



Climate Vulnerability in the Shadow of Gender, Age, Poverty and Location Nexus

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Abstract

Climate change is universally recognized as an environmental and economic crisis, but its social manifestations bear greater inequalities. This research explores how climate change disproportionately affects adolescent girls belonging to low-income urban and rural settlements in Delhi, India, and how gender, age, poverty, and location intersect to configure their vulnerabilities. Whereas previous research tends to conflate adolescent girls in a category of "women and girls," few studies focus on their special issues. This study employs the qualitative method using secondary materials and primary data from questionnaires and semi-structured interviews to present the lived realities of adolescent girls in flood- and drought-prone areas. Evidence shows that climate change exacerbates gender violence, interferes with education, adds more household and income-generating tasks for girls, and undermines their physical, psychological, and reproductive health. All these impacts tend to create a poverty cycle, food insecurity, and early marriage. This study brings to the forefront the imperative for gender-sensitive climate adaptation policies that emphasize resilient WASH infrastructure, accessible health care, secure schooling, and social protection arrangements. These connected issues must be addressed to construct equitable, climate-resilient futures.

Keywords: *Climate Vulnerability; Shadow of Gender; Poverty and Location Nexus*

Introduction

Climate change is typically defined as an environmental and an economic crisis, and rightly so, but the social consequences of climate change demonstrate something much more complex as it has serious human impacts and poor and marginalised groups disproportionately bear the brunt. Thus, climate change is not socially or gender neutral. The impact of climate change and extreme weather events is disproportionately experienced by women, girls and other gender minority groups, especially in developing nations and from poorer households, due to the structural inequalities and gender norms.

Although both men and women are affected by the impact of changing climate, gender differences in their capacity to respond, adapt, and recover are shaped and influenced by gender-based norms, practices and beliefs that accord unequal access to resources and limited rights to women and girls, Climate change disrupts not just the environment, but it disrupts their lives.

Taking the intersectionalities of gender, age, poverty and location, this paper explores how climate change disproportionately impacts from low-income families in rural areas and urban slums in Delhi, India, focusing on the vulnerabilities they face. There are limited studies on the impacts of climate change on adolescent girls as in most studies they are grouped under “women and girls”. However, due to their age adolescent girls face unique vulnerabilities than women, which would be more challenging due to poverty and location of their residence. The paper highlights the unique struggles and resilience of these adolescent girls. Their stories are not just accounts of hardship but also reflections their strength, creativity, and a drive for change. Understanding their lived experiences is important to creating targeted solutions and an opportunity to challenge societal norms that exacerbate their challenges, showing that empowering young girls is an important step toward building a more resilient and equitable future. This project is not only about identifying the problems but also about paving the way for solutions that allows these girls to reclaim their agency and thrive despite the odds. The central research question is: How does climate change affect the safety, health, and educational opportunities of adolescent girls from low-income communities?

The methodology followed is a qualitative methodology based primarily on secondary data, complemented by some primary data. Primary data was collected through a questionnaire and semi structured interviews with adolescent girls from urban slums and villages to capture subtle and often overlooked experiences. The field sites were Yamuna Khadar, Jagatpur Village, and Narshingapur Village.

Climate Change and Its Impacts

Climate Change: Climate change is not only occurring but also accelerating and threatening the planet gravely. Greenhouse gases released into the atmosphere through activities such as fossil fuel burning, deforestation, and large-scale agricultural practices are the most to blame. Climate change is occurring through slow-onset processes and through rapid-onset weather extreme events. The slow-onset changes are insidious, and work slowly over decades, altering ecosystems, which have implications for the lives of people everywhere. Two major processes under this are the gradual increase in temperature and the changes in the precipitation.

- **Gradual Increase in the Average Temperature:** According to NASA, the surface temperature of the planet has increased by approximately 1.2 C since the late 19th century, and the past decade was officially the hottest in the recorded history. As temperature rises, the atmosphere draws more water vapor out of oceans, disrupts the expected seasonal schedule, and accelerates glacier and ice sheet melting, all of which raises sea levels by about 3.3 mm per year (NASA Climate).
- **Changes in Precipitation:** Over the decades and years changes in precipitation patterns have been witnessed globally. Where people used to depend on predictable monsoons, now raindrops fall erratically, either in excess or in insufficient amounts, or just when they are least needed. In South Asia, the intense rainfall events have increased by 75 % compared to the mid-20 the century, and some regions of sub-Saharan Africa are now in a prolonged drought that may last years (IPCC 2022). Erratic rainfall disrupts agriculture, exacerbates water scarcity, and increases food insecurity, particularly in rural populations that rely on rain-fed agriculture.

The rapid-onset weather extreme events are more sudden and dramatic having immediate impacts through damage and loss of lives and properties. These are events such as hurricanes, floods, heatwaves, strike suddenly, sometimes without warning. Such events are becoming more frequent and more intense as global temperatures get higher. According to the World Meteorological Organization, weather-related disasters have increased more than twice in the past 50 years and have cost the world over \$3.6 trillion in economic damages (WMO 2021).

There is a lot of overlap in the effects of changes that are slow- vs. rapid-onset. The higher temperatures increase the severity of drought and the drought reduces the health of the soil such that when the heavy rains finally come, the ground cannot absorb them, which increases the chances of floods. In the meantime, the melting of the ice raises the ocean levels, and that aggravates the storm surges in the cases of cyclones, causing immense coastal flooding.

Impacts of Climate Change: Climate change impacts both human and natural systems. It is resulting in heatwaves, droughts, changes in precipitation, more frequent and intense storms and floods, forest fires, sea levels rise, soil erosion, saline water intrusion, and accelerated glacial melt. It is reported that weather-related extreme events such as floods, for example, cause displacement of approximately 20 million individuals annually, and heatwaves have become the most lethal weather-related hazard, killing over 148,000 people since the year 2000 (WHO 2023). Similarly, long droughts and high temperatures have fuelled wildfires that have burned down millions of hectares of land, eliminating biodiversity hotspots and releasing massive volumes of carbon into the atmosphere. This only aggravates climate change, as the released carbon is reabsorbed into the oceans and the atmosphere, which strengthens the feedback cycle.

Climate change brings about environmental degradation and resource shortages, which worsen existing inequalities (Islam and Winkel 2017, Pross et al. 2020). The impacts of climate change are leading to severe consequences such as increased food insecurity, poverty, health issues, and social instability by widening social and gender inequalities. They interfere with our food supply, reduce freshwater, undermine our infrastructure, and overwhelm our public-health systems, particularly in low-income countries who do not have much to respond to. The impacts of climate change are often felt first and disproportionately by people from the lower income countries and by the marginalised groups such as poor, women, elderly, children and physically challenged (Demetriades and Esplen 2008, Pross et al. 2020; Patel et al. 2019; Sugden et al. 2014).

Climate Change and Its Impacts on Adolescent Girls

Women and girls are disproportionately impacted by climate change due to the persistent gender inequalities whereby women and girls have limited rights, resources and power but have greater responsibilities, face repressive cultural rules and norms, and are often excluded from political and household decision-making processes that affect their lives (Arora-Jonsson 2011, Bartlett 2008). Apart from gender, other social-economic factors such as location of residence, race, gender, age, culture, ethnicity, economic status, etc. also shape a person's or groups' vulnerability (and capacities) to climate change impacts (Goodrich et. al. 2019, Shamsuddoha et.al, 2024). Thus, "it is the intersection of age and gender impacts that makes adolescent girls, particularly vulnerable to climate change, with serious implications for many of their right" (Plan International 2019:5). Add 'poverty' to this nexus, then the vulnerability multiplies as "events that might have little or no effect on children in high-income countries and communities can have critical implications for children in poverty" (Bartlett 2008:502). Thus, adolescent girls from the poor income families are even more vulnerable as they have the least rights, power and hardly any access to or control over resources; they fall at the bottom of the power hierarchy. Such adolescent girls "on the edge, like families on the edge, have fewer assets to draw on in every sense of the word, and are more likely to be adversely affected by the various challenges imposed

by climate change” (Bartlett 2008: 502). The location of residence too shapes the vulnerabilities – poor adolescent girls from urban slums and rural areas often face additional and unique vulnerabilities in the face of climate change due to the limited or lack of infrastructure, services and facilities. It is estimated that at least 200 million adolescent girls living in the poorest communities face increased risk from the effects of climate change (Atkinson & Bruce, 2015).

The impacts faced by such adolescent girls are numerous and can be broadly categorised under (a) health – general health and sexual and reproductive health, (b) workload, (c) sexual and gender-based violence, (d) food security and nutrition, (e) education, and (f) child marriage. Each of these are discussed below.

(a) Health – Physical Health, Mental Health and Sexual and Reproductive Health

Climate change events pose a significant threat to adolescent girls as at this age their bodies and brains are developing rapidly, with inadequate capacity to avoid threats and impacts, making them more vulnerable to disease, and shocks (Proulx et.al. 2024). Climate-driven changes and extreme weather events leads to negative impacts on air and water quality, which cause asthma, respiratory related health problems and illnesses, diarrheal diseases, vector-borne diseases, skin diseases and many other health problems (Proulx et.al. 2024), and all these affect adolescent girls from poor families even more given disadvantages they face due to their gender, age, poverty and place of residence like slums and villages. All the adolescent girls interviewed in this study reported of breathing problems, itching, coughing stomach and recurring diarrhoea after the floods of 2023. Some of them have also reported of suffering from asthma, bronchitis, pneumonia and joint pains from wading through cold floodwater since then. Girls from the slums reported of having their feet cut by broken bottles and metals as they had to walk barefoot through filthy water during the flood to get help, these cuts got infected later and turned into “painful boils”. A 13 year who works in a small recycling workshop that handles plastic drums, cut and burned her legs with the flood waters as chemicals had got mixed in the water, the skin on palms of her hands peeled due to the chemical mixed floodwater and as a result she is unable to carry heavy buckets even now. In the villages, girls reported of having more frequent headaches and feeling of weakness due to increase in heat levels and extended droughts.

As studies show extreme weather events, which are becoming more intense and frequent due to climate change, result in disruption to health services. The girls interviewed have reported this too. They talked about the severe limited health services and facilities they can access, particularly in the villages. The nearest health clinic and government dispensary was 6-8 km and sometimes they also rely on the monthly visits of the mobile clinic. They reported even this was closed months after the floods. Once it opened, they used to go all the way just to find that often medicines were not available. The health centres “prescribe general antibiotics and painkillers with no follow-up” and most often these are overcrowded, with waiting time often stretching to six hours, and if they get late the centres close before their turn comes. Some said they go to a charity clinic who sometimes distributes free tablets. Many of these girls said they resort to roadside herbal remedies for cough and itching. The situation in the slums is relatively better because the girls said there is a health clinic nearby. However, but it was not always reachable during severe floods and heavy rains as the roads get flooded causing severe disruption to transportation.

Climate-related events are linked to an increase in posttraumatic stress and other mental health disorders in adolescents, “mainly where there has been exposure to disaster-related injury, death and loss, and there is a lack of social and family support” as “adolescents have a heightened risk of internalising and externalising behaviours following climate-related disasters” (Proulx et.al. 2024:7). A review study by Sharpe and Davison (2022) from low- and middle-income countries found a prevalence of mental health disorders and posttraumatic stress among adolescents and children in the aftermath of climate disasters, such as floods. This was found in our interviews among the adolescent girls too,

particularly those from the slums. Many girls interviewed from the slums suffered injury as well as loss or damage of their houses and hardly got any social support during the 2023 floods. These girls report of fear, anxiety and phobia of rain. Some of their words are: “I used to love the sound of rain. Now it fills me with dread”; “The monsoon used to be my favourite time when we lived in the village. Now it only brings trouble”; “I still dream of water rushing into our room and I wake up gasping”; “It feels like the flood marked my body, like a reminder that help never came”; “Whenever I hear thunder, I grab my brothers and run, I don’t wait”; “Even now, whenever it rains, I get headaches, maybe it’s my body remembering the fear”; “That flood made me feel invisible — like nobody even saw us”. Such stress and trauma at this can result in lifelong effects.

Climate related extreme events like floods, hurricanes, etc, pose to menstrual health and hygiene for adolescent girls due to limited access to (or even lack of) clean water, hygiene facilities, access to proper menstrual products and medicine to manage their menstruation with dignity (Das 2017). Evidence of this is found by this study too. All the girls reported of facing challenges in managing menstrual hygiene during floods as menstrual products become less accessible, and inadequate support or availability of information. Girls from the slums said they typically purchase pads, but during floods, it becomes difficult to access these products. Maintaining menstrual hygiene is very challenging in the face of water shortage, and additionally, the water logging and overflowing toilets makes it particularly challenging to dispose the sanitary pads. For the school going girls in the villages, the school gives them gives sanitary kits, which are helpful, but these are not enough. They also taught about menstrual hygiene and so as one girl put it: “being in school means I learn how to take care of myself better”. However, since the sanitary kits are not enough, they use cloth, which often causes rash, plus since because there is not enough clean water for washing, they often get other infections. It is more difficult for the non-school going girls from the village. The reported that some non-government organisations (NGOs) distribute sanitary pads from time to time and also show them how to sanitize cloth -by boiling the cloth in clean water. However, the sanitary pads are not enough and not enough clean water, especially immediately after the floods, to boil the cloth in. Without adequate clean water, soap and adequate dry storage, cloth stays damp and smells and so infections are common. The girls in the village reported that the floodwaters had destroyed the lone hand-pump; and not they have to share a communal bucket for cleaning the used cloth. Everywhere girls also talked no proper disposal place as a result the pads or soiled cloth are dumped in a corner for days and the odour invites flies and insects, this resulting in more health hazards. Most girls suffer from severe stomach cramps during their menstrual cycle due to which non-school going girls reported of missing working for at least 2 days every month thus losing out on their earning, while school girls missed classes. Further, the lack of proper facilities where they can change in the schools and working areas was another reason for missing work and school. The lack of privacy to change during such times poses a profound challenge to their dignity and they face humiliation. Girls said reported: “Changing makeshift pads in public costs dignity and invites teasing”, “Changing in a cramped shared latrine is humiliating and exposes me to stares and leers”. “Changing pads in the open invites ridicule”, “Changing in public draws stares and insults.” The psychological consequences were also very strong and as one girl put it, the absence of private space during menstruation “made me feel dirty and ashamed”.

(b) Workload

Climate change and related disasters result in loss and damage of property, livelihoods and income leaving families in poverty. In such situation adolescent girls are the ones are called upon to take up the burden of many household chores and to contribute to the household income – they are the ones to take on the burdens on water and fuel collection, help in cleaning, washing and cooking, look after their younger siblings and elderly, and also contribute to the family income by taking up various small jobs such as domestic service, agriculture, textile factories and other jobs (Plan International 2011). Thus, increased workload is a major impact of climate change on adolescent girls. Each and every girl interviewed reported that their workload had increased a lot since the floods. Every girl said their working

hours had increased by 1.5 to 2 hours since the floods and they had to now wake up earlier to manage all the work, particularly for fetching water and other domestic chores. In the villages some the girls said they have to now walk about two kilometres at dawn to fill heavy buckets as the floods had destroyed the lone hand-pump. Most of the girls in both study sites also reported of spending time lining up for food and other relief packets for the family. To contribute to the family income, girls from the village do the following types of work: rag picking at construction sites, sweep streets, collect and sort recyclables, work in a recycling plant (₹90/day), work in a garment factory (₹120/day), work spinning cotton at a roadside mill for (₹70/day), wash dishes clean houses (₹50 – 80 per day), work in brick kilns (₹100 per day), carry water for shopkeepers, wash construction dust off cars, carry garbage bags (₹10 each). For some not only has the workload increased but income is less now: One girl said that before the flood, she earned ₹100/day sweeping shops and washing dishes, but after floods she lost this job as the shops did not want to continue and now, she collects bricks at a dismantling site, earning ₹70/day. Another girl said that before the flood she worked tidying neighbouring homes for ₹50/day but due to the flood, many houses were condemned and she lost her cleaning work disappeared; she now digs trenches in the mud for pay back-breaking work that leaves her sore for days. Girls from the urban slum said that many of them work in factories to help their family's income.

(c) Sexual And Gender-Based Violence

Reviews show that extreme weather events and disaster is more often than not linked to increases in gender-based violence towards women and adolescent girls (Thurston et. al 2021). These issues are more threatening for adolescent girls when collecting water, fuel and fodder, when in temporary shelters and where there is lack of privacy during sleep, washing, changing, and going to the toilets (Bartlett et. al, 2009, Plan International 2019). This is corroborated in this study too. Every single girl interviewed reported of experiencing some form of sexual and gender-based violence in the aftermath of the floods. These events concentrated around critical activities: collecting water, latrine use, journeys to relief lines, Sanitation, water and public space became risk areas. Dark, worn-out lanes, water and public spaces and latrines became risk areas and zones of peril. The girls reported of being groped, grabbed by men hiding behind tarpaulins, followed, men trying to “touch them”, attacked with stones by drunk men, jeered at, stared at, and threatened catcalls and aggressive remarks. All the girls reported that such incidents have spiked after the floods and they do not feel safe to go out alone especially after dusk. The girls in the village reported it is dangerous for them particularly as there are no lights in the area so men and boys hide in the dark alleys and corners. Girls from the slum are said they “don’t feel safe in their community and it’s not easy for girls to move around freely without worrying about harassment or danger”. The girls in the village said there is women’s shelter that offers a small safe room, but it’s overcrowded. In the slums the girls said a women’s community sometimes organises flashlights and whistles distribution to them; there are also patrols from time to time but not often. The main coping strategy the girls’ resort to in the villages and the slums is to walk in pairs or groups. They said this way they feel safer to an extent.

(d) Education

Climate-related displacement affects education. A report by Theirworld (2018) estimates that environmental threats and weather-related disasters, disrupt the education of approximately 37.5 million learners globally each year. Adolescent girls are more impacted due to reasons such as increase in household chores and responsibilities, which, given the gendered norms and practices, are typically allocated to girls; prioritising of education for boys; and, in some contexts, difficulties in managing menstrual hygiene (Atkinson & Bruce 2015, Resurrección et. al 2019). Damage and/or destruction to education infrastructure, damage or disruption of roads, transport links and hygiene and sanitation facilities in the schools, or displacement also result in the of access to education facilities (Chuang et al. 2018, Education Cannot Wait 2020). This is evidenced in the responses from the girls. One girl from the village said her family had moved from their original village after the family lost their farmland in

extended droughts and since then had not attended school. Others said that they were attending school till 2019, but the flash flood of that year created havoc their lives – many of their homes were damaged, their parents lost their jobs and earnings, their books were destroyed. As a result from early 2020 they had to drop out of school as the families could not afford uniforms, books, etc. and plus they needed income for the family so many of them started doing various jobs. In the slums, some of the girls who were not in formal schools reported they used to attend a small reading class but due to floods this shut down and since then they have not had any opportunity for education of any sort. The school-going girls from here reported that they missed classes for many days after the floods in 2023 as the roads were water-logged. Further, many of the girls reported they missed classes during their menstruation as the toilets were overflowing and there was no often no water.

(E) Food Security and Nutrition

Climate change related events can disrupt livelihoods resulting in loss of income, affect agricultural production leading to rise in food prices and all this can lead to food insecurity, and these result in undernutrition and malnutrition particularly among children and adolescents (Bartlett 2008, Lieber et. al 2022). Adolescent girls from poor income especially in the developing countries, are suffer more from food shortages, malnutrition and hunger when there is shortage of food as they are who get less food and eat last (Plan international 2019). The experiences of the girls interviewed show similar stories, All the girls from the villages said since the floods and drastic decrease in household incomes, food is always in shortage and they are always hungry; often they rely only on the relief food that is distributed. One girl said she had to skip two meals each day for some weeks immediately after the floods. Another said “once we had two meals a day; now we often eat just once, relying on leftover charity dal”, while a third said “due to hunger, I sometimes faint from low blood sugar. Experiences of food shortage and hunger are shared by the girls from the slum area too. Experiences included “eating only dry biscuits for three days”, “living on water and stale bread for four days”, “didn’t eat for two days”. One girl she wrote “about her hunger; about having to borrow two teaspoons of sugar from a neighbour” in her diary. Most of the school going girls said that the meal at school is the only proper food they get now.

(f) Child Marriage

There is also emerging evidence of a rise in early and forced marriage of adolescent girls. Climate-related crises can push families to marry their daughters early as a coping strategy to loss of assets and opportunities for income generation, displacement, disruption of education, and the creation of settings in which sexual violence and the fear of sexual violence increase (Mian & Namasivayam, 2017, Plan International.2011, Pope et.al 2023). The findings of this study show similar stories. All the girls reported of early marriages of girls from as early as the age of 13 in their communities. They said that in the face of poverty, loss or decrease in income and food shortage, families do this so that they will have less mouth to feed. Many also reported this is also a result of the fear of sexual violence and assault that has spiked after the floods. Most girls have had their sisters and married off at the ages of 13-16.

The Cycle: Violence, Gender, Health, Poverty, Education, and Child Marriage

The cycle of poverty, violence, health issues, education and child marriage of adolescent girls combine to have a profound effect on over-all wellbeing of adolescent girls. Collectively, the literature and these firsthand accounts clearly shows that gender-based violence, poor health, poverty, disrupted education and early marriage are closely related to each other, creating a vicious cycle of inequality that is getting worsened by climate change.

Recognizing the complex nature of the risks that girls encounter in their lives, in terms of seeking safety, protecting their health, securing proper education, and gaining access to economic opportunities, is

a prerequisite in the development of effective policies and interventions that prioritize their protection, well-being and empowerment. By doing this, we will be able to reduce the gendered effect of climate change and make sure that girls will prosper, despite changes in the environment.

Conclusion

Collectively, the stories in this paper show that education is much more than an academic exercise, it shows the lives of these girls and tells us once again to wake up to the climate emergency

Decades of scholarly studies and the lived experiences of the communities who have felt the impact of climate change cast no doubt that climate change is not gender-neutral in its effects. It is not a neutral force, as its increased intensity is faced disproportionately by people who are disadvantaged and marginalised, thus contributing to existing disparities. It often facilitates the transformation of environmental disasters into generators of violence, poor health, and reduced access to opportunities among low-income-level adolescent girls. Floods, heatwaves, or droughts are not just tearing up streetlights and power lines; they tear up the thin walls that protect girls, their health and their education, their dignity and well-being. These stories highlight how rapidly unsafe spaces in the community are not only facilitating harassment, but how a poor health system is compelling untreated disease in addition to menstrual indignities, and how economic pressure influences girls to forego their right to education in lieu of early marriages. These are not unique phenomena, they constitute a vicious cycle further aggravating each other and without intervention, the consequence of being vulnerable would be a genetic condition.

This cycle can be perpetuated by policy frameworks that disregard gendered realities. Any strong adaptation measure should have the adolescent girls located at the centre through investing in resilient WASH infrastructure, safe schooling, accessible healthcare, economic support to families, and protective systems that are sustainable even during crises. Unless we resolve climate change alongside its disproportionate effects on girls, we will have to live with the certain knowledge that half the population will be left behind. Ending this cycle is not an exercise of charity, it is a question of justice, and it is crucial to the creation of neighbourhoods able to withstand the demands of a changing world.

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