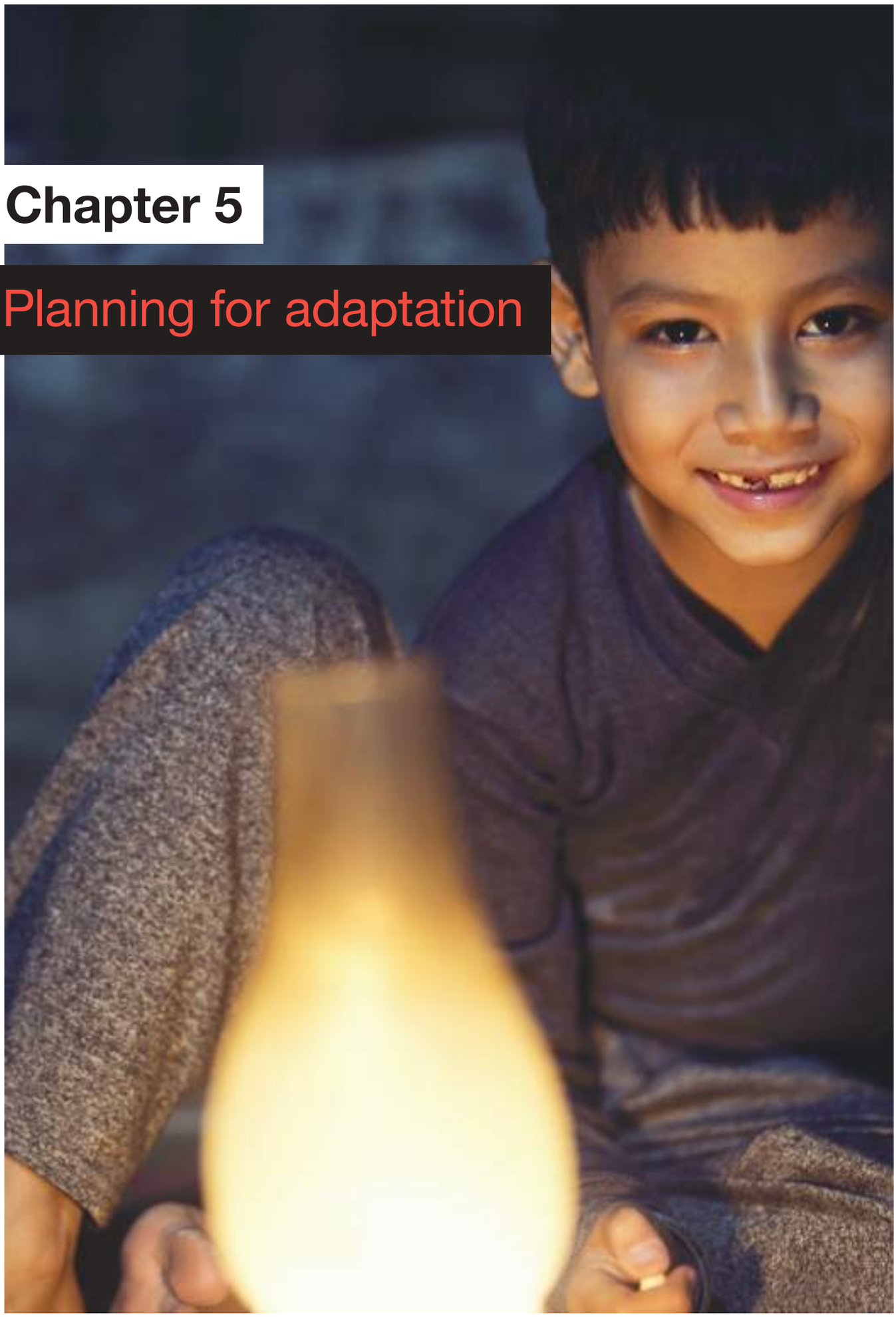
Protection rights:
Ensure children are safeguarded against all forms of abuse, neglect and exploitation

Development rights:
Include the right to education, play, leisure, cultural activities

Source: Save the Children analysis

Chapter 5

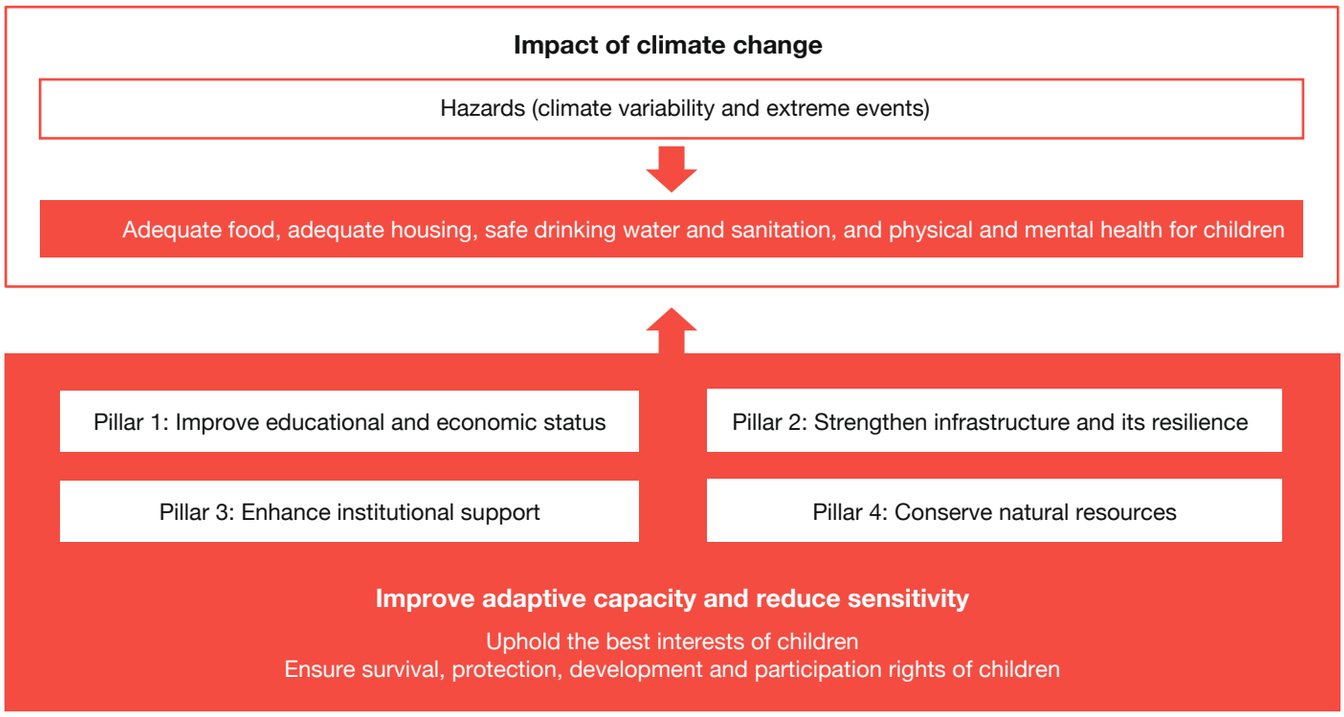
Planning for adaptation



Adaptation strategies to build the resilience of children to climate change need to be identified, considering how the impact of climate change affects the best interests of children (Figure 4.32). These strategies should ensure that the rights of children – survival rights, development rights, protection rights and participation rights as enshrined in the UNCRC – are adequately protected.

Combining the IPCC's AR5 framework, which identifies the impact and risks, with the best interests of the child framework, an adaptation planning framework focusing on protecting the rights of children has been prepared to identify measures that can be implemented in the project regions, as per the findings of the impact assessment (Figure 5.1).

Figure 5.1: Adaptation planning framework for children



Source: PwC analysis

5.1 Adaptation needs and strategies

The findings from the study show that interventions are required across a number of areas to address the vulnerabilities in communities, and specifically among children, to increase their adaptive capacity. Enhancing climate resilience requires a multi-pronged approach that is contextual to the communities and geographies. Planning for adaptation needs to be based on identified climate risks and impact. The country may explore a few actions in the context of the identified adaptation needs and gaps. The key adaptation needs, proposed adaptation strategies and the project regions where they are relevant are summarised in Table 5.1.

Although most of the strategies are important for all the study regions, some are very contextual and address specific adaptation needs or gaps pertinent to the study regions. An overview of how the adaptation strategies specifically address the geographic and socio-economic context of the study regions is also presented in Table 5.1.

"We do provide training on disaster management at the panchayat level. We are also working to form village-level disaster management committees."

– **Devendra Patwal,** DDMO, Uttarkashi

Table 5.1: Summary of adaptation needs and strategies and their applicability

Adaptation needs of the study regions: Childcare and development services

Childcare and development services: Childcare and development services require improvement in the regions studied in West Bengal, Uttarakhand and Madhya Pradesh. There is a need for better provision of sufficient nutrition, better healthcare access and educational opportunities for the children in these regions. It is critical to build the capacities of frontline workers involved in provisioning of education, health, nutrition and protection services to integrate the components of disaster risk reduction and climate change adaptation in their core work.

Proposed adaptation strategy: Leveraging existing childcare and welfare schemes	Alignment with child-centred adaptation planning framework
• Strengthening the implementation of existing child protection and welfare schemes • Leveraging child frontline workers towards climate resilience of children	Enhanced institutional support ensures survival, protection and development rights of children.

Applicability of the strategy					
Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
✓	✓	✓	✓	✓	✓

Adaptation needs of the study regions: Childcare and development services

Access to healthcare: The availability of healthcare services, infrastructure and accessibility needs to be improved to ensure seamless delivery of health services. This is especially important in the regions affected by disruption of services due to damage to infrastructure during extreme weather events.

Proposed adaptation strategy: Enabling delivery of health services through information and communications technology (ICT)	Alignment with child-centred adaptation planning framework
• Promoting the use of mobile health (mHealth) applications among communities	Nutrition security and coverage of health services ensure the survival rights of children.

Applicability of the strategy					
Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
✓	✓	✓	✓	✓	✓

Adaptation needs of the study regions: Childcare and development services

Safe environment during emergencies: In the project regions affected by disasters, such as Uttarkashi in Uttarakhand and South 24 Parganas in West Bengal, a safe environment is a critical need during or after emergency situations. It should ensure that the basic needs of children such as shelter, health and food are met. It is also important that disruption to education is minimised and efforts are made for students to return to schools in the aftermath of a disaster.

Proposed adaptation strategy: Ensuring child protection in disaster-prone areas

- Ensuring child protection in disaster-prone areas

Alignment with child-centred adaptation planning framework

Enhanced institutional support ensures survival and protection rights of children.

Applicability of the strategy

Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
✓	✓	✓	✓	✓	✓

Adaptation needs of the study regions: Childcare and development services

Resilient infrastructure: In Uttarkashi in Uttarakhand and South 24 Parganas in West Bengal, where damage to infrastructure due to extreme weather events is a serious concern, increasing the resilience of roads, bridges, hospitals, etc., is critical. Disruption to services due to infrastructure damage can affect emergency response activities, as well as the ability of the affected to access safe places, healthcare and other basic needs.

Proposed adaptation strategy: Climate proofing of basic infrastructure

- Developing guidelines for climate- and disaster-resilient infrastructure
- Climate proofing of critical infrastructure to withstand climate variability and extreme events in the present and future
- Development of real-time monitoring and early warning systems for disasters

Alignment with child-centred adaptation planning framework

Resilient infrastructure development ensures survival and protection rights of children.

Applicability of the strategy

Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
	✓	✓	✓		✓

Adaptation needs of the study regions: Childcare and development services

Livelihood security: Reduction in crop yield and crop loss due to climate variability and extreme weather events causes loss of income and increased indebtedness, leading to poverty and insufficient nutrition among communities dependent on agriculture. This was prevalent in all the regions studied. Hence, there is a need to climate proof livelihoods for them to withstand the impact of climate change. Farmers need to be informed and trained on agriculture and related practices that can increase climate resilience. Also, integrating agricultural practices with nutritional needs at the community level is needed to ensure nutrition security.

Proposed adaptation strategy: Ensuring livelihood and food security through climate-smart agriculture (CSA) practices

- Capacity building of farmers on CSA practices and alternative livelihood options
- Enhancing market linkages for agriculture and other produce

Alignment with child-centred adaptation planning frame

Provides nutrition security and coverage of health services and aids in the survival and developments rights of children

Applicability of the strategy

Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
✓	✓	✓	✓	✓	✓

Adaptation needs of the study regions: Childcare and development services

Water conservation: Water scarcity due to reduced precipitation or erratic rainfall and groundwater depletion is a serious issue in Madhya Pradesh and Uttarakhand, whereas degradation of water quality due to saltwater intrusion is a concern in West Bengal. Water resources, already under pressure as a result of growing water demand in relation to a finite supply, will be under even greater pressure in the future. Efforts need to be taken to replenish as well as conserve water sources at the community and individual levels.

Proposed adaptation strategy: Promoting sustainable water management

- Developing water safety/security plans (WSSPs) at the community level
- Planning for efficient groundwater recharge systems like rainwater harvesting
- Promoting efficient use of water for household and agricultural purposes
- Implementing subsurface water technologies to avoid saltwater intrusion in West Bengal's South 24 Parganas

Alignment with child-centred adaptation planning frame

Water conservation ensures protection of child rights indirectly.

Applicability of the strategy

Madhya Pradesh		Uttarakhand		West Bengal	
Morena	Khargone	Haridwar	Uttarkashi	Purulia	South 24 Parganas
✓	✓	✓	✓	✓	✓

Source: PwC analysis

In the following section, the adaptation strategies and specific measures that can be undertaken to enhance the climate resilience of communities and children are discussed in detail.

5.1.1. Including climate resilience in the ambit of existing childcare and welfare schemes

Reducing the socio-economic vulnerability of children is critical in enhancing their resilience to climate change. Hence, interventions to ensure basic needs such as water, sanitation, food and nutrition, access to education, healthcare and social security measures, as well as child-centric disaster preparedness, response and recovery need to be undertaken. At present, there are several national- and state-level programmes and schemes that are aimed at the welfare and safety of children. Many of these are steered by frontline workers such as AWWs, ASHAs, auxiliary nurse midwives (ANMs), multi-purpose health workers (MPW) and primary school teachers at community levels. The ICDS – a flagship programme launched by the Government of India (GoI) – has the prime objective of delivering a comprehensive set of services for early childhood care and development, covering health, nutrition and education aspects. Other initiatives such as the appointment of ASHAs and ANMs under the National Rural Health Mission (NRHM) also focus on the health and well-being of children. Based on the understanding of vulnerability of children, two adaptation measures are proposed in the project regions.

Proposed adaptation measures

Adaptation measure 1 – strengthening the implementation of existing childcare and welfare schemes: Duty bearers working towards the inclusion of a child-centred resilience approach to strengthen child protection standards and their implementation should be adequately supported. Existing development programmes face many bottlenecks related to the delivery of childcare and development services (better nutrition, healthcare and education) in project regions. According to an evaluation by the NITI Aayog, lack of adequate space, facilities, financial and human resources are some of the key issues plaguing effective implementation of the ICDS.[63] There is also a need to improve the training provided to AWWs, both in terms of number and quality. Similar problems exist for programmes under the NRHM as well. Activities can be proposed to strengthen these schemes with the objective of addressing vulnerabilities of children.

Adaptation measure 2 – leveraging frontline workers towards climate resilience of children: The capacities and competencies of frontline health workers like ANMs, AWWs, schoolteachers, district child protection units (DCPUs) and other stakeholders in building climate resilience in their respective areas of action should be enhanced. Frontline workers play a significant role in local communities on issues related to children. Hence their knowledge of community issues and reach among people can be leveraged towards promoting climate and disaster resilience. They can be sensitised on the impact climate change has on the basic rights of children – food and nutrition, healthcare, safe and clean environment, water, etc. For example, frontline workers could be trained to identify households in distress due to low crop yield or loss, or similar issues. They could also be trained in disaster preparedness and response and recovery measures, with a focus on the basic needs of children during disaster-related emergencies. Climate and disaster risk management plans can be developed with their support.

The proposed measures are ideal to address the vulnerabilities of children as this involves strengthening of already implemented national priorities and programmes such as the NRHM and the ICDS. However, activities related to or that which can possibly contribute to climate and disaster resilience are not currently part of roles and responsibilities of the frontline workers. Convergence of these programmes will be beneficial and is a key adaptation strategy.

63 *Niti Ayog, 2015. A Quick Evaluation Study of Anganwadis Under ICDS*

Key features of the strategy

Climate change and environment-related benefits

Better knowledge and skills will help frontline workers in effectively playing their roles to improve the nutrition, health and education of children. This will help in reducing the sensitivity of children to climate change. The adaptive capacity of the community will also be enhanced and they will be able to respond appropriately to emergency situations during extreme weather events, as well as to the impact of climate variability.

Social benefits

Frontline workers can support the community in ensuring hygienic practices, vaccination, primary healthcare, etc., and thereby increase the health and well-being of the community, including children. This could prevent the outbreak of diseases in the aftermath of extreme climate events. The focus of these frontline workers on women and the backward communities helps in ensuring equitable and gender-inclusive services.

Economic benefits

Ensuring childcare and development services by strengthening ASHAs and AWWs allows primary caregivers the freedom to undertake productive and income-generating activities without feeling burdened by the caregiving responsibility. Prevention and better management of health issues among children reduce lost working days of parents and primary caregivers, which would otherwise have been spent on caregiving activities.

Alignment with national policies, strategies and plans: The National Disaster Management Plan (NDMP), 2016, acts as the guidance document for disaster-related activities and mentions the use of anganwadis for rehabilitation of disaster-affected people. A revised draft of the NDMP discusses child-specific strategies and responsibilities of national and state agencies. The training of frontline workers is also specified as a strategy. However, the policy framework for schemes such as the ICDS and the NHRM does not cover the role that the frontline workers can play in enhancing the resilience of communities to climate change and disasters.

Linkages to SDGs: These measures reduce the exposure of local communities to extreme weather events and climate variability and promote sustainable development of the communities. They can contribute to the achievement of SDG 3 (Good Health and Well-being), 4 (Quality Education), 5 (Gender Equality), 6 (Clean Water and Sanitation), and 10 (Reduced Inequality).

Case study 1

Multi-sectoral approach of development

This case study highlights the significance of all-round development planning through a multi-sectoral approach. The case in point is in achieving nutrition's full impact on health and development outcomes. Nutrition-specific interventions are key to accelerating progress. However, it is also critical that other sectors – agriculture, education and social welfare – develop nutrition-sensitive interventions. A truly multi-sectoral approach will achieve optimal nutrition outcomes through greater coverage, while also helping other programmes achieve more powerful results and demonstrate their own potential for impact.

Poor nutrition compromises the immune system and makes the body vulnerable to infectious diseases; conversely, frequent illness often weakens nutritional status, which is critical to life-long health and development. Therefore, it is critical to improve the overall nutrition of vulnerable populations by delivering public health interventions – access to health, water and sanitation services, and disease control and prevention – with nutrition elements like micronutrient supplementation and promotion of optimal infant and young child feeding.

In Sandeshkhali II in West Bengal, Save the Children, India is working in the areas of health and nutrition since 2017 to reduce undernutrition among children under the age of five. To address undernutrition issues among children, STC worked towards the convergence of different departments (both nutrition-sensitive and nutrition-specific departments) at the block level from the very beginning of the project itself. Apart from health and the ICDS, STC is working with departments like Panchayati Raj institutions (PRIs), education, food and civil supplies, agriculture and animal husbandry departments. The functions of each department are outlined below.

Panchayat: Increase toilet usage, disposal of child faeces, regular water testing, installation of model water treatment plant, regularisation of the village health, sanitation and nutrition committee (VHSNC), working towards a malnutrition-free panchayat, etc.

Education department: Promotion of handwashing, personal hygiene, mid-day meals, strengthening school health programmes, deworming, weekly iron folic acid supplementation programme, etc.

Food and civil supplies: Ensure ration through the public distribution system (PDS).

Agriculture: Promotion of kitchen gardens, especially for families with malnourished children, technical support, involvement of Krishi Vigyan Kendra as a technical partner, etc.

Animal husbandry: Distribution of livestock to the families with malnourished children, technical support, etc.

In every quarter, the block development officer (BDO) organises a review meeting with the above-mentioned stakeholders to review the status of undernourished children. The following steps have helped in reducing the incidences of malnutrition in the block:

- Building strong relationships with various line departments for getting support related to programmes and schemes.
- Project data sharing with the line departments.
- The BDO, being the head of the block, always keeps track of the coordination among different departments.
- Regular updates about the project are given to the BDO.
- Regular coordination with project staff and government officials.

Currently, all the government departments in the block understand their roles in tackling malnutrition.

5.1.2. Enabling delivery of health services through ICT

During disasters or extreme weather events, health infrastructure or basic infrastructure such as roads and bridges, which is critical to access health infrastructure or facilitate emergency support, sustains severe damage. As a result, access to healthcare services and infrastructure is a common concern among the communities in the project regions. It is also to be noted that there are regions which face access issues otherwise as well. To address these problems, information and communication technology (ICT) enabled delivery of health services such as mobile health (mHealth) is proposed as an adaptation strategy.

Mobile health or mHealth helps communities access health services remotely through mobile phones and the internet. It helps in improving the adaptive capacity of the vulnerable population by providing reliable and real-time health services to communities, especially if facilities are not available within the proximity of where they stay or during emergency situations.

Proposed adaptation measures

To understand the need and demand or interest for mHealth among communities, more than 50 mHeath service applications have been developed by different players in India. The National Health Portal of the GoI endorses several mobile applications in its website developed by public and private sector institutions.[64] The app provides access to health information for the predominantly illiterate or semi-literate rural communities. The GoI is currently planning the deployment of this health information service in the panchayats that have recently been connected by broadband service. It is recommended that this app be deployed in the villages from project regions facing issues related to healthcare access. Any other app that may be better suited to address the needs of the project regions may also be used for deployment. mHealth is a new area and hence local experience may be lacking in the project regions. However, acceptance may not be a problem as benefits to children and the community in general are significant and immediately visible.

Case study 2

ImTeCHO mobile phone applications improving health services to adapt to extreme heat and drought conditions in Jhagadia district of Gujarat

Sewa Rural (a voluntary development organisation) adopted three primary health centres to improve the services provided with the introduction of the Innovative Mobile phone Technology for Community Health Operators (ImTeCHO). The application enables community workers involved in maternal, newborn and child health (MNCH) services to schedule and manage their tasks efficiently with the use of technology. In addition, the application uses recorded information to suggest diagnosis and customised treatment. The application has played an instrumental role in improved delivery of health services to women (pregnant and post-partum), premature babies and children under the age of two years, especially in reducing and treating diarrhoea and pneumonia.

Source: Yashwant, S. (2017). Defying Climate Change – Putting children and women first. CANSA

64 *Govt. of India, 2015. The National Health Portal*

Key features of the strategy

Climate change and environment-related benefits

Reduced travel to access health services can result in reduced emission of greenhouse gases (GHGs). From a climate resilience perspective, mHealth addresses the issues identified through studies on insufficient infrastructure acting as a barrier to access healthcare services and disruption of healthcare services or inability to access them due to damage of infrastructure during extreme weather events.

Social benefits

According to a report by a leading consultancy agency in 2012, mHealth saves 290,000 mothers and children in India annually. With the spread of mobile phones and the availability of internet even among rural and marginalised communities, the potential impact has grown multifold since this study. Deployment of mHealth solutions also makes healthcare affordable and accessible to the underserved who are particularly vulnerable due to their socio-economic background. Women, children and other vulnerable and marginalised communities who often face discrimination in accessing health services also benefit from mHealth options.

Economic benefits

Availability of health services in fingertips helps save time, which otherwise would have been spent on travelling to access those services. Also, timely medical help can prevent illnesses from becoming severe and the loss of productive days can be reduced.

Alignment with national policies, strategies and plans: The National Health Policy, 2017, recognises the role of technological innovations such as mHealth and advocates scaling up of various initiatives in the area of teleconsultation.

Linkages to SDGs: These measures increase the adaptive capacity of local communities to extreme weather events and climate variability and promote sustainable development of the communities. The measures can contribute to the achievement of SDG 3 (Good Health and Well-being) and 10 (Reduced Inequality).

5.1.3. Ensuring child protection in disaster-prone areas

In the study regions prone to extreme weather events such as South 24 Parganas and Uttarkashi, children are extremely vulnerable and require special care and support in overcoming the impact and associated trauma. It is important "that" the basic needs of children are met and their fundamental rights are not undermined during emergencies. The revised NDMP lays down several child-centric measures towards the well-being of children, including the setting up of child protection units as per the Integrated Child Protection Scheme (ICPS), India. The NDMP envisages that child protection units ensure access to child-friendly and community-based child protection mechanisms to work against violence and trafficking and restoration of children to their biological families, as well as promote community-based rehabilitation of orphans and children of single parents not in a position to provide care and protection, making use of state-specific foster parent support services/schemes.

The revised NDMP also proposes other child-specific measures such as activities to increase disaster-preparedness among children, ensure safety and disaster-preparedness of children's institutions (schools, foster care centres, kindergartens, pre-schools, facilities for care of children with special needs, orphanages, children's homes, shelter homes, etc., and all institutions designated for the care and protection of children under the juvenile justice system), and prevent exploitation and abuse of children. It requires development of support mechanisms and periodic monitoring of care and protection of children during all major disasters. The Ministry of Women and Child Development (MWCD), the Ministry of Social Justice and Empowerment (MSJE), the Ministry of Human Resource Development (MHRD), the National Commission for Protection of Child Rights (NCPCR) and the state child protection societies (SCPSs) are the national and state agencies responsible for the well-being of children during disasters. In this context, specifically addressing the issues faced by children in the project regions due to the impact of climate change and establishing child-centric relief and rehabilitation spaces are proposed as adaptation measures.

Proposed adaptation measures

Adaptation measure 1: Child-friendly spaces (CFSs) are widely used in emergencies as a first response to ensure the basic needs of children. CFSs are entry points for working with communities affected by disasters and ensure children's rights to protection, psychosocial well-being and non-formal education. They act as immediate relief spaces which contribute to the care and protection of children in emergencies, as well as transitional structures that serve as a bridge to early recovery and long-term supports for vulnerable children.[65] In the project regions, existing shelters or rehabilitation spaces and child protection spaces can be upgraded to CFSs. Where no such space is available, new CFSs may be set up. The Guidelines for Child Friendly Spaces in Emergencies – prepared by the UNICEF – on establishing and managing CFSs may be used as a reference for this activity or new guidelines contextual to India may be developed.

Adaptation measure 2: One of the key strategies for child protection is to form children's collectives to enhance adaptive capacities of children. This helps them leverage their own understanding of vulnerabilities and come out with informed solutions based on their needs and capacities. STC has adopted a child-centred approach in its programme intervention areas and worked with children's collectives. (Case study 3).

Case study 3

Children's collective

In Bihar's Khagaria district, STC complemented the work done by the Government of Bihar and communities with a four-part awareness programme and worked along with children's groups. The programme's agenda was to strengthen the individual's awareness, promote the community's awareness, use the media and leverage influence on the community. Within the community, STC has formed a Bal panchayat (children's council), a trained group of 15 democratically elected children who engage in issues which affect the youth of the village, including those of climate and environment. When they are made aware of a climate change and adaptation measure that is affecting a village, they create awareness among others, including creating awareness on environmental issues. To increase public pressure on officials, the media has been engaged to cover relevant stories of child protection issues and they have supported children's issues. Changes associated with the programme are reflected in all outcomes of interest, including climate change, increased school attendance, quantitative decline in child marriage and heightened awareness levels in parents, teachers, children and the community at large on child protection issues. As Khagaria faces recurring floods year after year, the children's collective also identifies child-friendly community-based approaches that have an impact of child protection issues like safe spaces, water provisions continuity in schools post floods and family preparedness to adapt to the crisis of floods.

Source: Save the Children, India

65 *United Nations Children's Fund, 2011. Guidelines for child friendly spaces in emergencies. New York: UNICEF.*

Key features of the strategy

Climate change and environment-related benefits

- CFSs increase the adaptive capacities of children and communities exposed to climate-related disasters by providing a safe space where the educational and recreational needs are met, along with basic needs. This allows children to recover emotionally from the trauma of facing the disaster.
- Children's collectives increase the adaptive capacities of children and communities exposed to climate-related risks and disasters by understanding risks and vulnerabilties and creating awareness amongst children, families and communties. This allows children to raise issues and take action by themselves and involve others facing climate crisis.

Social benefits

- CFSs provide emergency healthcare as well as provision for screening professional support related to health, food programmes, psychosocial activities, immunisation, parental counselling and play therapy, among others. This helps in ensuring the health and well-being of children. Gender-sensitive programming is a key defining aspect of CFSs. CFSs are also designed to ensure equitable access to all communities in line with UNICEF's principle that "CFSs are inclusive and non-discriminatory".
- Children's collectives respect the right of every child to participate and make communities aware and accountable in decisions and actions that affect their health and well-being, safety, education and climate-related risks and vulnerabilities.

Economic benefits

Ensuring childcare and development services through CFSs and Child Collectives will help parents engage in restorative work and resume income-generating activities.

Alignment with national policies, strategies and plans: Establishing a children's collective is aligned with the provisions specified by the National Plan of Action for Children, 2016. Establishing CFSs is aligned with the provisions specified by the revised NDMP.

Linkages to SDGs: These measures increase the adaptive capacity of local communities to extreme weather events and climate variability and promote sustainable development of the communities. The measures can contribute to the achievement of SDG 3 (Good Health and Well-being), 4 (Quality Education), 5 (Gender Equality), 6 (Clean Water and Sanitation), 10 (Reduced Inequality) and 16 (Peace, Justice, and Strong Institutions).

5.1.4. Climate proofing of basic infrastructure

In Khargone in Madhya Pradesh, Uttarkashi in Uttarakhand and South 24 Parganas in West Bengal, damage to basic infrastructure due to climate-related disasters such as floods, landslides and storms or cyclones are common. This results in damage to property and loss of life in some cases due to accidents from hindered movement during emergency situations. Climate-resilient infrastructure reduces the risk of climate-related disruptions by improving the ability of the asset to cope with the impact of extreme weather events. In this regard, there is a need for climate-resilient infrastructure in the regions mentioned above. It is proposed that the basic infrastructure in the regions such as transport network (roads, bridges, etc.), utilities, healthcare facilities and schools be climate proofed to reduce the vulnerability of the infrastructure to increased variability in climatic conditions such as increased rainfall and flooding.

Climate proofing can be achieved through implementation of structural adaptation measures, e.g. elevating the road, protecting earthworks from the impact of direct rain and improving cross drainage and additional capacity. Natural infrastructure can also be designed to support the structural adaptation measures. Management (or non-structural) adaptation measures such as changing the timing of maintenance, investment in early warning systems or enhancing quality control of construction and monitoring of existing assets can also be implemented. The design and implementation of these measures should be based on the current and future climate change impacts.

Proposed adaptation measures

Adaptation measure 1 – developing guidelines for climate and disaster resilient infrastructure: It is proposed that a climate and disaster risk assessment be conducted for critical infrastructure in vulnerable ecosystems. Based on the findings of the study, appropriate structural and management adaptation options shall be identified. The knowledge base developed through these activities can be consolidated by developing guidelines, standards and procedures for climate-resilient infrastructure for different ecosystems and climate hazard related risks. Such a document can provide guidance on suitable and cost-effective technologies or methods that can be considered for climate proofing and how the proposed measures can be designed and implemented. The guidelines should also include an economic framework based on extended cost-benefit analysis for evaluating climate proofing investments. Following the development of the guidelines, standards and procedures, key stakeholders can be trained on the use of the guidelines for planning infrastructure development and the use of extended cost-benefit analysis as the basis for decision making related to climate proofing investments.

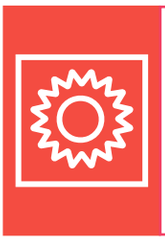
Adaptation measure 2 – climate proofing of critical infrastructure to climate variability and extreme events in the present and future: Efforts to upgrade or develop critical infrastructure integrating climate- and disaster-resilience considerations can be undertaken in vulnerable regions. The critical infrastructure should include critical access to roads, healthcare facilities and schools. This should be based on the understanding of the impact and risks to infrastructure and appropriate methods or technologies to mitigate or reduce the risks. Firstly, a micro-level assessment of critical infrastructure in the regions can be undertaken to identify assets that are critical in terms of their importance or vulnerability to climate change. Based on the outcome of this assessment, assets shall be identified for intervention. Secondly, an assessment of the regions in terms of availability and access to infrastructure shall be undertaken. Areas which are vulnerable can be identified and climate-resilient infrastructure can be built in those regions. A feasibility study and an assessment of environmental and social impact should be conducted for all the planned infrastructure upgrade or development.

Adaptation measure 3 – development of real-time monitoring and early warning system for landslides in Uttarakhand: The mountain region of Uttarakhand that covers Uttarkashi is prone to rain–induced landslides. Heavy casualties were reported in the region in June 2013, when more than 5,000 people died in rain-triggered landslides. Many incidents of landslides are reported from this region every monsoon. Loss of life, injuries and damage to property are quite common and children are the most affected in the regions as they have to travel a significant distance to reach their schools. In this context, it is important that a real-time monitoring and early warning system is developed and implemented. There are a few remarkable developments in this area such as the Landslide Hazard Assessment for Situational Awareness (LHASA) model developed by the National Aeronautics and Space Administration (NASA). This model identifies where and when landslide hazards are developing across the globe (updated every 30 minutes) and identifies the long–term patterns in landslide activity.[66] The Indian Space Research Organisation (ISRO) is also implementing an experimental early warning system for rainfall-triggered landslides in some parts of Uttarakhand during specific seasons. ISRO is also providing near real-time information on landslides through its Bhuvan geoportal. Recently, a real-time landslide warning system consisting of over 200 sensors was set up in the Sikkim-Darjeeling belt of north-eastern Himalayas. Public-private partnerships (PPPs) can be explored for such projects.[67]

66 *NASA Earth Observatory, n.d. Predicting Landslide Hazards in Near Real-Time. Available at https://earthobservatory.nasa.gov/images/92018/predicting-landslide-hazards-in-near-real-time (Accessed 2019)*

67 *Mishra, U., 2018. Sikkim gets real-time landslide warning system, Down To Earth. Available at https://www.downtoearth.org.in/news/natural-disasters/sikkim-gets-real-time-landslide-warning-system-61725 (Accessed 2019)*

Key features of the strategy



Climate change and environment-related benefits

CFSs increase the adaptive capacities of children and communities exposed to climate-related disasters by Climate-resilient infrastructure, specifically basic infrastructure, addresses the challenge of reduced mobility and inaccessibility of emergency healthcare by ensuring weather-proof services. Climate-resilient infrastructure also prevents environmental degradation as construction or renovation is done keeping in mind the environmental challenges of the region.

Social benefits

Climate-resilient basic infrastructure addresses many of the challenges associated by the communities even during disaster-free periods by ensuring seamless services and access. This has the potential of preventing mortality and morbidity during climate-related disasters.

Economic benefits

Recent disasters indicate that up to 66% of total public sector losses in weather- and climate-related extreme events are related to infrastructure damage.* Resilience of insfrastructure helps in reducing loss and damage of infrastructure.

** Coalition For Disaster Resilient Infrastructure (CDRI), 2019. Brochure of Coalition for Disaster Resilient Infrastructure*

Alignment with national policies, strategies and plans: The National Health Policy, 2017, recognises the role of technology such as mHealth and advocates scaling up of various initiatives in the area of teleconsultation and linking tertiary care institutions (medical colleges) to district and sub-district hospitals that provide secondary care facilities for the purpose of specialist consultations.

Linkages to SDGs: These measures increase the adaptive capacity of local communities to extreme weather events and climate variability and promotes sustainable development of the communities. These measures can contribute to the achievement of Goal 3 (Good Health and Well-being) and 10 (Reduced Inequality).

Case study 4

Women-led climate-resilient farming to adapt to droughts in districts of Maharashtra

The three-year long drought (2014–16) in 28 districts of Maharashtra resulted in 28,662 families suffering from increasing incidents of farmer suicides, highly indebted farmers, drying up of water in dams, limited fodder for cattle and lack of alternative livelihood opportunities. Swayam Shikshan Prayog (SSP), a Pune-based organisation, designed, tested and successfully implemented an innovative model of engaging women farmers in adopting mixed cropping through demonstrations. The model aimed at empowering women to be active decision makers for the operational as well financial aspects of farming through leasing a small piece of land and allowing them to cultivate independently. Training and financial assistance helped them to diversify the risk with water-efficient organic farming of vegetables, millets, cereals and pulses in a mixed crop setup, as against water-intensive and high-risk cultivation of cash crops. The model addresses issues of food security, income security, natural resource management and women empowerment.

Source: Yashwant, S. (2017). Defying Climate Change – Putting children and women first. CANSA

5.1.5. Ensuring livelihood and food security through CSA practices and alternative livelihoods

Diversification of livelihood, which caters to agriculture and allied activities and other occupations at household and community levels, is an important way to reduce climate change risks. Livelihood diversity, including crop production, livestock production, wage labour, salaried work, own business, land rental and remittances at household levels is an important way to reduce livelihood risks. Ensuring the availability and accessibility of agriculture, horticulture and veterinary services to all people (irrespective of their caste, class and sex) is thereby critical at all times. The idea is to provide additional skills (a mix of primary, secondary or tertiary service) that allow a household to adopt the changes through basic livelihood services near each village.

Climate smart agriculture (CSA) is an approach for developing agricultural strategies to secure sustainable food security under climate change. It helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives – sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change and reducing and/or removing GHG emissions, wherever possible.

Proposed adaptation measures

Adaptation measure 1 – capacity building programme for farmers: Capacity building for CSA would involve extensive participatory demonstrations of location-specific agricultural practices that help farmers gain access to knowledge and provide confidence to cope with adverse weather conditions. In this strategy, an effort is made to marshal all available farm technologies that have adaptation potential and demonstrate them in farmers' fields in most vulnerable districts through a participatory approach. Some practices under CSA that help adapt to climate change impacts on Indian agriculture are dryland farming, residue incorporation instead of burning, growing drought- and flood-tolerant varieties of crops, water-saving methods, location-specific agronomic and nutrient management, improved livestock feed and feeding methods, traditional methods of environment-sustainable farming, community based ecosystem management, etc.

Capacity building of farmers on alternative livelihood options can include skills and knowledge development on animal husbandry (poultry, goat and duck farming, etc.) and value-addition of produce (value-added food products, handicrafts, etc.). As a part of the training sessions, farmers can be trained on the choice of crops that will help them to ensure food security. Such an awareness-generation programme on nutrition security shall help farmers in integrating nutrition considerations during their decision making on crops and agricultural practices. Providing marginal and small farmers with resilient seeds and saplings and better-quality fertilisers at subsidised rates would also help in ensuring that nutritious food is provided to children. Moreover, the creation of cold storages at the panchayat or the cluster of the panchayat level would also be a transformative step to address the issues of storage due to erratic weather conditions. Institutional interventions under CSA promote collective action and build resilience among communities.

68 *Food and Agriculture Organization, n.d. Climate-Smart Agriculture. Available at http://www.fao.org/climate-smart-agriculture/en/ (Accessed 2019)*

69 *Central Research Institute for Dryland Agriculture, n.d. National Innovations on Climate Resilient Agriculture. Available at http://www.nicra-icar.in/nicrarevised/ (Accessed 2019)*

Case study 5

Land shaping model of integrated farming

Due to its topographical uniqueness, the Sundarbans is disadvantaged in terms of conventional agricultural practice due to several reasons like:

- inundation and waterlogging due to the area being naturally low lying, thus affecting production
- saline water infiltration from nearby oceans leads to more saline content in land, affecting productivity
- dearth of irrigation facilities and dependence on groundwater for agriculture that affect groundwater reserves
- rapidly increasing incidences of natural disasters, coupled with a high rate of soil erosion, pose further challenges to agriculture as the prime livelihood of the region.

The vulnerability of economically disadvantaged communities is magnified in the face of natural disasters. STC and the Sundarban Social Development Centre SSDC initiated the land shaping model of integrated farming in Patherpratima block. It aimed at improving the economic condition of poor families with small landholdings, thereby minimising distress migration in search of livelihood. This model also promotes environment-friendly agricultural practices that enhance the core values of environmental health. Thus, marginalised landowners who have unproductive, salinity-affected land are offered input, technology and ancillary assistance to develop their land to be disaster resilient.

The strategy addresses the challenge on following fronts:

- Agriculture: Provides scope for utilising small landholdings beyond the traditional option of single crop through cultivation of high-yielding varieties, including vegetables. Promotes usage of organic fertilisers, reducing input cost and helping ecology.
- Environment: Excavation of a reservoir that harvests rainwater reduces dependence on groundwater for agricultural purposes. The reserved water helps in replenishing groundwater reserves.
- Low lying land: The soil excavated from the reservoir elevates the height of the land.
- Land usage: Integrates fishery and duck rearing in the water of the reservoir, providing further economic viability to land use. The waste feed of the duck supports the fishes.

Instead of cultivating only rice and keeping the land fallow for more than six months, land shaping converts the plots to yield diverse harvests of 10–12 types of crops per year. Because of erratic monsoons, failure of rice crop was frequent earlier but now incomes are generated in different seasons and from other activities like fishing, poultry, duck rearing and horticulture.

The land is used for growing rainy season vegetables like okra and cucumber, and also used to grow pulses or early mustard in the muddy soil as relay crops. In winter, vegetables like tomato, spinach and beans are cultivated. Apart from traditional varieties of rice in the monsoon season, the lowland is used for cultivation of chilly and bitter gourd in the summer season, sunflower is grown using irrigation water from the pond. Through land shaping, the annual income from agriculture has increased to meet nutritional requirements of the families and generate additional income, making distress migration and ecologically damaging livelihoods like wood cutting and prawn fingerling collection unnecessary. With the production of different types of vegetables, pulses, eggs and fruits, nourishing food for the family is assured. Children can be enrolled in schools and women of the family can engage themselves in gardening, duck rearing, etc.

Source: Save the Children, India

Key features of the strategy

Climate change and environment-related benefits

Primarily addresses vulnerability through increasing adaptive capacity of farmers, especially with regards to income and water security. The adaptation measure also allows for reducing sensitivity that arises due to bad agricultural practices. Low-carbon farming practices lead to reduction of emissions from agricultural activities. Techniques such as integrated nutrient management (INM) and integrated pest management (IPM) help increase the usage of organic fertilisers made from manure, thereby reducing the need for chemical fertilisers and improving overall ecological health.

Social benefits

It can help address food security and economic losses through reduction of crop failures. With alternative livelihoods, the overall climate impact on famers is reduced. It can also help address food security and equitable distribution of resources among all levels of farmers (marginal and landless) through a collective approach.

Economic benefits

The measures enhance yield and therby income of the people. Some of the CSA measures can result in cost avoidance (cost of chemical fertilisers, pesticides, etc.).

Alignment with national policies, strategies and plans: This approach is strongly supported through the National Mission on Sustainable Agriculture (NMSA) and the National Innovations on Climate Resilient Agriculture (NICRA). It finds resonance even with state-level schemes and plans. It is mostly under the purview of the departments of agriculture, rural development and Panchayati Raj.

Linkages to SDGs: These measures increase the adaptive capacity of local communities to extreme weather events and climate variability and promote their sustainable development. These measures can contribute to the achievement of SDG 1 (No Poverty), 3 (Good Health and Well-being) and 10 (Reduced Inequality).

5.1.6. Promoting sustainable water management

Water quality and quantity are issues in all the three regions under the study, as the earlier sections elaborate. Water resources, already under pressure because of growing water demand in relation to a finite supply, will be under even greater pressure in the future due to climate change. This is a result of (but not limited to) three factors – the projected decrease in rainfall and erratic rainfall patterns, decreased availability resulting from over-extraction and the amplifying effect it has on the overall ecosystem. Hence, adaptation strategies consisting of measures to conserve water, reuse water and reduce consumption are the need of the hour. As found from the study, the different regions covered faced different water-related problems and their adaptation needs are different from each other. This is due to the very large temporal and spatial variation in rainfall in India. Hence, adaptation planning contextual to the geography and demography is critical. Keeping in mind all these factors, specific adaptation measures are proposed for the project regions.

Proposed adaptation measures

Adaptation measure 1 – developing water security plans at the community level: Water availability and the factors affecting the availability vary from region to region, necessitating tailored interventions at the community level. Water security plans (WSPs) provide a systematic and integrated approach to water supply and demand management based on assessment and control of various factors that pose a threat to safe water and sustainable livelihoods. WSPs developed by community-level groups can play a key role in integrated approaches to water management. They provide effective strategies to promote sustainable water management practices at the community level and also to mitigate and alleviate drought or flood conditions. These plans help in establishing a decentralised, participatory, multi-sectoral and multi-disciplinary governance structure for water management at the community level. These may involve identifying and implementing interventions at the household level such as efficiency in household water use or irrigation for agriculture, and conservation measures at village level such as canals and watershed management. This is a key measure proposed under the Draft National Water Framework Bill, 2016.[70]

Adaptation measure 2 – construction/renovation of water harvesting, conservation and ground recharge structures: There is a need to establish or strengthen water management structures in order to address the existing challenges related to water and the future risks to its availability due to climate change. New structures for harvesting and conserving water and also to recharge the groundwater table need to be constructed in many of the project regions. The existing structures can be assessed for their utility and renovation work can be undertaken accordingly. Farm ponds, dug wells and earthen check dams are some of the commonly used structures that can be constructed or renovated. However, the type of structure to be constructed should be decided based on the hydrology and geography of the region. It is important that the structure allows for storage and consumption, as well as enables recharge of the groundwater table. Defunct or unused borewells, tube wells, dug wells and similar structures may be connected with surface water sources or water-harvesting structures so as to enable recharge of shallow aquifers. These help store runoff water during the monsoon season and recharge groundwater during the next few months of the dry season.

Adaptation measure 3 – promoting efficient use of water for household and agricultural purposes: Harvesting and conservation of water need to be complemented with judicious use of water resources to ensure water security. To achieve this, community members can be made aware of the importance of efficient use of water and also be equipped with techniques and practices that reduce consumption at households and farms. Awareness campaigns can be conducted and training sessions can be arranged for farmers. Such sessions should cover rainwater harvesting at homes and farms, recycling of water for purposes other than drinking, use of micro-irrigation structures at farms, cultivation of less water-intensive crops or heat- and drought-tolerant crops, etc. Specific areas for training need to be finalised, based on the context of the communities. Monitoring and budgeting of community-level water use can be promoted and governance structures can be established for effective implementation. Another notable idea is to train children as change agents to promote sustainable water management practices among communities.

Adaptation measure 5 – implementing subsurface water technologies to avoid saltwater intrusion in South 24 Parganas: The salinity problem in coastal aquifers of West Bengal is mostly due to the presence of seawater (as connate water), with different degrees of salinity getting entrapped during marine transgression. Slow movement of groundwater in coastal areas with a long residence time in contact with a stationary coastward saltwater body also causes quality deterioration.[71] The coastal region is also prone to frequent cyclonic storms. During the cyclonic storms, high tidal waves enter deep inland and also form tidal creeks, the influent seepage from which deteriorates the quality of groundwater.[72] To address this issue of saltwater intrusion that affects the water security, subsurface water technologies can be implemented in South 24 Parganas. Subsurface water technologies are a mix of techniques that extract relatively freshwater from the upper zone of the fresh saline aquifer using multiple partially penetrating wells.

70 *Govt. of India, 2016. Draft National Water Framework Bill. Available at http://jalshakti-dowr.gov.in/sites/default/files/Water_Framework_18July_2016%281%29.pdf (Accessed 2019)*

71 *Govt of India, 2014. Report on status of ground water quality in coastal aquifers of India. Available at http://cgwb.gov.in/WQ/Costal%20Report.pdf (Accessed 2019)*

72 *Ibid.*

Case study 6

Amni – a model for community-based issue and management systems

Like many other villages in Bihar's Khagaria district, Amni too faced a grave issue of contaminated water. A study conducted by STC and its partner organisation Nav Jagriti revealed the presence of fluoride, iron, sulphur and other impurities in water, which rendered it unfit for consumption purposes. This resulted in various health-related issues for the villagers and they were desperately looking for solutions.

This issue was actively taken up by the project team of STC and a 1,500-litre water filter was installed. Installation of the filter was a big relief to the people who earlier used traditional methods such as boiling of water or using cloth to filter impurities. The filter provided potable water at a nominal charge of INR 5 for 20 litres up to a maximum of 100 litres, accessible by anyone at any time. The project team supported the community to take up the ownership of the filter and helped in developing a water management committee (WMC) comprising 15 members. This committee was trained to successfully manage their finances and maintain the filter through the money collected from the users.

Apart from this, institutional mechanisms such as a village disaster management committee (VDMC) and a proper village disaster management plan (VDMP) were successfully formed. The task force formed in schools by STC was instrumental in monitoring several issues related to children within the village. Similarly, the Bal panchayat was also instrumental in linking children to the child protection committee (CPC) formed in the community.

Source: Save the Children, India

Case study 7

Water purification system to address water shortage owing to salinity after the tsunami in Tamil Nadu

The devastating tsunami that hit the state of Tamil Nadu in 2004 resulted in villages facing an acute shortage of pure water, primarily due to salinity of surface and groundwater sources. Most of these villages had project interventions by STC. The village of Kottaikuppam was also affected by cyclone Vardha in 2016. A predominantly fishing village, it suffered immensely due to the cyclone since most of the fishing boats were hired from nearby villages. The quality of drinking water was also deplorable due to the salinity in water. “On using the water for cooking, the colour of the food would change,” complained 28-year-old Nitya. As a result, villagers, especially children, would often fall sick. Further, they would have to travel a few kilometres to access quality healthcare, often resulting in loss of a day’s work.

During the meetings conducted by the community mobilisers in this project to look for solutions, the unanimous demand for a water purifier came up. The team, on carefully analysing the prevailing salinity of groundwater, suggested installing water purifiers with reverse osmosis (RO) technology to help desalinate the water and make it potable. The community welcomed the suggestion and agreed to install the RO in the existing community space to make it accessible to all. Earlier, the villagers spent INR 600–700 per month on drinking water, which was reduced to INR 100 per month for 20 litres a day after the purifier was installed in April 2017.

Not only has quality potable water become accessible, it has also become affordable for these villagers and reduced their expenditure on healthcare.

Source: Save the Children, India

Key features of the strategy

Climate change and environment-related benefits

Proposed measures enable recharging of underground aquifers and minimising water-induced erosion and consequent silting of water bodies. Groundwater recharge reduces the effect of both droughts and floods on the quantitative degradation or lack of water resources due to changes in rainfall. Availability of water prevents ecological degradation as well.

Social benefits

Sustainable water management practices ensure cleaner and safer water for drinking and livelihood purposes. WSPs can help ensure equitable water distribution as they are participatory and allow the involvement of women and people from marginalised backgrounds in decision-making processes. Storage structures increase water supply during dry periods to help address drinking water demands and therefore, help reduce mortality/morbidity due to unavailability of drinking water. Storage of water within a village ensures that villagers do not have to travel long distances in search of water.

Economic benefits

Availability of water prevents crop loss and subsequent livelihood loss, poverty and food insecurity. It also increases crop productivity and yield, thereby enhancing income. Another key benefit is the reduction in water costs or electricty costs that were incurred to pump water for irrigation.

Alignment with national policies, strategies and plans: The National Water Policy, 2012, provides the policy framework for the proposed measures. The proposed measures are strongly supported through the NMSA and National Water Mission under the National Action Plan on Climate Change (NAPCC), besides the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY). Its framework is similar to certain state-level schemes and plans (gram panchayat development plans). The Government has mandated state departments dealing with rural drinking water supply, rural sanitation, school education, health, women and child development, water resources, agriculture, etc., to form a state water and sanitation mission (SWSM) at the state/union territory (UT) level. Further, similar missions will be translated down to the village level through the village committees. However, departmental responsibility at the village level remains vague.

Linkages to SDGs: These help in addressing both poverty alleviation and water security. These can help in increasing agricultural productivity and create avenues for income-earning opportunities (INPIM, 2010). These measures can contribute to the achievement of SDG 3 (Good Health and Well-being) and 10 (Reduced Inequality).

Case study 8

Children as agents to monitor water use and reuse in Kolkata

STC facilitated the formation and training of children's groups in Kolkata's ward number 65 (parts of Park Circus, Topsia and Tiljala) to reduce water use and water wastage in the area. When the children first learnt about climate change issues, they took up a campaign to educate other children and youth in their area about climate change. For this, they utilised important days like Earth Day and World Environment Day. They have also used recycled materials to make banners and roped in stakeholders like the ward councillors to be able to use resources like saplings for free.

Once this initial campaign was over, the children and the youth worked towards household-level adaptation strategies. The scarcity of safe water in informal settlements was the first issue that came up in the meetings and was taken up for further household-level adaptation.

The steps in this strategy are given below:

1. Monitoring water use in terms of:
    a. household level use of water – house-to-house assessment to check how much water a household uses daily on an average to meet its daily needs
    b. household level reuse of water – gauging of reuse of water in the household, e.g. reusing wash water to clean toilets and terraces.
2. Monitoring waste segregation in terms of:
    a. non-contamination of groundwater – collecting and segregating waste before they reach any water source or drainage points
    b. clean toilets to prevent contamination of water source points – this issue corresponds to the reuse of wastewater as clean toilets without leakage prevent any chance of contamination of water sources.
3. Seasonal rainwater harvesting for urban greening by putting up pots with plants all throughout the rooftops of informal settlements to ensure that herbs and plants can grow with kitchen water and/or rainwater collected in buckets.
4. Engaging with local stakeholders to ensure uninterrupted safe water supply to all residents by mapping existing water sources in the area and working towards ensuring pipelines (12 inches in diameter and currently under construction) for water supply in the area.

Source: Save the Children, India

Case study 9

Aquifer restoration from seawater intrusion in Vaippar Basin, Tamil Nadu

Seawater encroachment in central parts (Kuthiraimozhi Teri) and southern parts (Udankudi) of Vaippar Basin in Thoothukudi district due to heavy pumping by farmers and poor rainfall lowered the water level below the mean sea level. The river originates in the eastern slope of Western Ghats and falls into the Gulf of Mannar near Vaippar village under Vilathikulam taluk of Thoothukudi district. Due to seawater intrusion through the mouth of the Vaippar river, both surface water and groundwater in this area had become saline. The agriculture activities of the region were totally affected. To avoid seawater intrusion, the villagers tried to build earthen bunds across Vaippar as a temporary measure, but they got damaged during the monsoon season and high tides. Additionally, most of the aquifers in the basin were affected by seawater intrusion due to heavy withdrawal of groundwater. The Government of Tamil Nadu, in conjunction with local universities, attempted to address these through artificial recharge of the aquifer by constructing check dams at appropriate locations to recharge the aquifers and focusing more on harvesting rainwater.

By constructing the structures mentioned above, the following benefits were aimed to be accrued.

1. The groundwater will be recharged and the groundwater table will be considerably raised in and around the area.
2. Seawater intrusion will be arrested to the maximum extent.
3. The existing water resources may be additionally improved.
4. The irrigation lands of this area will be stabilised. Moreover, 990 acres of land will be additionally benefited.
5. The water table of the existing 19 wells in the area will be improved.

The state government has accorded an administrative sanction of INR 1,477.35 lakh for the above check dam constructed under the World Bank aided Irrigated Agriculture Modernization and Water-Bodies Restoration and Management (IAMWARM) project. The work was completed in September 2014. Saline water intrusion has been prevented and the water stored in the check dam has augmented the groundwater level in more than seven villages. The expenditure incurred for the construction of the check dam was INR 1,451.81 lakh.

5.2. Economic analysis of proposed strategies

In most cases, climate change interventions are non-revenue generating in nature and involve the public sector. The conventional approach for examining such projects has been a cost benefit analysis of the investment projects that focus more on the economic net present value (ENPV) of the project.[73] For the selection of a project for financing by public authorities and development financing institutions (DFIs), it is expected that the ENPV>0. Simultaneously, the economic internal rate of return (EIRR) needs to exceed the economic opportunity cost of capital.[74] However, conventional cost-benefit analysis (CBA) does not often consider the entire range of economic, social and environmental impact, along with the external costs and benefits throughout the life of the project. An extended cost-benefit analysis (ECBA) arrives at an overall net impact of the intervention by looking beyond purely financial values and encompasses the comprehensive economic, social and environmental impact of a project. This monetises the hidden and external costs not normally accounted for in decision-making processes (GGGI, 2015).[75]

A financial and economic cost-benefit analysis was conducted using ECBA methodology to evaluate the financial viability of the investment on the proposed adaptation strategies. Total benefits were estimated for all the proposed interventions as the sum of economic benefits (EBs) and sustainable development benefits (SDBs), where the SDBs include benefits to society and the environment. The analysis considered a thirty-year period, including the five-year project implementation period. A social discount rate of 10% per annum was used to quantify the present values of the cost and direct/indirect benefits, and accordingly estimate net benefits for the periods 5 years (short term), 10 years (medium term) and 30 years (long term). Only direct benefits and those of significant magnitude were quantified. A summary of the analysis is presented below.

Table 5.2: Summary of economic analysis

Strategy	ENPV (INR)			EIRR (%)	CBR*(%)
	Short term	Medium term	Long term		
Leveraging existing child protection and welfare schemes	-109,346,956	177,911,295	214,456,972	15	1.2
Ensuring child protection during emergencies in disaster-prone areas	-5,682,9180	177,436,960	213,885,201	15	1.2
Enabling delivery of health services through ICT	-26,451,305	45,145,533	49,175,138	23	0.5
Climate proofing of basic infrastructure	-21,998,912	-43,327,500	562,308,750	15	0.9
Ensuring livelihood and food security through CSA practices and alternative livelihoods	-24,715,935	40,055,868	48,283,951	14.68	1.18
Promoting sustainable water management	-1,244,691,500	4,093,203,929	4,934,010,064	24.4	1.79

** Cost to benefit ratio*

Source: PwC analysis

73 Economic net present value (ENPV): Economic net present value is the measure of net economic gains accruing to the economy and society from a project over the entire economic life of the project. It is calculated as the present discounted value of net economic benefits (i.e. economic benefits – economic costs), discounted by economic opportunity cost of capital.

74 Economic internal rate of return (EIRR): It is the rate of discount at which the ENPV = 0. This is the rate at which net economic benefits accrue from a project annually. Asian Development Bank, 2017. Guidelines for the Economic Analysis of Projects

75 Global Green Growth Institute, 2015. Green growth assessment & extended cost benefit analysis - a handbook for policy and investment decision makers

A project can be considered viable if the EIRR is higher than the discount rate used for estimation. The economic analysis shows that the projects are economically viable, given the EIRR is above 12%, which is the discount factor used. In the short term, the cash outflows are negative. However, the benefits are realised in medium and long term. The detailed analysis results are presented in the Annexure 2.

Conceptually, a climate change adaptation project yields developmental benefits while addressing the adaptation needs (reducing the impact of loss or damage due to climate change). Mitigation benefits also get added to the developmental and climate change benefits of the project. However, given the current level of scientific evidence related to how climate change affects local weather, hydrology and societies, estimating the climate benefits of the project in isolation from development benefits was not undertaken as a part of this study. Instead, a multicriteria analysis of the proposed strategies was conducted to establish the climate change benefits of the project specific to children. Each of the strategies was rated none, low, medium and high, corresponding to values of 0, 1, 2 and 3. against the factors - contribution to mitigation of climate change, direct reduction of sensitivity of the child to climate change, direct enhancement of adaptive capacity of children to climate change, and potential to ensure survival, protection, development and participation rights of children.

Table 5.3: Estimation of climate benefits from proposed adaptation strategies specific to children

Proposed strategy	Contributes to mitigation of climate change	Reduces sensitivity of the child to climate change directly	Directly enhances the adaptive capacity of children to climate change	Ensures survival, protection, development and participation rights of children directly	Total
Leveraging existing child protection and welfare schemes	None	High	High	High	9
Ensuring child protection during emergencies in disaster-prone areas	None	High	High	High	9
Enabling delivery of health services through ICT	None	Medium	Medium	Medium	6
Climate proofing of basic infrastructure	None	Medium	Low	Medium	5
Ensuring livelihood and food security through CSA practices and alternative livelihoods	Medium	Medium	Low	Low	6
Promoting sustainable water management	None	Low	Low	Low	3

Source: PwC analysis

5.3. Barriers to implementation

The planning and implementation of adaptation strategies focusing on or considering child-specific impact face multiple barriers at present. The key barriers to planning and implementation are listed below:

- In the context of climate change impact, children are not covered explicitly, sufficiently or comprehensively in any of the existing programmes. At present, most of the government and large livelihood programmes are blind to climate change risks and are not informed of the possible risks, especially those related to children at the design level. A review of the existing policy frameworks shows inadequate coverage on child-specific impact due to climate change and related disasters and how the vulnerability of children can be reduced, and their resilience can be enhanced. However, many of the development programmes address the vulnerability of children and have great potential in enhancing resilience.
- Considerations related to children in planning, budgeting, implementation and appraisal of the different development, climate resilience and disaster resilience programmes in the country are limited at present.
- Inadequate capacity on climate change impact assessment and adaptation planning focusing on all levels, including the public sector, civil society organisations and the private sector, remains the key challenge.
- There is no blueprint on channelising private sector investment for enhancing climate and disaster resilience of children. This requires comprehensive planning and greater government ownership and capacities.

Chapter 6

Roadmap for child-focused climate change adaptation

The understanding of climate change impact, vulnerability of children to climate change and their adaptation needs helped in making recommendations as part of the study. The recommendations are categorised as follows:

Mainstreaming climate change through transformative strategies

What steps (policy, institutional, financing) may be taken towards mainstreaming climate change in the planning and budgeting cycle of the Central Government and sub-governmental levels in India?

Building resilience through adaptive strategies

What are the specific adaptation measures that can be implemented in the study regions?

It is to be noted here that while adaptation measures specific to study regions and their vulnerabilities are presented in Chapter 5, this chapter discusses cross-cutting recommendations aimed at developing policy instruments, institutional frameworks and financial mechanisms to enable implementation of the proposed adaptation strategies, along with an implementation plan for proposed adaptation measures.

Key findings

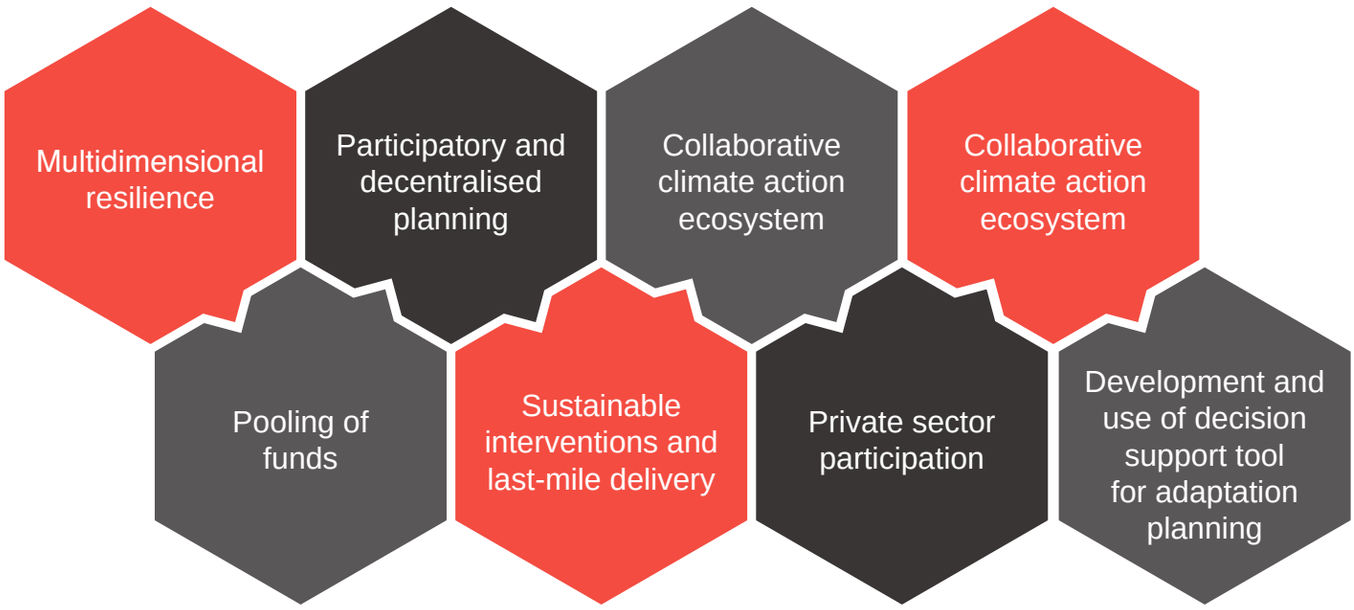
The key impact of climate change on children in the selected districts is summarised below:

- In Morena and Purulia, West Bengal, indebtedness of many households due to poor agriculture productivity led to children dropping out of schools.
- In Khargone, Madhya Pradesh, the decrease in groundwater level affected the availability of drinking water and dehydration (20%) was common among children.
- In Haridwar, parents complained of an itching disease after the floods.
- In Khargone, Purulia, and South 24 Parganas, more than 50% of the respondents reported that children were unable to play outside due to excessive heat during summers.
- In Uttarkashi, children were reported to have not been taken to hospitals due to inaccessibility of hospitals.
- In Morena, Madhya Pradesh, education was affected during the rainy season as children found it difficult to reach their schools.
- In Uttarakhand, children made up for around 39% of the reported hospital admissions in the aftermath of a climate-related disaster.
- In all districts in Uttarakhand (except Uttarkashi), more than 50% of the respondents mentioned malnutrition in children due to insufficient food as climate variability and extreme events affected crop yield and income.
- In Purulia and South 24 Parganas in West Bengal, 58% of the respondents reported that their children faced heat-related health issues such as dehydration, skin diseases and allergies.
- In Uttarakhand, 30% of the respondents reported that their children were affected (injured) due to climate-related disasters such as floods and landslides.
- In Purulia, 15% of the respondents said that their children had to miss school for more than a month in the aftermath of a disaster.

6.1. Mainstreaming climate change through transformative strategies

Comprehensive adaptation planning should result in the development of portfolio of climate change adaptation opportunities that can be mainstreamed in the policies, plans and programmes of the country. This is crucial to ensure best use of investment needs, given the limited resources available and competing needs. Towards this, a policy framework to enhance climate resilience of children and communities through mainstreaming climate change considerations into policy planning, budgeting and implementation should be developed. A general framework is proposed in this report in the context of the existing political and governance landscape in India, the broad objectives and dimensions of which are presented below.

Figure 6.1: Framework for mainstreaming child-related climate change considerations



Source: PwC analysis

The eight pillars of the policy framework for mainstreaming child-related climate change considerations are discussed in detail below.

1. **Multidimensional resilience:** Adaptation strategies have the potential to generate economic, social and environmental benefits. The benefits from a proposed strategy may not be restricted to the stated objective and often has spill over effects across sectors and communities in the forms of increased job creation, rise in gross domestic product (GDP) and formation of social capital. Investment decisions should consider direct and indirect benefits and multi-sectoral implications while evaluating the suitability of adaptation strategies. In addition, for better design and implementation of adaptation strategies, risk-informed policy and programmatic frameworks can be put in place. This will help in considering climate risks while designing large-scale or small-scale programmes.

2. **Participatory and decentralised planning:** Ensuring inclusivity and equitable access to all stakeholders should be the underlying principle of climate change adaptation in India. This is important, considering the diverse socio-economic background of the country. The key to addressing this aspect is ensuring participatory planning and continuous dialogue between communities, policymakers and implementing agencies. There should be adequate platforms and processes that enable all sections of the communities, especially the marginalised and the vulnerable, to voice their needs and concerns. Also, given the need to plan, design and implement adaptation strategies contextual to the communities and regions, the investment framework should focus on a decentralised process that devolves the power to plan and implement to the communities. This should involve mainstreaming climate investments in local budgets and plans and explicit stating of climate adaptation and mitigation benefits as intended objectives.

3. **Collaborative climate action ecosystem:** A multitude of actors play roles in climate action and child development in India. This includes different levels of government (national, state and local government institutions), international development agencies (bilateral development agencies, multilateral funding agencies, etc.) and the private sector (corporates, philanthropic foundations, civil society organisations, social entrepreneurship entities, etc.). These players undertake different roles of varying capacities at a larger or limited geographic scope. It is important that the framework identifies the current and potential roles of these actors in climate action and leverages on the synergies for greater impact. A roadmap that facilitates integration and cooperative collaboration among actors, while incorporating the project life cycle (project ideation, planning, implementation, monitoring and evaluation) needs to be developed. Such a framework should bring together and promote interdisciplinary and multisectoral thinking.

4. **Convergence with existing policies and actions:** In the past few decades, India has made substantial public investments towards socio-economic development. One of the most remarkable initiatives implemented in the country is the MGNREGA in 2005. The MGNREGA's objective is to ensure at least 100 days of guaranteed employment (in a financial year) in rural areas to adult members of households interested in unskilled manual work. The NREGA addresses poverty through promotion of waged employment by creating durable assets for sustainable natural resources management and disaster mitigation, Some of the other key policies and schemes implemented in India for socio-economic development are the NHM, the NSAP, the PMFBY and Rashtriya Krishi Vikas Yojana (RKVY), Deendayal Antyodaya Yojana-National Rural Livelihoods Mission (DAY-NRLM), Deendayal Antyodaya Yojana-National Urban Livelihoods Mission (DAY-NULM), amongst others. There are a few initiatives that focus on children (MDM, ICDS, SSA) as well. To undertake the proposed specific and cross-cutting adaptation strategies, it is important to converge or integrate with existing government policies and actions. This will help in optimising the efforts through bringing in synergies between different policies/actions and different sectors by converging funds, institutional technical expertise, social mobilisation or other aspects related to planning and implementation.

5. **Pooling of funds:** Budgetary outlays are often insufficient for effective climate interventions. Therefore, there is a need to identify and leverage different funding sources. There are multiple options that the framework can cover, including climate finance options such as the Green Climate Fund (GCF) financing and private funds. There are different financing instruments like grants and loans that can be explored. Pooling of resources and blending of finances and instruments should be the focus of the investment framework. This would ensure adequacy of financing, involvement of multiple stakeholders and greater transparency, accountability and efficiency in the use of resources, thereby contributing to maximisation of socio-economic and environmental benefits.

6. **Sustainable interventions and last-mile delivery:** Adaptation interventions are not one-time investments and often incur recurring costs such as operation and maintenance, and overheads. This necessitates planning for covering future costs at the time of design of the adaptation intervention. A long-planning horizon to ensure long-term sustainability to avoid the interventions becoming non-functional post the implementation period should also be considered. Also, the investment framework should encourage revenue generation from climate intervention projects and establish a mechanism for financial planning of interventions. Another key problem faced during implementation is related to delivery of technology/services to the beneficiaries. Incentivising actors in the supply chain

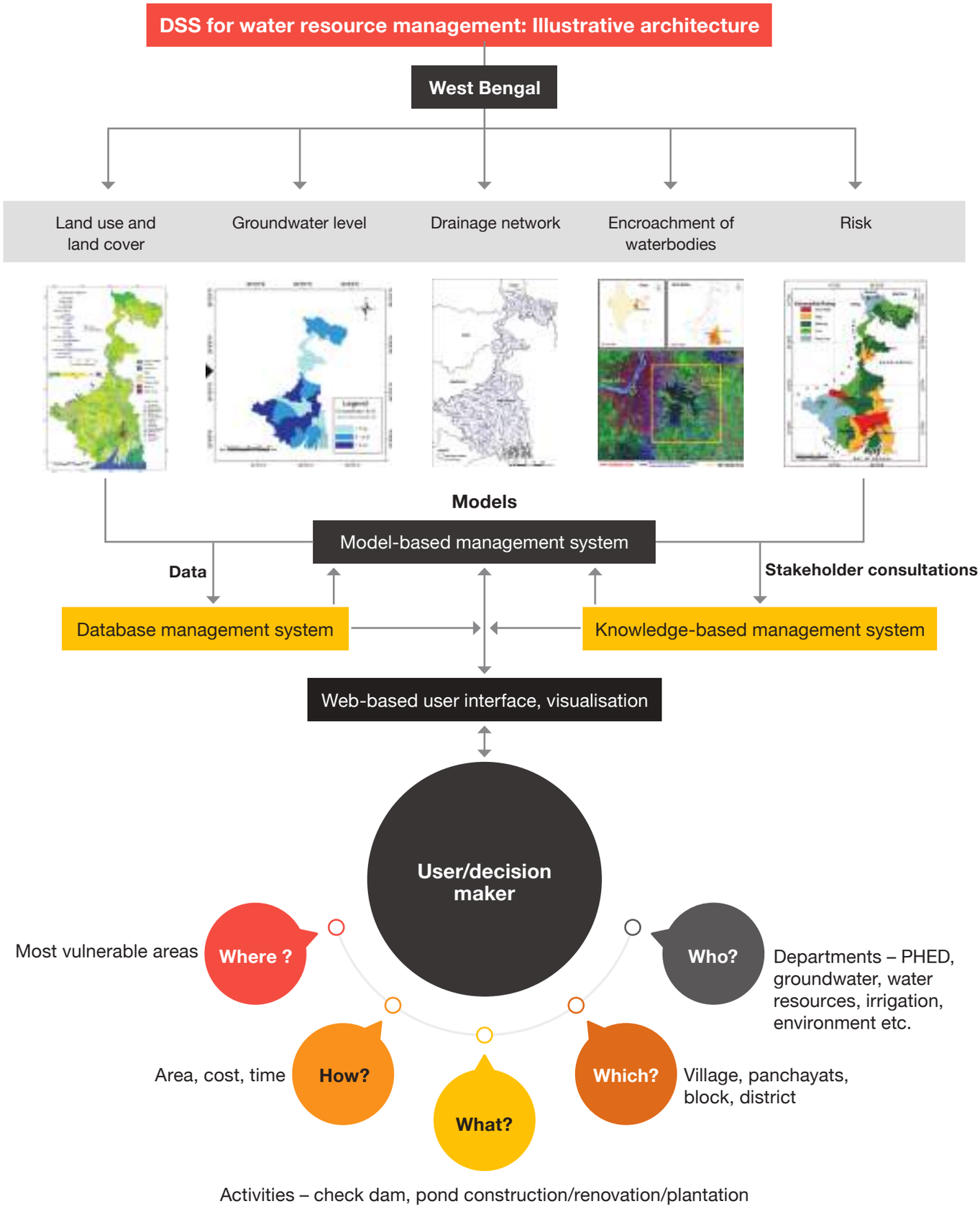
to ensure last-mile delivery and establishing mechanisms to monitor and evaluate the delivery of services are important. Sustainability of interventions and last-mile delivery will reduce the risk to investments that may otherwise hinder private sector participation.

7. **Private sector participation:** Approximately USD 206 billion is required between 2015–2030 for implementing adaptation actions across sectors in India and it is estimated that the country faces a funding gap of USD 38 billion for effective climate action.[76] The private sector can be a key player in addressing this gap. In addition to financial resources, the private sector can contribute in terms of technical expertise, management experience and professionalism to climate action, thereby bringing in efficiency in the system. Hence, the strategic investment framework should consider private sector players as partners, identify the barriers to their participation and implement measures to remove hurdles and promote their participation.

8. **Development and use of decision support tool for adaptation planning:** The availability of authentic secondary data has been a bottleneck for the current study. There needs to be a proper geo-referenced database for researchers to carry out extensive climate-vulnerability assessments and policymakers to take informed decisions based on such assessments. A geographic information system (GIS) based decision-making tool may be developed as a decision support system (DSS) for planning and monitoring of adaptation interventions. The DSS will be used as a platform for generation of authentic secondary data cross-referenced with the GIS information, maps and reports to plan and monitor the implementation of on-ground intervention activities like the location for water harvesting structures, costing of the interventions, work allocation of the departments for implementation of the interventions and ground truthing. The DSS will be developed using three components of DSS, i.e. database management system, model-based management system and knowledge-based management system. The final output from the DSS will generate reports and maps to visualise the locations (village area, forest lands, hill slopes, etc.) for taking interventions, activities (like pond renovation and check dam construction), costing and identifying departments responsible for implementation. Also, the DSS will help to locate the areas for natural resource encroachment (loss/shrinkage of waterbodies) and make policies and regulations to remove encroachment. Below is an illustration on how a DSS may be developed for water resource management in drought-stricken areas of West Bengal.

76 India's Intended Nationally Determined Contribution: Working towards Climate Justice. Available at https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf

Figure 6.2: DSS for water resource management in drought-stricken areas of West Bengal (illustrative)



Source: PwC analysis

6.2. Building resilience through adaptive strategies

Based on the findings of studies conducted, six adaptation strategies are proposed as part of this study in Chapter 5. In this section, we propose an implementation plan for the strategies. The proposed implementation plan consists of an indicative list of activities to be conducted for each of the strategies and measures, timeframe for implementation and potential institutions that may play a role in the planning and implementation and is presented in Table 6.1.

Table 6.1: Implementation plan for proposed adaptation strategies and measures

List of activities to be undertaken	Timeframe	Institutions responsible
Strategy 1: Leveraging existing childcare and welfare schemes • Strengthening the implementation of existing child protection and welfare schemes • Leveraging child frontline workers towards climate resilience of children		
Undertaking evaluation study on the shortcomings of the protection and welfare programmes in the project regions	Short	Interested development agencies and civil society organisations (CSOs) may take the responsibility
Reviewing of the NHRM and the ICDS to align the work as per the revised NDMP	Short	Government agencies (national level)
Sensitising government stakeholders involved in planning and implementation, including district administration, community representatives, ASHAs, ANMs and AWWs regarding gaps and needs of the programme	Short	Interested development agencies and CSOs may take the responsibility
Conducting training needs assessment of the frontline workers	Short	Interested development agencies and CSOs may take the responsibility
Preparing guidelines for regular capacity building of the frontline workers	Short	Government agencies (national level)
Developing a capacity-building programme for frontline workers on skills and knowledge related to their routine roles and responsibilities, awareness about climate change and its impact on communities and children, and disaster preparedness, response and recovery measures with focus on children	Medium	Government agencies (national/state level)
Establishing linkages between local disaster management teams, local community institutions (SHGs, gram sabhas, etc.) and frontline workers and facilitating formation of community emergency response teams	Medium	Local government institutions
Addressing the financial and human resource related gaps of social protection and welfare programmes based on the findings of evaluation studies	Long	Government agencies (national/state level)
Upgrading the infrastructure and facilities required by frontline workers	Long	Government agencies (national/state level)
Preparation of standard operating procedures (SOPs) for frontline workers on how to respond to climate variability as well as extreme climate events.	Short	Interested development agencies and CSOs may take the responsibility

List of activities to be undertaken	Timeframe	Institutions responsible
Strategy 2: Enabling delivery of health services through ICT • Promoting use of mHealth applications among communities		
Identifying a suitable mHealth solution or service provider	Short	Interested development agencies and CSOs can evaluate and finalise in consultation with government agencies
Customising the mHealth solution (using colloquial language, etc.)	Short	mHealth service provider
Linking primary health centres, secondary care facilities (district/subdistrict hospitals) and tertiary care institutions (medical colleges) to mHealth solutions for specialist consultations	Medium	mHealth service provider
Piloting the implementation in selected project villages by: • conducting awareness generation campaigns to promote the mHealth app • signing up of community members to access the services • monitoring and evaluation of the progress.	Short	Interested development agencies and CSOs can take the responsibility of the pilot project. This may be implemented jointly with local governments. Local community institutions and frontline workers such as ASHAs or ANMs may be onboarded for awareness building and signing up activities.
Scaling up implementation to other villages	Long	Government agencies (national/state level)
Strategy 3: Ensuring child protection in disaster-prone areas • Development of CFSs • Formation of children's collectives		
Developing country-specific guidelines for CFSs with a special focus on the convergence of existing child protection and welfare schemes at national and state levels	Short	Interested development agencies and CSOs may take the responsibility
Stocktaking of shelters or facilities available in the project region and assessing their suitability and performance	Short	Interested development agencies and CSOs may take the responsibility
Identifying suitable spaces for upgrading shelters or facilities into CFSs or setting up new CFSs	Short	Interested development agencies and CSOs may take the responsibility
Strengthening individual awareness and building children's collectives	Long	Interested development agencies and CSOs may take the responsibility

List of activities to be undertaken	Timeframe	Institutions responsible
Strategy 4: Climate proofing of basic infrastructure • Developing guidelines for climate- and disaster-resilient infrastructure • Climate proofing of critical infrastructure to climate variability and extreme events in the present and future • Development of a real-time monitoring and early warning system for landslides in Uttarakhand		
Preparing guidelines for climate- and disaster-resilient infrastructure	Short	Interested development agencies and CSOs can take the responsibility
Communicating and training on the use of guidelines	Short	Interested development agencies and CSOs can take the responsibility
Sensitising on the use of extended cost-benefit analysis as the basis for decision making related to climate proofing investments by policymakers and other decision makers	Short	Interested development agencies and CSOs can take the responsibility
Identifying critical basic infrastructure that requires climate proofing in the project region	Short	Government agencies (state level)
Conducting feasibility study and environment and social impact assessment of identified critical infrastructure for upgrade or construction	Medium	Government agencies (national/state level)
Climate proofing existing critical infrastructure	Long	Government agencies (national/state level)
Designing and constructing critical infrastructure	Long	Government agencies (national/state level)
Strategy 5: Ensuring livelihood and food security through CSA practices and alternative livelihoods • Capacity building of farmers on CSA practices and alternative livelihood options • Enhancing market linkages for agriculture and other produce		
Developing capacity building programmes for farmers on CSA, alternative livelihoods and nutrition security	Short	Interested development agencies and CSOs can take the responsibility
Selecting beneficiaries in the project region for training	Short	Interested development agencies and CSOs can take the responsibility
Conducting training sessions for the farmers and communities	Medium	Interested development agencies and CSOs can take the responsibility
Enhancing market linkages for agriculture and other produce	Medium	Government agencies (national/state level)
Strategy 6: Promoting sustainable water management • Developing WSSPs at the community level • Constructing/renovating water harvesting, conservation and ground recharge structures • Promoting efficient use of water for household and agricultural purposes • Implementing subsurface water technologies to avoid saltwater intrusion in South 24 Parganas		
Developing WSPs at community levels	Medium	Interested development agencies and CSOs can take the responsibility
Identifying existing water harvesting/conservation/ groundwater recharge structures for renovation and areas for construction of new water management structures	Short	Interested development agencies and CSOs can take the responsibility

List of activities to be undertaken	Timeframe	Institutions responsible
Conducting awareness campaigns to promote water efficiency	Short	Interested development agencies and CSOs can take the responsibility
Developing a capacity-building programme for the community and farmers on irrigation techniques, use of drought-/heat-resistant crops, practice of less water-intensive farming and water budgeting	Short	Interested development agencies and CSOs can take the responsibility
Selecting children as change agents and training them to promote sustainable water management	Short	Interested development agencies and CSOs can take the responsibility
Establishing governance structure for water monitoring and budgeting at the community level	Medium	Interested development agencies and CSOs can take the responsibility
Implementing water budgeting at the community level	Medium	Interested development agencies and CSOs can take the responsibility
Implementing subsurface water technologies to avoid saltwater intrusion in the Sundarbans	Long	Government agencies (state level)

Source: PwC analysis, 2019

In addition to the specific adaptation strategies, a few generic strategies may be implemented across geographic areas in the country for communities affected by climate change.

Ensuring access to education: Youth and adolescents, especially women and girls, should be trained on skills that take into consideration the availability of resources and unique needs of the communities and customise them accordingly. Special scholarships can be given to children in families affected by climate risks (crop failure, migration, etc.) with a focus on single parents/caregivers, women-headed households, children-headed households, elderly caregivers, and households with disabled family members (particularly parents and caregivers). Further, the establishment of a quality vocational education training institute at the block or panchayat cluster level would enhance and diversify the skills of youths and adolescents, enabling them to fulfil the demands of the market-relevant secondary and tertiary sectors.

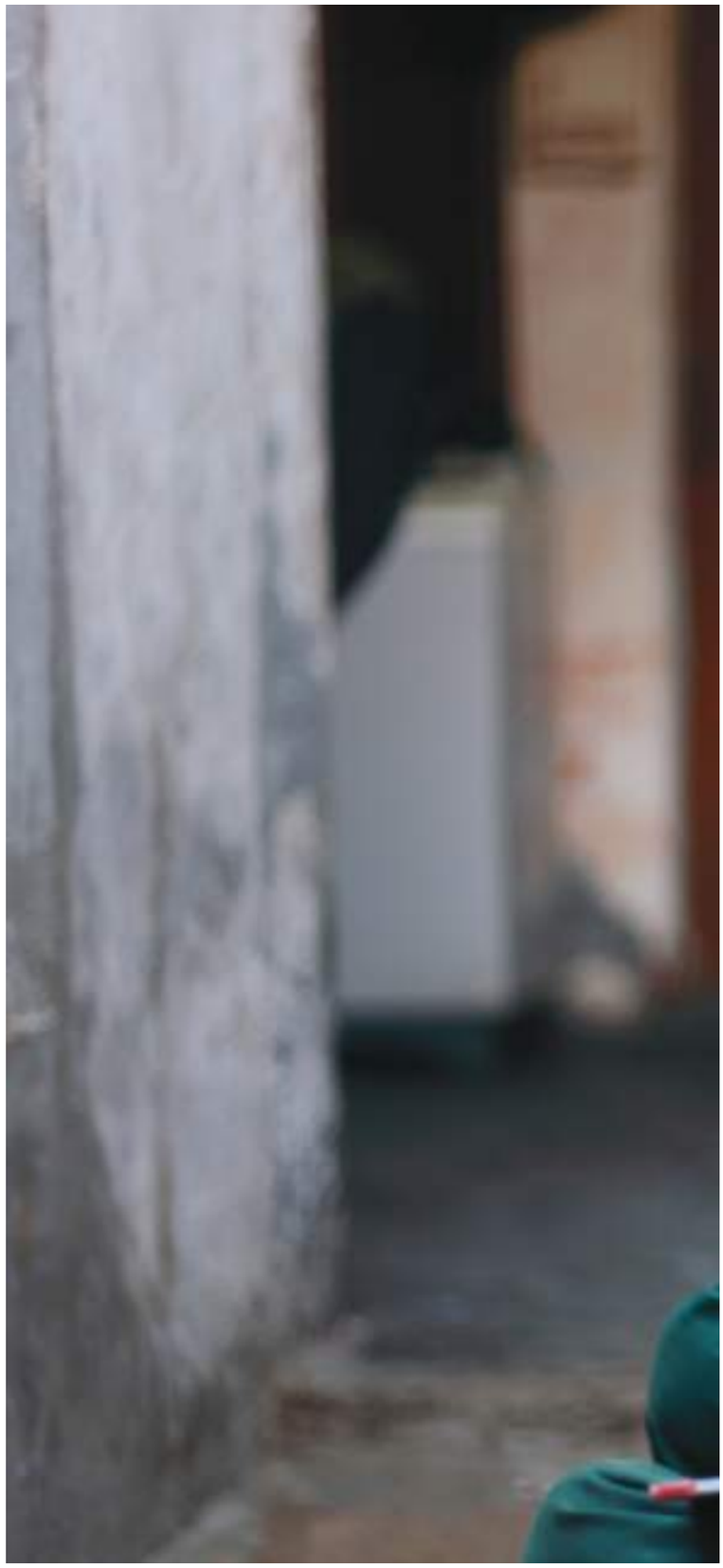
Ensuring livelihood security and social protection: Formal and informal gender-sensitive social protection and safety net programmes, including microfinancing, SHGs, social insurance and community-led initiatives (e.g. grain banks, seed banks and tool banks), are important to absorb the effects of climate change on livelihoods. Provisioning for these safety net programmes and linking them with existing programmes such as the NSAP and crop insurance programmes is important. There should be a specific formal financial policy to cater to the rural economy of India, including simple terms and conditions for a labourer to access credit at an informal rate. A framework to establish at least one formal financial institution (which could even be a post office) at the panchayat level should be developed and implemented. Specific measures like crop insurance that covers the uncertain risks of disaster and climate change should be taken. Ensuring village-level availability and accessibility of basic livelihood services (agriculture, horticulture and veterinary services) to all people, irrespective of their caste, class and gender, is critical. The availability of quality services, such as cold storage facilities at the panchayat level or farmer extension centres at the block/panchayat level, will help communities to avail information and support in a timely manner, without disrupting their work. Last-mile service delivery will be a transformative step to address the issues faced by the communities.

Building knowledge and awareness of climate change and its impact: There is a need to undertake awareness-building initiatives regarding climate change, its impact on communities and the implications for children. All key stakeholders – policymakers, government institutions (especially local government bodies), civil society and community organisations, NGOs, among others – should be sensitised through customised awareness-building activities. Formation of eco/nature clubs is helpful in imparting knowledge and awareness to children. Disaster and climate risk education can be integrated into the formal education curriculum. Government stakeholders at all levels should be trained on climate change and mainstreaming climate change resilience. Local governance and service providers at the field level should be trained on specific risks and impact that may affect their area of jurisdiction or operations. Sensitisation of the media will play a key role in spreading awareness. The capacity of the media to cover climate-related reporting and bring out a climate change perspective while reporting social, economic and environmental issues should be strengthened. It is important that the needs of the marginalised and vulnerable population are taken into consideration in the content as well as the medium of communication of the knowledge and awareness-building efforts.

6.3. Way forward

As highlighted in the study, children bear the brunt of climate change as it affects their fundamental rights of survival, protection, development and participation. They are particularly susceptible to injuries due to their lack of capacity to understand and respond well to danger. They face emotional distress in the aftermath of climate-related disasters due to high rates of sleep disturbance, loss of life and property, and other psycho-social issues. They are also more susceptible to water- and vector-borne diseases. Their education and academic performance are affected as a result of extreme weather events like floods and droughts. In extreme cases, they are forced to drop out of school to support their households. Communities, especially the ones that are marginalised, are severely impacted.

This study aimed to identify and analyse the threats to the rights of children induced by climate change by assessing climate-related hazards as well as the sensitivity and adaptive capacity of communities and children. Since climate change is recurrent in nature and is expected to get more severe and devastating in the future, the rights of children are under constant danger. The study therefore suggests building resilience amongst communities and children through adaptive strategies and by mainstreaming climate change in policy formulation and decision making. A child-centred rights-based approach to policies and extensive planning to protect child rights articles under the UNCRC is needed across states, districts and lower levels of administration in India. Such actions will help India achieve the commitments made to children under the Constitution and the UNCRC.



Annexure 1: Key district-wise observations from the primary survey

The key observations from our primary survey are presented in this annexure.

Key issues – district wise

Purulia

- Acute poverty in more than 50% of the households
- Drought/lack of seasonal rainfall and depletion of groundwater led to a decrease in crop productivity by approximately 50%.
- Decrease in crop productivity and loss of livelihoods/income leads to insufficient nutrition (of approximately 60%); more prominent among scheduled tribes (approximately 45%)
- Economic condition and water crisis play a role in access to irrigation facilities for farming (approximately 65%)
- Insufficient nutrition is common among households with a monthly income less than INR 5,000 or below poverty level (BPL) households (approximately 41%) and is a key contributing factor to malnutrition and chronic illnesses (approximately 40%)
- Limited resources and dependence on natural resources make health an area of concern among scheduled tribes (approximately 65%).
- Widespread open defecation (approximately 90%) leading to health-related problems
- Health issues such as skin diseases, dehydration and diarrhoea due to climate-induced stress or extreme events (approximately 80%)

South 24 Parganas

- Increased salinity and lack of seasonal rainfall has led to livelihood loss and reduction in agricultural income due to productivity decrease (approximately 40%)
- Lack of alternative/secondary livelihood options increases vulnerability of local people to extreme events (approximately 50%)
- Insufficient nutrition due to decrease in crop productivity and loss of livelihoods/income (approximately 30%); more prominent among scheduled castes (approximately 55%)
- Widespread out-migration (approximately 50%); more among scheduled castes (SCs) (approximately 60%), those with primary and secondary education (approximately 40%) and men (approximately 80%)
- Seasonal migration with peopling migrating once or twice in a year (approximately 55%)
- Migration as a survival strategy to improve economic conditions affected by climate- induced stress/extreme events (approximately 90%); indebtedness – a major driver (approximately 30%)
- Non-migrant households have the intention to migrate in the future (approximately 27%)

Key issues – district wise

Morena

- Poverty due to crop loss (approximately 40%)
- Majority of the households lived in kutcha houses (approximately 63%) and higher prevalence of open defecation (approximately 53%)
- High susceptibility of children to water and vector-borne diseases (approximately 36%)
- Lack of proper nutritious food had led to malnutrition in children (approximately 15%)
- Limited movement during rains (approximately 25%) affecting livelihood access
- Limited access to healthcare facilities due to distance and insufficient infrastructure (road and transport) (approximately 61% among SC/ST against approximately 41% among all children)
- 15% of the children in the age group of 5–14 did not go to school; 57% of these children belonged to the SC/scheduled tribe (ST) category and the majority of them were female
- Indebtedness of households due to poor agriculture productivity had forced children to leave schools (approximately 12%)

Khargone

- Water crisis in more than 50% of the households
- Decrease in groundwater level had affected the availability of drinking water for children, causing dehydration (approximately 21%)
- Agriculture had suffered significantly from water scarcity and has led livelihood loss (approximately 40%) and insufficient nutrition in households (approximately 34%)
- A lot of women work outside the villages; 50% of the primary caregivers work as crop farmers or daily wage labourers
- These were households that were BPL (42%) and had a debt greater than 1 lakh (52%)
- Insufficient nutrition (40%) and nutritional and emotional well-being (approximately 26%) are issues in large number of households with working mothers
- Higher incidence of children falling sick with skin diseases, chikungunya and vomiting in these households due to heat and heavy rainfall (42%)
- In 38% of the households, the primary caregiver had no schooling, and approximately 30% had only attended primary school
- 58% of the households fetched water from the surface or dug wells or tube wells. The absence of a primary caregiver was found in households where it was the woman's responsibility to fetch water

Key issues – district wise

Uttarkashi

- Landslides/floods are a frequent occurrence in Uttarkashi (approximately 65%)
- In 36% of the cases, children were injured due to extreme event
- Already existing insufficient infrastructure (77%) is further damaged, affecting access to services
- Majority of the people are exposed to temporary displacement of the household due to extreme events (67%)
- Temporary displacement severely affects children's education due to increased absenteeism (80%)
- Temporary displacement also affects the economic well-being of the household and could affect their main livelihood

Haridwar

- Outstanding loans are a problem in 44% of the households in Haridwar
- While none of them fall below the poverty line, almost 40% of the households have an average income of less than INR 5,000 per month
- 45% of households belonged to the SC category.
- The main livelihood of the households in Haridwar is daily wage labour (42%); other livelihood options are agriculture, construction workers, small petty business ownership, etc. which are also vulnerable to extreme events
- Debt-ridden households are more vulnerable to health issues due to climate change (83%)
- Households report economic security, housing and drinking water adversely being impacted by climate change
- Significant prevalence of diseases such as diarrhoea, skin irritation and allergies among children (46%)
- Access to health services is an issue (45%) as the nearest medical facility was more than 5 km away, which is compounded by insufficient infrastructure

Annexure 2: Details considered for economic analysis of the proposed adaptation strategies

The targets and beneficiaries for the planned activities for the six identified strategies and assumptions considered for estimating costs and benefits are summarised in this annexure.

Details considered for economic analysis of the adaptation strategy – leveraging existing child protection and welfare schemes

Particulars	Unit of measurement	Value	Assumptions
Households to benefit	Number	132,717	Objective of the intervention is to target 5% of the rural households in the six project regions per year
Number of Anganwadi centres (AWCs) to be strengthened	Number	120	30 AWCs to be strengthened per year from years two to five. This will cover a population of 24,000 (assuming 1 AWC per 800 population).
Number of PHCs to be strengthened	Number	120	30 PHCs to be strengthened per year from year two to year five.
Cost for strengthening child frontline programmes/upgrading of infrastructure per AWC or PHC	INR	24 crore	INR 10 lakh per AWC or PHC
Number of frontline workers to be trained	Number	600	100 frontline workers per project region per year Given the one ASHA per 1,000 population norm, approximately 600 ASHAs to cover 5% of the population. Same number of AWWs can also be trained.
Cost of training per frontline worker	INR	1,000	Per frontline worker

Particulars	Unit of measurement	Value	Assumptions
Expenditure for the following activities: 1) Evaluation study of the child protection and welfare programmes 2) Review of NHRM and ICDS to align the work as per the revised NDMP 3) Sensitisation of government stakeholders 4) Assessment of training needs 5) Preparation of guidelines for regular capacity building of the frontline workers 6) Preparation of information, education and communication (IEC) materials 7) Consultation for collaboration and formation of community emergency response team 8) Handholding activities	INR	23 lakh	One-time consultancy fee or professional fee for these activities is considered
Households with children suffering from health issues related to nutrition, drinking water, hygiene and exposure to disasters	%	30%	Assumption based on primary survey
Monthly expenditure on healthcare for children	INR	389	Assuming that 50% of the average expenditure (medical and non-medical) per hospitalised case in rural areas is for children
Households with children suffering illnesses or injuries due to disasters	%	30%	Assumption based on primary survey
Additional healthcare expenses in the aftermath of climate hazards	INR	800	Assuming additional expenses due to climate hazards
Minimum wage per day	INR	200	Conservative estimate of minimum wage
Number of man-days lost by caregivers due to sick children	Days	2	-
Absenteeism due to health issues	Days	5	-

Details considered for economic analysis of the adaptation strategy - enabling delivery of health services through ICT

Particulars	Unit of measurement	Value	Assumptions
Households to benefit	Number	132,717	Objective of the intervention is to target 5% of the rural households in the six project regions per year
Expenditure on the following activities: 1) Identification of a suitable mHealth solution or service provider 2) Customisation of the mHealth solution 3) Linking health centres and institutions to an mHealth solution for specialist consultations Number of awareness campaigns	INR	20 lakh (year-one expenditure)	One-time consultancy fee or professional fee for these activities is considered
Cost of conducting awareness generation campaigns (per village) to promote the mHealth app	INR	25,000	One-time consultancy fee or professional fee is considered. This is incurred in year one.
Number of ASHAs to be trained	Number	600	100 frontline workers per project region, per year Given one ASHA per 1,000 population norm, approximately 600 ASHAs to cover 5% of the population
Cost of sensitising community members (per ASHA worker) on the mHealth solution	INR	2,500	Frontline workers to facilitate subscription of 100 households on the mHealth platform. A fee of INR 25 per household can be paid to the frontline worker.
Households with members suffering from illnesses or injuries	%	30%	Assumption based on primary survey
Monthly expenditure on healthcare	INR	777	National average expenditure (medical and non-medical) per hospitalised case in rural areas is for children
Saving of costs due to timely intervention and avoided travel	INR	20%	-
Households incurring healthcare expenses in the aftermath of climate hazards	%	10%	-
Additional healthcare expenses in the aftermath of climate hazards	INR	800	-
Minimum wage per day	INR	200	Conservative estimate of minimum wage
Number of man-days lost due to illness	Days	4	-

Details considered for economic analysis of the adaptation strategy - ensuring child protection during emergencies

Particulars	Unit of measurement	Value	Assumptions
Children in the region	Number	2,516,130	
Developing country-specific guidelines for CFSs and stocktaking of shelters or facilities to be upgraded into CFSs.	Number	10 lakh	One-time consultancy fee or professional fee for these activities is considered
Number of buildings to be upgraded as CFSs	Number	10	10 shelters/building per year
Children to benefit per CFS	Number	4,000	It is assumed that shelters that can accommodate 1,400 people are upgraded as CFSs. An average of 400 children can be accommodated in each such space.
Cost of upgrading into CFS per shelter/ building	INR	10 lakh	The cost considered does not include the cost of construction of a shelter. This amount is to enhance the facilities or for purchase of materials that are required to ensure that the shelter/building is as per CFS guidelines.
Operation and maintenance (O&M) costs	%	2	Recurring cost of 2% of initial investment is considered. A 5% increase in year-on-year cost post project implementation period is also considered.
Children suffering from illnesses or injuries in the aftermath of disasters	%	30%	Assumption based on primary survey
Additional healthcare expenses in the aftermath of disasters	INR	500	Assuming 50% of average expenditure (medical and non-medical) per hospitalised case in rural areas is for children
Minimum wage per day	INR	200	Conservative estimate of minimum wage
Number of man-days lost by caregivers due to sick children in the aftermath of a disaster	Days	2	-

Details considered for economic analysis of the adaptation strategy - climate proofing of basic infrastructure

Particulars	Unit of measurement	Value	Assumptions
Households to be benefited	Number	132,717	Objective of the intervention is to target 5% of the rural households in the six project regions per year.
Number of AWCs to be strengthened	Number	120	30 AWCs to be strengthened per year from year 2 to year 5. This will cover a population of 24,000 (assuming 1 AWC per 800 population).
Number of PHCs to be strengthened	Number	120	30 PHCs to be strengthened per year from year 2 to year 5
Cost for strengthening child frontline programmes/upgrading of infrastructure per AWC or PHC	INR	24 crore	INR 10 lakh per AWC or PHC
Cost of upgrading into CFS per shelter/ building	INR	10 lakh	The cost considered does not include the cost of construction of a shelter. This amount is to enhance the facilities or for purchase of materials that are required to ensure that the shelter/building is as per CFS guidelines.
Number of frontline workers to be trained	Number	600	100 frontline workers per project region, per year Given the one ASHA per 1,000 population norm, approximately. 600 ASHAs to cover 5% of the population. Same number of AWWs can also be trained.
Cost of training per frontline worker	INR	1,000	Per frontline worker
Expenditure for the following activities: 1) Evaluation study of the child protection and welfare programmes 2) Review of NHRM and ICDS to align the work as per the revised NDMP 3) Sensitisation of government stakeholders 4) Training needs assessment 5) Preparation of guidelines for regular capacity building of the frontline workers 6) Preparation of IEC material 7) Consultation for collaboration and formation of community emergency response team 8) Handholding activities	INR	23 lakh	One-time consultancy fee or professional fee for these activities is considered

Particulars	Unit of measurement	Value	Assumptions
Households with children suffering from health issues related to nutrition, drinking water, hygiene, exposure to disasters	%	30%	Assumption based on primary survey
Households with children suffering from illnesses or injuries due to disasters	%	30%	Assumption based on primary survey
Additional healthcare expenses in the aftermath of climate hazards	INR	800	Assuming additional expense due to climate hazards
Minimum wage per day	INR	200	Conservative estimate of minimum wage
Number of man-days lost by caregivers due to sick children	Days	2	-
Absenteeism due to health issues	Days	5	-

Details considered for economic analysis of the adaptation strategy - ensuring livelihood and food security through CSA practices and alternative livelihoods

Particulars	Unit of measurement	Value	Assumptions
Households to benefit	Number	410	Total net sown area to be benefitted was divided by the average farm landholding size of 1.1 hectares (NABARD, 2018).
Area under cultivation	('000 ha)	1,504	Net sown area in the six districts
Area under cultivation to be benefitted	('000 ha)	451	30% of net sown area
Cost of conducting awareness generation campaigns/capacity building programmes to promote CSA	INR	10,000,000	Consultancy fee or professional fee for these activities is considered for the project duration.
Cost of sensitising the government stakeholders involved in planning and implementation, including district administration, community representatives	INR	300,000	One-time consultancy fee or professional fee for these activities is considered.
Conduct assessment of training needs of frontline workers	INR	300,000	One-time consultancy fee or professional fee for these activities is considered.
Preparation of IEC material on CSA	INR	1,000,000	One-time consultancy fee or professional fee for these activities is considered.
Net return due to adoption of CSA practices	INR	15,000	Assumed based on previous studies

Details considered for economic analysis of the adaptation strategy - promoting sustainable water management

Particulars	Unit of measurement	Value	Assumptions
Households to benefit	Number	132,717	Objective of the intervention is to target 5% of the rural households in the six project regions per year.
Number of new structures (farm ponds) to be constructed	Number	3,000	100 per region, per year
Number of new structures (farm ponds) to be renovated	Number	3,000	100 per region, per year
Cost of construction of farm ponds	INR	100,000	Per structure
Cost of preservation of existing ponds	INR	20,500	Per structure
O&M cost for farm ponds	INR	150	Per structure
Number of new structures (dug wells) to be constructed	Number	3,000	100 per region, per year
Number of new structures (dug wells) to be renovated	Number	3,000	100 per region, per year
Cost of construction of dug wells	INR	50,000	Per structure
Cost of preservation of existing dug wells	INR	1,000	Per structure
O&M cost for dug wells	INR	100	Per structure
Number of new structures (earthen check dams) to be constructed	Number	3,000	100 per region, per year
Number of new structures (earthen check dams) to be renovated	Number	3,000	100 per region, per year
Cost of construction of earthen check dams	INR	200,000	Per structure
Cost of preservation of existing earthen check dams	INR	20,500	Per structure
O&M cost for earthen check dams	INR	150	Per structure
Number of villages where campaigns will be conducted	Number	600	100 per region
Cost of conducting awareness generation campaigns to promote sustainable water management	INR	30,000	One-time consultancy fee or professional fee is considered
Number of villages to be covered for WSP	Number	600	100 per region
Cost of reparation of village-level WSP	INR	50,000	One-time consultancy fee or professional fee is considered
Average net income of sample households from different sources	INR	11,301	-

Particulars	Unit of measurement	Value	Assumptions
Incremental income due better irrigation	%	30%	It is assumed that the income of the households will increase by 40% due to better availability of water
Water demand (rural) for drinking	Litres	10,125	Calculated for a month for a family of 4.5 (average family size) considering rural water demand of 75 litres per person for drinking
Price of water per litre	INR	1	-
Water demand for household purposes met through measures	%	5	It is assumed that households will meet 5% of their drinking water demand through water management measures
Households with members suffering from waterborne diseases	%	20	Based on primary survey
Monthly expenditure on healthcare due to waterborne diseases	INR	300	-

Glossary

ANM	Auxiliary nurse midwife
AR5	Fifth Assessment Report
ASHA	Accredited Social Health Activist
AWW	Anganwadi Worker
BPL	Below Poverty Line
BDO	Block development officer
CPC	Child protection committee
CFS	Child-friendly space
CWC	Children Welfare Committee
CSA	Climate-smart agriculture
CBA	Cost-benefit analysis
DVC	Damodar Valley Corporation
DSS	Decision support system
DAY-NRLM	Deendayal Antyodaya Yojana-National Rural Livelihoods Mission
DAY-NULM	Deendayal Antyodaya Yojana-National Urban Livelihoods Mission
DFI	Development financing institution
DMO	Disaster Management Officer
DCPU	District child protection unit
DDMA	District Disaster Management Authority
DDMO	District Disaster Management Office
DISE	District Information System for Education
DPO	District Project Officer
EB	Economic benefit
ENPV	Economic net present value
ECBA	Extended cost-benefit analysis
FGD	Focus group discussion
GCF	Green Climate Fund
GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographical information system
GLOF	Glacial lake outburst flood

GoI	Government of India
HRC	Human Rights Council
HVI	Heat Vulnerability Index
ICDS	Integrated Child Development Scheme
ICT	Information and communication technology
ICPS	Integrated Child Protection Scheme
ImTeCHO	Innovative Mobile phone Technology for Community Health Operators
INM	Integrated nutrient management
INDC	Intended Nationally Determined Contribution
INR	Indian rupee
IPM	Integrated pest management
IPCC	Intergovernmental Panel on Climate Change
ISRO	Indian Space Research Organisation
KII	Key informant interview
LHASA	Landslide Hazard Assessment for Situational Awareness
MDMS	Midday Meal Scheme
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
mHealth	Mobile health
MHRD	Ministry of Human Resource Development
MNCH	Maternal, newborn and child health
MPW	Multi-purpose health worker
MSJE	Ministry of Social Justice and Empowerment
MWCD	Ministry of Women and Child Development
NAPCC	National Action Plan on Climate Change
NAFCC	National Adaptation Fund on Climate Change
NASA	National Aeronautics and Space Administration
NCPCR	National Commission for Protection of Child Rights
NDMP	National Disaster Management Plan
NFHS	National Family Health Survey
NGO	Non-governmental organisation
NHM	National Health Mission
NICRA	National Innovations on Climate Resilient Agriculture
NIDM	National Institute of Disaster Management
NMSA	National Mission on Sustainable Agriculture
NOAA	National Oceanic and Atmospheric Administration

NRHM	National Rural Health Mission
NSAP	National Social Assistance Programme
PHC	Primary health centre
PDS	Public distribution system
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PPP	Public-private partnership
PRI	Panchayati Raj institution
PwCIF	PwC India Foundation
RCP	Representative Concentration Pathway
RI	Risk index
RKVY	Rashtriya Krishi Vikas Yojana
RO	Reverse osmosis
SC	Scheduled caste
SCPS	State Child Protection Society
SDB	Sustainable development benefit
SDG	Sustainable Development Goal
SDMO	State Disaster Management Office
SPSS	Statistical Package for the Social Sciences
SSA	Sarva Shiksha Abhiyan
SSDC	Sundarban Social Development Centre
ST	Scheduled tribe
STC	Save the Children
SWSM	State water and sanitation mission
UN	United Nations
UNCRC	United Nations Convention on the Rights of Child
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United National International Children's Emergency Fund
USD	United States Dollar
VDMC	Village disaster management committee
VDMP	Village disaster management plan
VHSNC	Village health, sanitation and nutrition committee
WRI	World Resources Institute
WSP	Water security plan

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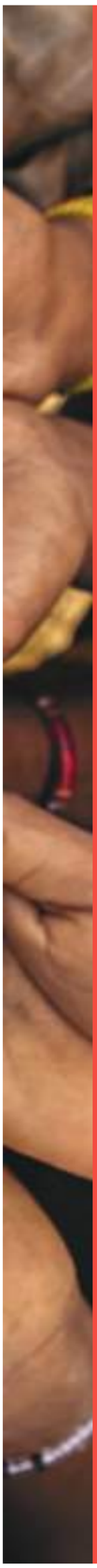

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In a world where millions of children are denied their rights because of who they are or where they live, we aim to put the most deprived and marginalised children first, and to tackle the barriers to survival, learning and protection.

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