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The Pakistani Floods of 2022: How Vulnerability is Amplified by Climate Change and Political Policy

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Abstract

As the global economy has evolved, there has been a magnification and intensification of interactions between the environment and people. The risk and vulnerability produced by these interactions, which pollute and degrade the environment for material gain, will only be lessened once this relationship is fully appreciated. Over time, climate change has made the monsoon system's fluctuations more drastic in the Indian Ocean World (IOW), creating more significant and devastating storms in South Asia. Climate change amplifies vulnerability while economic, political, and agricultural practices increase vulnerability to floods. For example, this article discusses the magnification of vulnerability that occurred during the devastation of flooding in Pakistan in the summer of 2022 due to poor developmental planning, extractive political institutions, and climate change interactions. This article will analyze the crucial leverage points in Pakistan's unjust political and economic systems to grasp how Pakistani governance limits mobility, agency, and education. It will highlight how poverty and the factors purposely limiting upward mobility magnify vulnerability to natural disasters. The true effect of the floods is not any one impact, but the disempowerment that a combination of every impact causes. When the effect of these impacts coalesce with the destruction of entire communities' homes and livelihoods, millions lose their autonomy and become dependent on help from politically and economically active figures of authority who lack an appreciation for the roadblocks communities in rural Pakistan face. These figures also often have a vested interest in keeping these communities disempowered and vulnerable for personal financial gain.

Keywords: Vulnerability, Governance, Inequality, Resilience, Extractive Policies, Empowerment, Adaptation and Mitigation, Insecurity

Introduction

Inspired by the increasing prevalence of environmental disasters that produce large-scale refugeehood and create billions of dollars' worth of economic damage in developing countries, this article aims to understand how human-environment interactions contributed to the severity of the Pakistani floods in 2022. For most of its history, climate change has been a topic of empirical scientific research, where developmental agencies and governments are responsible for turning this research into policy initiatives that reduce the impact of climate change.[1] When social scientists study climate change, they concentrate on understanding the environmental impact of the global economy and political practices that put communities in the developing world at risk.[2] As a result, mainstream discourses on climate change focus predominantly on mitigation and adaptation strategies.[3] Here, sustainable development programs are meant to create resiliency against climate change and concentrate on limiting the global economy's environmental damage.[4] However, these global institutions have done little to restrain polluting and degrading economic practices – which are the principal culprits of environmental damage – as these policies threaten to hinder commercial and developmental agendas.[5] This is especially true in countries where policies of neoliberal development are prioritized over environmental protection. Addressing the increased frequency of extreme environmental events is becoming much more prevalent in social science research. Investigations of these disasters must become a crucial component of any discourse on climate change, especially if powerful institutions do not work to curb the root of this

[1]Harriet Bulkeley, "Navigating climate's human geographies: Exploring the whereabouts of climate politics," *Dialogues in Human Geography* 9.1 (2019).
[2]Bulkeley, "Navigating climate's human geographies."
[3]Anne Jerneck, "Searching for a mobilizing narrative on climate change," *The Journal of Environment & Development* 23.1 (2014).
[4]Mike Turner and Susan Buckingham, "Understanding environmental issues," *Understanding Environmental Issues*, (Los Angeles: SAGE Publications, 2008): 175-206.
[5]Turner and Buckingham, "Understanding environmental issues."

increased frequency.[6] These inquiries can highlight vulnerabilities in adaptation and mitigation techniques already in place, and can help to create a framework for understanding these new, more severe disasters.[7] Support networks must evolve to limit the impact of disasters and learn how to better assist at-risk communities and infrastructure before and after the fact.[8]

As extreme climatic events become increasingly common, future research must recognize both environmental and political circumstances of climate change and disaster.[9] Addressing both can decrease poverty and inequitable development – the principal drivers of vulnerability – for low-income communities, while ensuring disaster resilience and more secure forms of economic activity that support the environment and local communities.[10] This paper bridges the gap between formal, scientific research of environmental phenomena and evaluations of political, economic, and social ideologies that examine the production of heightened vulnerability to severe climatic events. Examining the local and global factors of climate change and development can offer a holistic image of a disaster that identifies crucial vulnerabilities in developmental planning on a local and national level that environmental disaster exacerbates.[11] With this holistic representation, it becomes possible to create an informed view of the significant human-environmental interactions that determine the social and economic costs of future environmental disasters. An investigation of the devastation of flooding in Pakistan in the summer of 2022 provides the ideal platform to analyze interactions between climate change and human development that magnify vulnerabilities in developmental planning.

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[6]Christopher B. Field et al., eds. *Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change*, (Cambridge: Cambridge University Press, 2012).
[7]Field et al., *Managing the risks of extreme events and disasters.*
[8]Field et al., *Managing the risks of extreme events and disasters.*
[9]Field et al., *Managing the risks of extreme events and disasters.*
[10]Field et al., *Managing the risks of extreme events and disasters.*
[11]Field et al., *Managing the risks of extreme events and disasters.*

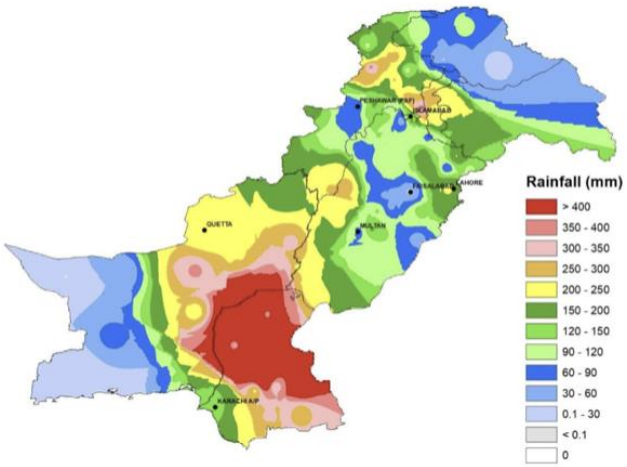
This paper is divided into four sections. Section one, regional environmental effects, examines the impact of climate change on Pakistan that highlights how sea and air temperature change influences the prevalence of rainfall, underscoring the environmental context and devastation produced by mass flooding. Following this environmental analysis, the following section, quantitative impacts of flooding, examines the economic and material damages of the flooding and the significant challenges the Pakistani government and NGOs face in their attempts to curb the devastation. By first analyzing the material and economic impacts of flooding in the most affected regions and the significant challenges relief workers face, it becomes possible to understand how flooding aggravates vulnerability and can help to clarify the subsequent consequences for at-risk groups that are the focus of the third section, downstream social impacts of flooding. This section examines how Pakistan's social and political networks compound risk in vulnerable, low-income communities and clarifies failures in attempts to mitigate the harm of volatile monsoon rains and the risk vulnerable communities face in the aftermath of the disaster. Finally, in the last section, crucial political and social leverage points, an inspection of regional political barriers to sustainable development highlights how vulnerable communities receive little support to reduce the impact of climatic threats in rural Pakistan.

Utilizing a multidisciplinary approach to understanding the increased severity and destruction of flooding in Pakistan enables the production of a holistic account highlighting the importance of contextualizing the role of human-environment interactions. As such, this article generates a novel framework for understanding the influence of humanity's insecure relationship with nature, clarifying extractive political practices that magnify risk and ensure rural communities in Pakistan remain vulnerable.

Regional environmental effects:

Rising sea-surface temperatures (SST) in the western Indian Ocean pose a significant threat to established patterns of rainfall in Pakistan. Since 2010, Pakistan has experienced a 17.58 mm/year decrease in rainfall, coupled with a 0.18°C annual rise in temperature.[12] Relatedly, in the last 20 years, there has been an increased variability in the quantity of rainfall in Pakistan annually.[13] Pakistan is increasingly affected by drought during El Niño events, as the anchoring effect of warm SSTs in the equatorial region of the western Indian Ocean pins the Intertropical Convergence Zone (ITCZ) south during El Niño years, limiting rainfall in Pakistan.[14] However, the inverse is true during La Niña years when monsoon storms are driven northward earlier, bringing increased rainfall.[15] The summer of 2022 was a La Niña summer.[16]

Map 1: Accumulated rainfall distribution (mm): August, 2022.



According to the Pakistan Meteorological Department, these La Niña conditions brought a 180% increase in rainfall in July and a 243% increase in rainfall in August 2022.[17] **Map 1**[18] highlights this devastating increase in precipitation and showcases the regions hit hardest by monsoon rains.

[12]Fasiha Safdar et al., "Climate change indicators and spatiotemporal shift in monsoon patterns in Pakistan," *Hindawi, Advances in Meteorology* (2019).
[13]Wenju Cai et al., "ENSO and greenhouse warming," *Nature Climate Change* 5, no. 9 (2015): 849-859.
[14]Tim Vasquez, "The Intertropical Convergence Zone," *Weatherwise: THE POWER, THE BEAUTY, THE EXCITEMENT* 62, no. 6 (2009): 24-30; H. Annamalai et al., "Southwest Indian Ocean SST variability," *Journal of Climate* 18, no. 20 (2005): 4150-4167.
[15]Cai et al., "ENSO and greenhouse warming."
[16]International Research Institute for Climate and Society (IRI), and World Meteorological Organization (WMO). n.d. Review of *WMO Predicts First "Triple-Dip" La Niña of the Century*. *World Meteorological Organization*. World Meteorological Organization (WMO). Accessed November 30, 2022.
[17]National Weather Forecasting Center Islamabad, "Monthly Weather Report August 2022," Pakistan Meteorological Department. Islamabad, Pakistan, (August 2022).
[18]"Monthly Weather Report August 2022."

Map 2: Evolution of Floodwater in Pakistan

Source : This map illustrates cumulative satellite-detected water using VIIRS in Pakistan by UNOSAT during 1 July to 9 October

Map 2[19] highlights the path of flood waters and the centrality of the Indus River in delivering flood water to Sindh, located on the eastern side of the river, and Balochistan, situated in the northwest section of the map. The Indus River is the principal means of irrigation in both Sindh and Balochistan, and multiple dams exist on the river to mitigate flooding.[20] However, the Tarbela Dam and Chashma Barrage – the largest dams on the Indus River – were not built to withstand such severe flooding and do little to prevent extensive damage.[21] As a result, over 85,000 km² of land in Pakistan has been flooded by

[19]*Pakistan: 2022 Monsoon Floods*, "Situation Report No. 5," OCHA Humanitarian Advisory Team (HAT), Pakistan, (September 9th, 2022).
[20]Daanish Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan," *Economic Geography* 74, no. 3 (1998): 289-305.
[21]Bushra Khan, Muhammad Jawed Iqbal, and M. Yosufzai, "Flood risk assessment of river Indus of Pakistan," *Arabian Journal of Geosciences* 4, no. 1 (2011): 115-122.

torrential rains, including 48,530 km² of cropland.[22] This overwhelming rainfall had enormous impacts on Pakistan's Sindh and Balochistan districts, located in the country's southeast.[23]

Quantitative impacts of flooding

Analyzing the social and developmental impacts of flooding starts with an investigation of the material damages of the floods. Agriculture, economic, and infrastructure loss are the central drivers of further disempowerment and vulnerability in the most affected regions. Examining how these sectors were distressed by the flood waters highlights how the impairment of economic activities and infrastructure led to further vulnerability. By considering human loss, displacement, and economic and agricultural damages, the causes of downstream social impacts become clear.

According to the OCHA report, by October 14th, 2022, roughly 806,000 houses have been destroyed, and 1.3 million homes have been damaged in the Sindh and Balochistan districts.[24] In total, there are 8.48 million and 1.75 million households in Sindh and Balochistan, respectively; this means roughly 20% of homes in Sindh and Balochistan were damaged or destroyed.[25] **Map 3**[26] highlights the regionality of this destruction. Furthermore, the National Disaster Management Authority (NDMA) has suggested that the monsoon rains have impacted as many as 33 million people in Pakistan, 23 million of which live in Sindh or Balochistan.[27]

[22]"Situation Report No. 5."
[23]"Monthly Weather Report August 2022."
[24]*Pakistan: 2022 Monsoon Floods*, "Situation Report No. 9," OCHA Humanitarian Advisory Team (HAT), Pakistan, (October 14th, 2022).
[25]Government of Pakistan, Ministry of Planning, Development and Special Initiatives, "2017 PROVINCIAL CENSUS REPORT SINDH," Asif Bajwa, et al. No. 6, (Islamabad, Pakistan: Pakistan Bureau of Statistics, 2017); Government of Pakistan, Ministry of Planning, Development and Special Initiatives, "2017 PROVINCIAL CENSUS REPORT BALOCHISTAN," Asif Bajwa, et al. No. 6, Islamabad, Pakistan: Pakistan Bureau of Statistics, 2017.
[26]OCHA. 2022, Review of *Pakistan - 2022 Monsoon Floods: Houses Fully and Partially Damaged (as of 15 September 2022)*. *ReliefWeb*, UN Office for the Coordination of Humanitarian Affairs.
[27]Government of Pakistan, "NDMA MONSOON SITREP - 2022 (Daily SITREP No 102 Dated 23rd Sep, 2022)," *National Disaster Management Authority (NDMA)*. Islamabad, Pakistan: National Disaster Management Authority.

The number of livestock lost during the flooding has also been astronomical. Roughly 1.2 million animals have been lost to the flooding, and 70% of agricultural land has been damaged or destroyed in the severely affected regions.[28] The loss of animals and agricultural land will overwhelm families and individuals who rely on these practices for subsistence and income.

Map 3: Housing Impact as of September 22nd, 2022

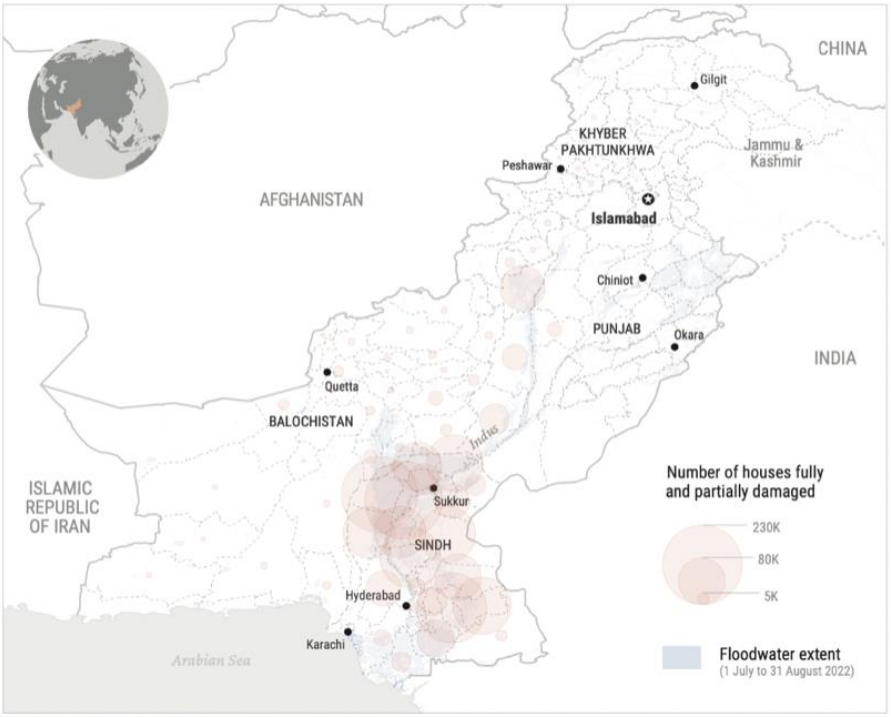
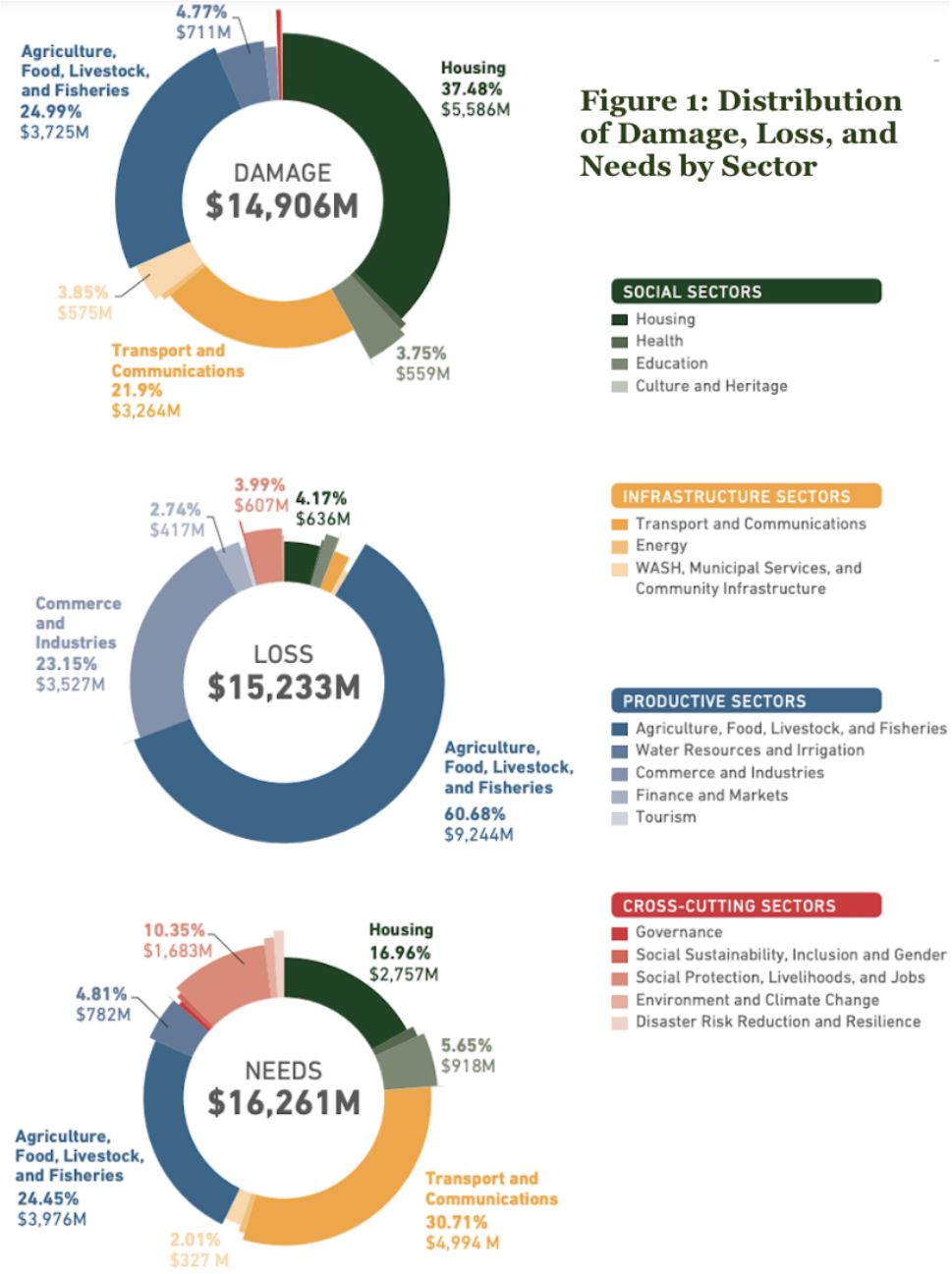


Figure 1[29] highlights the extent of economic losses and damages. According to the Post Disaster Needs Assessment (PDNA), overall economic damages in Pakistan are roughly $15 billion USD – 15% of Pakistan's yearly GDP – this incredible economic loss will send at least 2 million households into poverty.[30] Families in Sindh and Balochistan will face the brunt of impoverishment, with a nine and seven percent increase in poverty impending in both regions, respectively.[31] Here, the damages and economic losses highlight the significant funding Pakistan will need to rebuild agricultural and economic infrastructure in these regions. Additionally, the destruction of 13,000 kilometers of road vital to the supply of goods to the entire region will

[28]The Government of Pakistan, Asian Development Bank, European Union, United Nations Development Programme, and World Bank, "Pakistan Floods 2022: Post-Disaster Needs Assessment," Ahsan Iqbal et al. Islamabad, Pakistan: Ministry of Planning Development & Special Initiatives, 2022.
[29]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[30]Iqbal et al, "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[31]Iqbal et al, "Pakistan Floods 2022: Post-Disaster Needs Assessment."

hamper government and humanitarian aid groups' ability to supply food to at-risk households facing inflated food prices and an inadequate supply of food. Rebuilding communities and economic production in many areas of these districts have yet to begin, as standing water still



exists in many regions as of October 28th, 2022, and water management infrastructure designed to mitigate flooding is severely lacking.[32]

While there are significant economic and agricultural losses, most households in rural Pakistan will experience further drawbacks that result from these quantitative impacts. As "disaster management in Pakistan, particularly with regard to natural hazards, focuses mainly on rescue and relief processes," little is done to mitigate the consequences of flooding before it occurs.[33] Without steady income generated by agricultural productivity, many families will have no source of income; rising prices for household commodities will exacerbate these conditions.[34] This is especially true for households in Sindh and Balochistan, as these two regions are the poorest in Pakistan, and are especially vulnerable to the increasing prevalence of floods and drought. They will face significant social and health issues created by the floods caused by the loss of agricultural productivity, livestock, and infrastructure vital to economic productivity and the transportation of essential commodities.

Downstream social impacts of flooding

With an account of the damage done to infrastructure and agriculture, understanding how economic damages impact social well-being and vulnerability is possible. To understand the short and long-term social effects of flooding, an analysis of **(1)** food (in)security; **(2)** affected health systems; **(3)** gender issues; **(4)** children and infants' education; **(5)** the marginality of refugees and people with disabilities are five important categories.

[32]"Situation Report No. 9."
[33]Lubna Rafiq, and Thomas Blaschke, "Disaster risk and vulnerability in Pakistan at a district level," *Geomatics, Natural Hazards and Risk* 3, no. 4 (2012): 324-341.
[34]Iqbal et al, "Pakistan Floods 2022: Post-Disaster Needs Assessment."

Food insecurity is an immediate issue facing most families as "the price of wheat and other basic food items reached near-record levels in August 2022."[35] A recent National Nutrition Survey estimates that "close to 1.6 million children could suffer from severe acute malnutrition and require treatment in Sindh and Balochistan flood-affected areas."[36] Additionally, according to OCHA reports, 14.6 million people will require "emergency food assistance from December through March 2023."[37] Food insecurity is the principal concern for children facing a lack of nutritional and health services vital to their well-being.[38] The loss of transportation networks, food shortages, and crop failure caused by flooding jeopardizes children's development; without proper nourishment, many children will be stunted and unable to complete their cognitive development.[39] Stunted growth is a prevalent health risk to families in Pakistan. It causes "poor cognition and educational performance, low adult wages, lost productivity and when accompanied by excessive weight gain later in childhood, an increased risk of nutrition-related chronic diseases in adult life."[40] Food shortages and a lack of clean drinking water will increase a child's chance of stunting by 13 percent.[41] Furthermore, children from the poorest families have a 43% increased chance of stunting because of flooding and lack of access to resources.[42] Stunting is even more likely when mothers are malnourished while pregnant: if mothers have a low BMI, children have a 40% higher chance of being stunted.[43] The food shortage experienced in Sindh and Balochistan will undoubtedly increase the prevalence of stunting in infants and children; as a result of flooding,

[35]"Situation Report No. 9."
[36]*Pakistan: 2022 Monsoon Floods*, "Situation Report No. 10," OCHA Humanitarian Advisory Team (HAT), Pakistan (October 28th, 2022."
[37]"Situation Report No. 9."
[38]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[39]"Situation Report No. 10."
[40]V. De Sanctis, A. Soliman, N. Alaaraj, S. Ahmed, F. Alyafei , and N. Hamed, "Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood," *Acta Biomed* 92:1 (2021 Feb 16).
[41]"Situation Report No. 10."
[42]"Situation Report No. 10."
[43]"Situation Report No. 10."

children have little hope of acquiring the necessary calories for normal cognitive and physical development.[44]

Furthermore, flooding creates significant challenges to healthcare systems and isolates entire communities from urgent, life-saving care. There are three levels of healthcare in Pakistan: primary, secondary, and tertiary healthcare services. The primary level of healthcare, Basic Health Units (BHUs), is an individual's first interaction with the healthcare system and handles primary healthcare, like providing vaccinations and medication, caring for injured individuals, and referring people to facilities where specialized care or knowledge is required.[45] Typically, any one BHU will serve roughly 25,000 people.[46] However, Rural Health Centers (RHCs) serve rural communities too far from BHUs; these facilities typically serve 100,000 or more people. This primary level of healthcare is the principal actor in supporting communities, women, and children harmed by the flooding.

According to the OCHA report from October 28th, roughly 2,000 of these health facilities have been destroyed or damaged in Pakistan, and 25% of those damaged are in Sindh.[47] There are multiple issues facing people without access to healthcare who still live in flooded regions. First, stagnant water, still prevalent in Sindh and Balochistan, is a significant health concern, as many diseases thrive in post-flood conditions.[48] Recent reports suggest that as many as 1.8 million people suffer from vector-borne diseases perpetuated by stagnating water in Sindh alone.[49] Poor sanitary conditions brought on by enduring stagnant water are exacerbated by the breakdown of home sanitation facilities built to clean water and manage organic waste and the collapse of health

[44]"Situation Report No. 10."
[45]"2017 PROVINCIAL CENSUS REPORT SINDH."
[46]"2017 PROVINCIAL CENSUS REPORT SINDH."
[47]"Situation Report No. 10."
[48]"Situation Report No. 10."
[49]"Situation Report No. 10."

facilities in rural Pakistan.[50] Poor hygiene is one of Pakistan's most dangerous factors contributing to increased vector-borne diseases.[51] Before the floods, one-fifth of households did not have proper waste management systems.[52] After the floods, more than one-third of the population has no choice but to partake in the "practice of open defecation," as more than 6 million people in Pakistan no longer have access to at-home sanitation facilities.[53] In conjunction with stagnant water, open defecation is the principal cause of cholera, diarrhea, and dysentery.[54] In Sindh and Balochistan, waterborne diseases are an ever-present obstacle for individuals and healthcare professionals with limited access to medication. To further complicate the operations of health facilities in Pakistan, the breakdown in the transportation sector has made delivering medications and care in flood affected areas even more challenging, leaving millions without access to life-saving medication.[55]

The breakdown of health facilities, combined with the prevalence of vector-borne disease and a breakdown in at-home sanitation facilities, heightens vulnerability to disease in Sindh and Balochistan. Central to this increased vulnerability is the lack of infrastructure necessary to circulate life-saving medicine and food. The most at-risk communities do not have the medical support or sanitation facilities necessary to slow the spread of disease caused by flooding.[56] The degradation of infrastructure and the movement of goods will enhance the risk these communities face, as supporting them will be challenging, slow, and expensive and many households will be left without any support.[57]

[50]Haruna Kashiwase, "Open defecation nearly halved since 2000 but is still practiced by 670 million," World Bank Blogs (Nov. 19, 2019).
[51]"Situation Report No. 10."
[52]"Situation Report No. 10."
[53]"Situation Report No. 10"
[54]Kashiwase, "Open defecation nearly halved since 2000 but is still practiced by 670 million."
[55]"Situation Report No. 10."
[56]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[57]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."

The impact of flooding in Pakistan disproportionately falls on women. In times of crisis, gender inequality is often exacerbated by deteriorating economic conditions, as the disproportionate burden on women to manage household tasks will increase.[58] In Pakistan, women are traditionally responsible for dealing with waste, collecting water, and acting as caregivers.[59] The pressure on women to adhere to these gendered norms will increase due to the flooding. Fewer home sanitation facilities, limited access to fresh water, and medical support will "aggravate the burden on women's duties and increase their vulnerability in terms of both health and personal safety."[60] As a result, women will be forced to continue their roles as caregivers and face pressure to discontinue their education to support the family's needs. According to the UNFPA, "the rights, needs and vulnerabilities of women and girls are sometimes overlooked in emergencies when many humanitarian actors are focused on reaching a large number of people in the shortest period of time."[61] Women always bear the brunt of a disaster, as gender-based violence and discrimination are often ignored and perpetuated during disasters making women and children 14 times more likely to die when a disaster occurs.[62] In Pakistan, "the United Nations Population Fund estimates that 640,000 adolescent girls during the current crisis are vulnerable and at increased risk of coercions, gender-based violence, and child marriage."[63] In addition to added domestic responsibilities, women face increased gender-based violence due to the displacement caused by flooding and loss of infrastructure.[64] As a result of disasters, tensions and hardship will increase

[58]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[59]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[60]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[61]"Pakistan: UN Addresses Gender-Based Violence against Flood Victims," UN News, (November 26, 2010).
[62]Okai, Asako Okai, Review of "*Women Are Hit Hardest in Disasters, so Why Are Responses Too Often Gender-Blind? United Nations Development Programme*" (blog), (March 24, 2022).
[63]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[64]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."

rates of harassment and abuse, making forced marriage much more common, as economic and food insecurity make families desperate to find alternative sources of income and support.[65]

The lack of access to medical facilities further compounds the pressure on women during disasters. Pregnancies do not stop when disaster strikes, and without access to maternal support, being pregnant during floods increases the chances of complications and death. According to the OCHA report on October 14th, 2022, roughly 650,000 pregnant women in Pakistan cannot access maternal services.[66] Women will experience heightened vulnerability during the pregnancy and afterward, as they have no medical or social support to ensure their health and well-being. Lack of access to medical services, lost sanitary stations, an absence of clean drinking water, and an increased burden on women to support their households makes them incredibly vulnerable to gender-based violence perpetuated during disasters.[67]

Additionally, flooding impacts children's development in several way, including loss of access to education, immunization, and nutrition.[68] According to OCHA's October 28th report, over 7,000 schools have become relief camps in the wake of flooding, preventing over 3.5 million children from continuing their education.[69] Lack of education often forces children into child labor and has potential long-term impacts on economic and social well-being for future generations.[70] The final threat to children's well-being is the lack of access to immunization and natal care.[71] According to the PDNA report, 5.5 million households with children under five will no longer have access to immunization, and 2.8 million more households with newborns cannot obtain "ante-

[65]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[66]"Situation Report No. 9."
[67]Okai, "Review of *Women Are Hit Hardest in Disasters*."
[68]"Situation Report No. 10."
"[69]Situation Report No. 10."
[70]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[71]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."

natal check-ups and postnatal care."[72] This has both long and short-term effects on children, as a lack of immunization will increase the prevalence of treatable diseases, which are already spreading at increased rates due to stagnant water.[73] It could also impact infant development; if women cannot get proper support for their babies before and after birth, the risk of early complications is significantly higher as the "lack of prenatal care is associated with a 40% increase in the risk of neonatal death."[74] Without roads and health facilities, vulnerability is heightened by the inability to provide medicines, care, and food to children who cannot develop healthily without it.[75] In total, 10 million children "require immediate life-saving support."[76] The destruction of infrastructure and increased food insecurity caused by flooding will challenge Pakistan and humanitarian groups' ability to address the needs of these children.

The final at-risk groups that face heightened vulnerability due to flooding are refugees and people with disabilities. Both groups encounter increased marginalization regardless of disasters, as they are economically disempowered and face discrimination that prevents them from securing equal access to education, employment, housing, social services, and transportation.[77] When flooding strikes, the vulnerability these groups face increases exponentially. In Sindh and Balochistan, there are over 800,000 Afghan refugees: they do not own land, they rely on humanitarian aid, and they live in refugee camps with limited to no access to essential services.[78] Additionally, 3.8 million people living with disabilities live in regions hardest hit by the flooding.[79] These marginalized groups suffer from the same issues created by economic and infrastructure

[72]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[73]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[74]Rosenberg, Jared Rosenberg, "Neonatal death risk: Effect of prenatal care is most evident after term birth," *Perspectives on Sexual and Reproductive Health* 34, no. 5 (2002): 270.
[75]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[76]"Situation Report No. 9."
[77]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[78]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[79]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."

deterioration; however, they have even less agency and fewer resources and will become even more reliant on governmental and humanitarian support to rebuild their lives after the floods.[80]

Crucial political and social leverage points

A comprehensive analysis of the quantitative and qualitative impacts of the 2022 Pakistan flooding necessitates a review of the systems that allowed for the displacement of 33 million people. The flooding witnessed in 2022 was not the first of its kind; in 2010, similar floods in the same region – also during a La Niña year – produced similar consequences.[81] Additionally, research on climate change, referenced in this paper, has made it abundantly clear that droughts and floods will occur more often and be more severe. The past flooding and increased volatility of droughts and monsoons warrant an awareness of the increased risk climate change places on rural communities in Pakistan.[82] Therefore, it is crucial to understand the policies that weakened households in Sindh and Balochistan's ability to mitigate and adapt to floods. The ruling landlord class views the rural labor pool as an expendable resource and maintains it by disenfranchising its members. With an analysis of the crucial leverage points in Pakistan's unjust political and economic systems the factors reinforcing poverty and limiting upward mobility that magnify vulnerability to natural disasters for rural communities in Pakistan becomes clear.

Pakistan was founded in 1947 following the British partition of India.[83] Regular conflicts and military takeovers have, to a large degree, militarized Pakistani political systems; there have

[80]Iqbal et al., "Pakistan Floods 2022: Post-Disaster Needs Assessment."
[81]Rebecca Lindsey, "2010 La Niña Continuing in the New Year," Climate.gov. NOAA, (December 31, 2010).
[82]Sahib Haq, Laura de Franchis, Siemon Hollema, Anders Petersson, Michael Sheinkman, Axel Pustan, Fawad Raza, Simon Dradri, Bilan Osman Jama, and Henri Josserand. "The Pakistan Flood Assessment," *WFP.org*. World Food Programme, (2010).
[83]Muhammad Luqman and Nikolaos Antonakakis, "Guns better than butter in Pakistan? The dilemma of military expenditure, human development, and economic growth," *Technological Forecasting and Social Change* (2021): 121143.

been five military coups, and the country has spent roughly half of its existence under military rule.[84] This has had significant impacts on the allocation of Pakistani funds: as of 2021, Pakistan spends 18% of its budget on military expenditure – 5.75 billion USD; this is their second highest category of expenditures, only interest payments were higher.[85] In contrast, the Pakistani government spends 1.9 million USD on environmental protection, 370 million USD on education, and 158 million USD on housing and community amenities, which, combined, is less than two percent of their yearly expenditures.[86] The government's focus on human development and reducing vulnerability has taken a back seat to militarization. As a result, neoliberal policies, prioritizing market-led growth through global capitalism, are the primary drivers of economic development.[87] These policy initiatives maintain cycles of inequality, as focusing on urban development and excluding rural communities from developmental programs have long-term consequences for human development.[88] Pakistan's standing in the Human Development Index (HDI) as the 149th best country for human development, out of 186 countries, in 2016 highlights these poor conditions of governance that work to marginalize its rural citizens.[89]

The militarization of the Pakistani government and celebration of neoliberal market ideologies has allowed for the maintenance of a feudal political system in Pakistan. In this feudal system of governance, elite landlords perpetuate systems of inequality and hoard profits from agricultural labor, leading to significant class stratification, wherein five percent of farming households own two-thirds of all agricultural land in Pakistan.[90] In doing so, these landlords have

[84]Luqman et al., "Guns better than butter in Pakistan?"
[85]Haq et al., "*The Pakistan Flood Assessment*."
[86]Haq et al., "*The Pakistan Flood Assessment*."
[87]Luqman et al., "Guns better than butter in Pakistan?"
[88]Luqman et al., "Guns better than butter in Pakistan?"
[89]Luqman et al., "Guns better than butter in Pakistan?"
[90]Nabeel Muhammad, Gerard McElwee, and Leo-Paul Dana, "Barriers to the development and progress of entrepreneurship in rural Pakistan," *International Journal of Entrepreneurial Behavior & Research* 23, no. 2 (2017): 279-295.

dampened state-citizen relationships: "They have their own private goals and can utilize the services of armed criminal gangs…[where they engage in] land grabbing [by] exploiting their political influences."[91] This militarized and feudal governance system has increased its citizens' vulnerability and has dismantled any expectation of state assistance and support.[92] As a result, low-income rural farmers are trapped in a cycle of vulnerability and repression that benefits landlords. Government policy focuses on maintaining military expenditure and perpetuating a feudal land ownership system built and maintained by elite landlords attempting to extract value from low-income, rural farmers.[93]

The manipulation of governance in Pakistan has eroded hope of changing these political systems. Wealthy elites limit the prospects of creating a positive social contract between the government and its citizens through violence. A resident living in a rural community in Sindh highlights the violence individuals face living in areas economically, politically, and socially controlled by the landowning elite:

> Even if I am able to run alone, the landlord will kidnap my sisters/family or will throw my brothers in his jail. I cannot fight him […] and he owns the whole system, I cannot even file a complaint to police of someone else. I cannot even imagine to stand or raise a voice against him.[94]

Here, the consequences of a militarized, feudal society become apparent as low-income individuals have their agency limited. Political norms further ingrain this violence and oppression as many landlords are politically active, making them immune from any punishment.[95] For generations, landlords' domination of political and economic systems has installed demeaning cultural norms for low-income farmers as "many locals consider themselves and their traditions and lifestyles

[91]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[92]Luqman et al., "Guns better than butter in Pakistan?"
[93]Luqman et al., "Guns better than butter in Pakistan?"
[94]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[95]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

subordinate to their landlords."[96] Using their property as a tool to gain political power, landlords have exploited Pakistan's combative history with India to engrain a feudal system of government that exploits low-income farmers into cultural tradition.

The militarization of politics in Pakistan perpetuates this system of inequality, leaving poor households with little hope of gaining governmental support. Furthermore, landlords work to "suppress education in their areas, discourage rural-urban migration and do not allow the formation of groups in villages."[97] This barrier of entry into education hinders rural communities' ability to build resiliency and economic independence as landlords limit opportunities for entrepreneurship and prevent many rural farmers from getting higher wages as skilled laborers.[98] Instead, this lack of access to education ensures that these farmers continue to rely on landlords for employment. Additionally, the landlords' use of violence to limit mobility or collective action further disempowers farmers as they have no choice but to rely on landlords for employment.[99] Restrictions on education, mobility, and unionization preserve a strict hierarchy based on landownership and profession, where poor farmers are utilized as a cheap labor force that cannot advocate for their rights.[100] **Figure 2**[101] highlights landlords' manipulation of agricultural and education norms in rural Pakistan to enhance their control over rural farmers and reduce their own vulnerability to flooding. This is especially true in Pakistan's most agriculturally active regions– Punjab, Sindh, and Balochistan– where economic and political control over low-income communities ensures large profits and political hegemony.

[96]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[97]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[98]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[99]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[100]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[101]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."

Figure 2:
Intracommunity Vulnerability to Flood Hazard in Pindi and Qatalpur

Indicator	Landless (*N*=21)	Small Farmer (*N*=26)	Large Landowner (*N*=3)
Average income (1994 U.S. $/yr.)	282	2,880	23,800
Income loss in flood year (%)	41	67	77
Average landholding (hectares)	0	6.9	84
Average number of dependents	2.7	3	3.3
Average number years of schooling	4	8	15
Percentage with nonfarm sources of income	71	77	33
Percentage with fewer cattle heads than before the last major flood	33	54	0
Primary means of recovery	Sale of livestock; loans from friends and relatives	Nonfarm labor; loans from friends and relatives; sale of livestock	Loans from lending institutions

Landlords in rural Pakistan largely focus on adding to their wealth and maintaining the disenfranchisement of rural farmers. As a result, discussions about the importance of international aid meant to uplift rural farmers' economic and social well-being or decrease environmental harm are challenging, as most aid "has served the vested interest group of the society and the political elite in the governmental circle."[102] This is especially true after 9/11, when the American war on terror in the Middle East – during which foreign aid to Pakistan increased sevenfold – intensified the dedication to military spending, allowing elite landlords to enhance their militaristic control over feudal systems of governance.[103] In fact, according to a study by Alesina and Weder, foreign aid increases governmental corruption and exerts a negative impact on human development and economic growth.[104] Here, the true extent of rural farmers' vulnerability to environmental destruction, corruption, and exploitation becomes apparent. They have no support from local and national government policy, and any attempts to uplift these communities through foreign aid

[102]Muhammad Arshad Khan and Ayaz Ahmed, "Foreign aid—blessing or curse: Evidence from Pakistan," *The Pakistan Development Review* (2007): 215-240.
[103]Khan et al., "Foreign aid—blessing or curse."
[104]A. Alesina, and B. Weder "Do Corrupt Governments Receive Less Foreign Aid?" *American Economic Review* 92: 4, (2002): 1126-1 137.

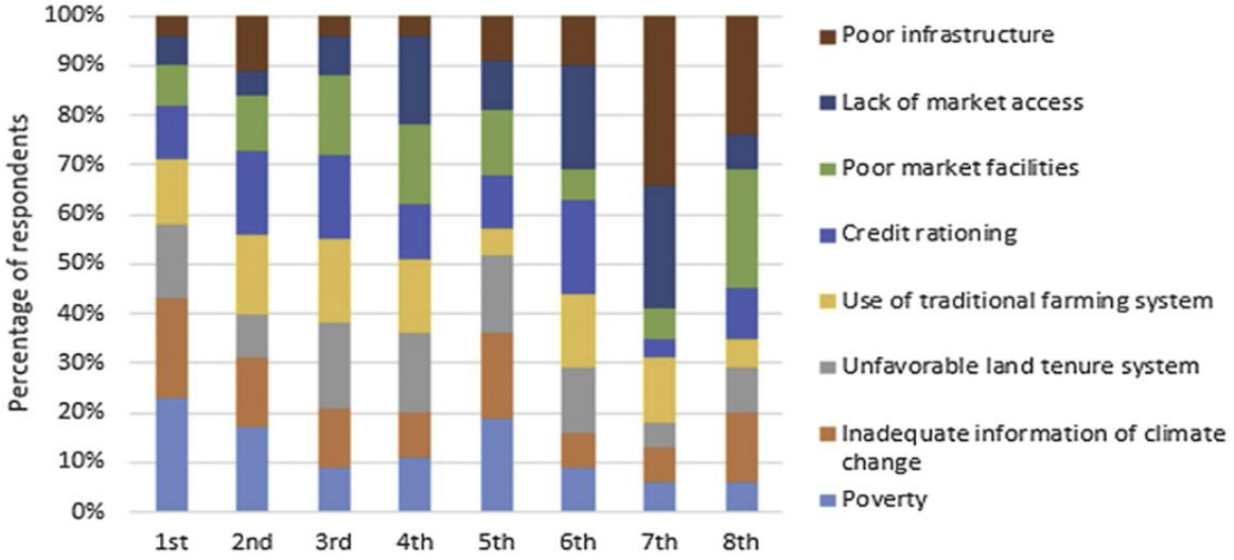
advantage elite landlords and allow them to perpetuate their feudal system of governance, as they hoard the aid for themselves.[105]

Vulnerability magnified by landlords' exploitative use of political systems and violence makes building resilience to natural disasters a significant challenge. With a grasp of how such governance limits mobility, agency, and education, it becomes possible to recognize why adaptation strategies were not achieved. The ruling landlord class views the rural labor pool as an expendable resource and maintains it by disenfranchising its members.[106] Three principal leverage points magnify the impacts of poverty and increase risk and vulnerability to natural disasters: **(1)** lack of education and understanding of climate change; **(2)** inequitable access to resources; **(3)** poor land tenure and farming systems. In a study of farmers' risk perception of flooding in Sindh and Balochistan, 41.5% of farmers viewed poverty as the first or second deterrent to aggravating resiliency. Additionally, inadequate information on climate change, poor land tenure systems, and traditional farming practices were ranked as the second, third, and fourth factors preventing the widespread use of adaptive strategies.[107] **Figure 3**[108] details the complete list of factors restricting adaptation according to rural farmers. Poverty is certainly the principal factor limiting adaptation; however, this section will explore how poverty interacts with crucial leverage points enhancing risk, rather than poverty on its own. The creation of policies meant to maintain poverty produces the factors that increase risk.

One of the principal ways Pakistani landlords maintain systems of inequality is by limiting equal access to education.[109] In doing so directly benefits the landowning class as landlords "find

[105]Alesina and. Weder "Do Corrupt Governments Receive Less Foreign Aid?"
[106]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[107]Imran Khan, Hongdou Lei, Irshad Ali Shah, Imad Ali, Inayat Khan, Ihsan Muhammad, Xuexi Huo, and Tehseen Javed, "Farm households' risk perception, attitude and adaptation strategies in dealing with climate change: promise and perils from rural Pakistan," *Land use policy* 91 (2020): 104395.
[108]Khan et al., "Farm households' risk perception, attitude and adaptation strategies."
[109]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."

Figure 3: Importance ranking of factors affecting adaptation measures



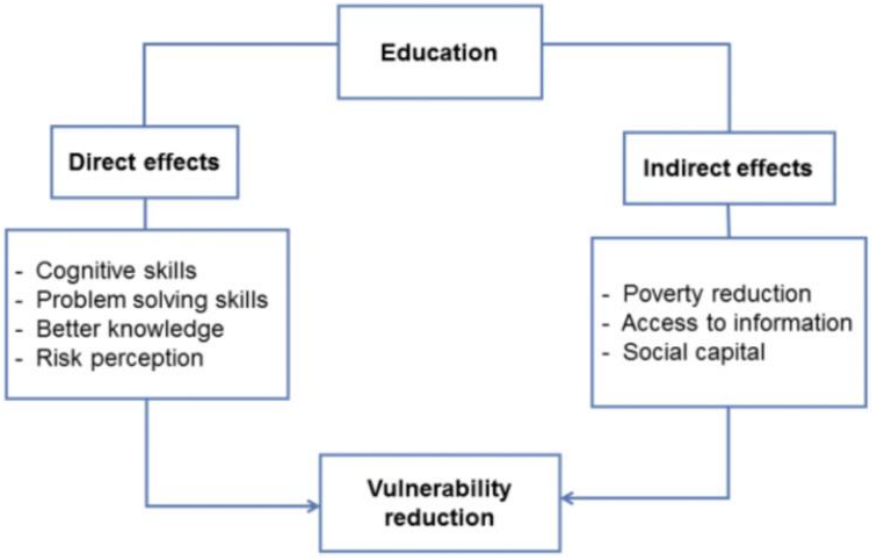
it convenient to perpetuate low literacy rates and keep the masses' backward',"[110] allowing them to maintain a supply of cheap, controllable labor without any chance of upward mobility.[111] Access to knowledge and literature explaining climate change, the risks communities face, and the best ways to mitigate and adapt to the effects of environmental crises is often the best step in reducing vulnerability to natural disasters.[112] By creating high barriers of entry to education, landlords are decreasing rural communities' capacities of resiliency building to volatile environmental conditions.[113]

Awareness through education is central to mitigating the risk of natural disasters; it can affect where individuals decide to build their homes, what type of crops they grow, when they

[110]Ayesha Siddiqi, *In the Wake of Disaster: Islamists, the state and a social contract in Pakistan*, (Cambridge: Cambridge University Press, 2019).
[111]Siddiqi *In the Wake of Disaster*.
[112]Muhammad, et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[113]Siddiqi, *In the Wake of Disaster*.

grow them, and it can increase the chance of success in rebuilding after a disaster.[114] **Figure4**[115] highlights education's direct and indirect effects on building resilience to disasters. Education is central to building "knowledge, skills, and competencies that can influence their adaptive capacity."[116] When disaster strikes, these cognitive skills can be crucial in adapting to adversity.[117] One of the most crucial skills that education can provide low-income farmers is literacy and numerical skills.[118] With these skills, rural communities can access more information on environmental factors and climate change, allowing them to make more informed decisions before and after a disaster that can lessen devastation.[119] Additionally, educated farmers are more likely to access crucial information on weather patterns when they are educated, giving them early warnings that allow them to prepare for floods properly.[120] For example, a study by Hassan Raza found that heads of households who receive a secondary education or higher were 45% more likely to avoid crop loss from flooding

Figure 4: Effects of Education



[114]Khan et al., "Farm households' risk perception, attitude and adaptation strategies."
[115]Raya Muttarak and Wolfgang Lutz, "Is education a key to reducing vulnerability to natural disasters and hence unavoidable climate change?," *Ecology and Society* 19, no. 1 (2014).
[116]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[117]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[118]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[119]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[120]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

than those without an education.[121] More than 50% of farmers in rural Pakistan have witnessed increased crop disease and reduced crop yield due to the increased volatility of droughts and flooding.[122] By varying their planting time, using crop diversification, and buying farming insurance, educated farmers reduce the risk of any single flood or drought destroying their livelihood.[123]

Understanding the interaction between education and poverty is crucial in comprehending risk for farmers. With limited education, farmers are not exposed to certain problem-solving skills and risk perception and are more likely to be unaware of mitigative measures that reduce their vulnerability.[124] Not only does this magnify their risk, but it also keeps farmers impoverished. Higher education levels allow farmers to practice "diversified economic activities beyond agriculture and hence are less dependent on climatic or environmental factors."[125] Therefore, when floods strike, if farmers have diversified sources of income, the destruction of agriculture and livestock will not reduce their income as severely. A study by Muttarak and Lutz[126] on Thai farmers' strategies for mitigating the impacts of floods highlights this fact, citing that educated communities experienced significantly less income loss than uneducated communities after floods.[127] Education allows farmers to access and understand more information, practice adaptive agricultural techniques, and create new forms of income, which are crucial in mitigating flooding risks.[128]

[121]Hassan Raza, "Using a mixed method approach to discuss the intersectionalities of class, education, and gender in natural disasters for rural vulnerable communities in Pakistan," *Journal of rural and community development* 12, no. 1 (2017).
[122]Khan et al., "Farm households' risk perception, attitude and adaptation strategies."
[123]Khan et al., "Farm households' risk perception, attitude and adaptation strategies."
[124]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[125]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[126]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[127]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"
[128]Muttarak and Lutz, "Is education a key to reducing vulnerability to natural disasters?"

However, limited educational opportunities in Sindh and Balochistan highlight how a lack of access to education hinders farmers. This divide is highlighted by the rural-urban split in literacy in Sindh and Balochistan; in urban areas in Sindh, 71% of the population is literate, while only 51% of the rural population is literate in rural Sindh.[129] Literacy rates in Balochistan are even lower, where 61% of the urban population and 38% of the rural population are literate, the lowest of any region in the country.[130] There are also gendered divisions of education, access to information, and resources; when there is a "higher proportion of women with at least secondary education… [communities]... suffered lower mortality from disasters."[131] The imbalance of literacy rates between men and women in rural Sindh and Balochistan highlights this educational inequality, as only 24% and 17% of women are literate in rural Sindh and Balochistan, respectively.[132] With better educational programs prioritizing women's education, communities become more resilient to disaster.

However, even with education, poverty may make these adaptive strategies inadequate. Farmers may not have the resources to obtain accurate weather forecasts if technology is too expensive, and they may not be able to afford products that allow them to adapt to changing climatic conditions – like more resilient strains of plants, more resilient irrigation systems, or sturdier houses.[133] This is especially true if heads of households are women, as cultural norms isolate them from social networks and community resources.[134] Using skills learned through school that increase entrepreneurship, access to diversified sources of income, cognitive thinking skills,

[129]Government of Pakistan, Finance Division, "Chapter 10- Education," *PAKISTAN ECONOMIC SURVEY 2015-16*.
[130]"Chapter 10- Education."
[131]Muttarak, Raya, et al. "Is education a key to reducing vulnerability to natural disasters?"
[132]"Chapter 10- Education."
[133]Hussain et al., "A comprehensive review of climate change impacts, adaptation, and mitigation on environmental and natural calamities in Pakistan," *Environmental monitoring and assessment* 192.1 (2020): 1-20.
[134]Raza, "Using a mixed method approach to discuss the intersectionalities of class, education, and gender in natural disasters for rural vulnerable communities in Pakistan."

better risk perception, and understanding of climate change education can reduce vulnerability to floods.[135] However, these points are made moot if oppressive political forces prevent farmers from achieving upward mobility that would allow them to take advantage of higher levels of education.

Additionally, in Pakistan, system of governance excludes poor, rural farmers from accessing crucial resources that can help reduce vulnerability to disaster. A focus on neoliberal pathways of development, which support urban economic growth and ignore human development in rural Pakistan, inhibits governmental support for rural communities.[136] Landlords' exclusionary policies isolate low-income farmers from any resources that could help them build resiliency. Instead, they are left to fend for themselves as "physical infrastructure, access to material and resources, poor housing conditions, improper maintenance, and insufficient drainage infrastructure compound unsafe conditions and reduce adaptive capacity leading to high vulnerability."[137] Landlords sequester resources; state-run irrigation systems benefit large cotton producers; the most fertile and safest lands are taken by landlords to grow cash crops, and landlords use loans to buy fertilizers, equipment, and other resources vital in rebuilding damaged land after flooding that is not available to low-income farmers.[138] Furthermore, due to their political power and access to wealth, landlords control provisions of finances, food, medical supplies, water, and agricultural equipment.[139] This "tight control of the distribution of water, fertilizers, tractor permits and agricultural credit along with control of local government" ensures landlords are solely responsible for allocating resources crucial to building adaptive and mitigative strategies.[140] As a result of these longstanding feudal policies, rural, low-income communities "have no way of influencing state

[135]Shakeel Mahmood and Kiran Hamayon, "Geo-spatial assessment of community vulnerability to flood along the Ravi River, Ravi Town, Lahore, Pakistan," *Natural Hazards* 106.3 (2021): 2825-2844.
[136]Luqman et al., "Guns better than butter in Pakistan?"
[137]Mahmood and Hamayon, "Geo-spatial assessment of community vulnerability to flood."
[138]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[139]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[140]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

actions, which serve to accentuate their vulnerability and exposure to a range of hazards."[141] Through these governance systems, landlords have built a system of oppression that hoards resources vital to decreasing the vulnerability to floods for themselves and has left rural communities on their own.[142]

The difference in poverty rates between rural and urban areas can highlight landlords' tight control over resources and finances. In these rural regions, landlords limit economic and political autonomy and exacerbate poor growth conditions, creating a further barrier to growth for low-income farmers who are boxed out of opportunities to raise their income levels. Two of the three provinces with the highest difference in poverty rates between urban and rural regions are Sindh and Balochistan.[143] With rural poverty rates of 28.9 and 35.8 and urban poverty rates of 13.8 and 21.5, Sindh and Balochistan have a difference of 15.1 and 14.3, respectively.[144] Rural poverty emanates from a lack of access to economic opportunities, education, financial options, and health infrastructure, all controlled by landlords.[145]

Creating equitable access to resources that reduce rural farmers' vulnerability could be further realized if politically active landlords shared their resources and access to governmental support. With better land management policies, more equitable allocations of funds and resources, and governmental support, rural communities could build stronger homes in safer areas, gain access to water management technology that could protect their lands from floods, and have equitable access to education and health facilities that could reduce poverty and risk over time.[146]

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[141]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[142]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[143]Muhammad Irfan, "Poverty and natural resource management in Pakistan," *The Pakistan Development Review* 46, no. 4 (2007): 691-708.
[144]Irfan, "Poverty and natural resource management in Pakistan."
[145]Homi Kharas et al., "To move the needle on ending extreme poverty, focus on rural areas," *Future Development, Brookings*, (February 21, 2020).
[146]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

However, most governmental policies for low-income farmers are extractive and exploitative. This is especially true for women living in rural communities as "female household heads do not interact with other community members due to traditional cultural norms and, thereby, lack social support" that can provide them with resources and information crucial to building adaptability and resiliency.[147]

While landlords do not focus on marginalizing women, the cultural norms they install to ensure hegemonic control over rural Pakistan inadvertently disempower women, as "the prevalent economic culture systems largely determine the complementary role of women in agriculture."[148] Landlords could single-handedly alter these policies if they sought to promote sustainable development practices for farmers. By allowing farmers to build on land safe from floods, promoting the establishment of schools and health facilities for rural farmers, and providing more equitable access to agricultural tools and irrigation systems, low-income communities and women could work to build resilience and better adaptive strategies themselves.[149] Instead, oppressive allocations of funds and resources designed to support large landowners and exploit rural communities are central to putting low-income households in rural Pakistan at even greater risk.

The Sidhnai spillway is a perfect example of this: initially designed by the British to inhibit flood waters from destroying villages and farmlands, powerful landlords changed the plans after Pakistani independence, as the original designs for the spillway would have led floodwaters through their land.[150] The subsequent redesign of the spillway brought floodwaters directly to two villages: Pindi Kamlanewala and Chak 6-D.[151] Now, every year – even without abnormal floods

[147]Raza, "Using a mixed method approach to discuss the intersectionalities of class, education, and gender in natural disasters for rural vulnerable communities in Pakistan,"
[148]Mushtaqur Rahman, "Women and rural development in Pakistan," *Journal of Rural Studies* 3, no. 3 (1987): 247-253.
[149]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[150]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[151]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."

witnessed in 2010 and 2022 – these villages experience flooding that destroys land, forcing annual relocation and rebuilding.[152] While this example is more than 100 years old, the feudal governance systems central to changing the spillway's design are still present, highlighting the extractive policies that inflame inequitable access to resources that put farmers at heightened levels of risk.

A lack of access to resources is intrinsically related to poverty; without financial support or high-income levels, rural farmers rely entirely on politically active landlords to allocate resources and funds before and after a disaster that could reduce vulnerability. If these landlords choose to oppress and deny low-income communities of support, they cannot build resiliency themselves.[153] Over time, this has exponentially increased the risk rural communities face as low-income farmers "have little influence in the management of their own resources, such as irrigation water, and even less on the decisions of the state institutions that decide about the exposure of their lives and property to flood hazard."[154] The oppressive and inequitable principles that allow landlords to maintain economic and political dominance over these communities amplify vulnerability to disaster.[155] Landlords have promoted conditions of poverty for rural communities by sequestering any access to resources that could create upward mobility.

Finally, poor land use tenure and agricultural practices are significant leverage points that heighten rural farmers' vulnerability. Three factors contribute to the degradation of agricultural land, making it more expensive to grow crops, more prone to flash flooding, and more vulnerable to climate change: cash cropping, labor practices, and deforestation. In practice, poor land use norms and inequitable divisions of land ownership – caused by cash cropping and oppressive labor practices – increase vulnerability to flooding, as land degradation erodes natural barriers to

[152]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[153]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[154]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[155]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

flooding that can prevent widespread devastation.[156] Additionally, market-driven agricultural practices that prompt deforestation and inadequate labor regulations perpetuate systems of inequality and poverty, making low-income communities more vulnerable to flooding and reducing their ability to build resilience to natural disasters.[157]

The division of land ownership between the elite landowning class and low-income communities in rural Sindh highlights how market-driven agricultural production advantages landlords and leave the landless class more vulnerable to flooding. In Pakistan, only half of rural households own land, and the wealthiest 2.5% own 40% of all rural land.[158] Rural Sindh and Balochistan have some of "the highest incidence of land inequality as well as the highest rate of vulnerability, chronic poverty, lack of influence in the market, and incidences of violence against women."[159] Rural Sindh has the highest rate of landless individuals in all of Pakistan. When flooding strikes, 66% of individuals in Sindh who do not own land will be rendered homeless, without employment opportunities, a place to sleep, or food sources[160]

Furthermore, when flooding strikes, boundaries between properties are destroyed, and rights to lands are washed away with them, allowing landlords to forcefully take land from smallholding farmers who lack the political or financial means to challenge these land grabs.[161] Landlords use "bribes and patronage, or harass the landowners to the point where they ceded their rights. [This is especially true for individuals in rural Sindh who] depend heavily on their informal social networks and politically influential landlords for secure land possession.[162]" Flooding places

[156]Hussain et al., "A comprehensive review of climate change impacts, adaptation, and mitigation."
[157]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[158]Fatima Naqvi, *My Land, My Right: Putting land rights at the heart of the Pakistan floods reconstruction*, (Oxfam, 2011).
[159]Naqvi, *My Land, My Right*.
[160]Naqvi, *My Land, My Right*.
[161]Naqvi, *My Land, My Right*.
[162]Naqvi, *My Land, My Right*.

immense health and financial risk on low-income individuals in rural Sindh and Balochistan and allows landlords to further their autonomous control of the rural regions.

Cash crops are vital to maintaining an agricultural exportation industry in Pakistan, but the high costs associated with cultivating cash crops highlight how poverty and agricultural practices accentuate inequality. Cotton is the most valuable cash crop grown in Pakistan.[163] In 2021, 3.4 billion USD of cotton was exported from Pakistan.[164] However, growing cotton in Pakistan requires significant financial investments, as expensive fertilizers, insecticides, and herbicides are vital to its production.[165] Additionally, cotton can only be grown on the most fertile land in Pakistan.[166] Due to the high costs associated with growing cotton, only landlords with large swathes of land and access to financial resources can grow it. As a result, the accumulation of wealth from the most economically productive crop grown in Pakistan leads to a "progressive concentration of wealth in the hands of a few large farmers, whereas the small farmers are progressively marginalized in an increasing cash economy."[167] Here, the interactions of poverty and cash-cropping practices highlight the magnification of inequitable agricultural practices. Low-income farmers and laborers, who work for landlords, must now purchase goods they traditionally produced themselves as valuable land is utilized for cash cropping rather than subsistence.[168]

[163]Majid Lateef, Tong Guang-ji, Muhammad Usman Riaz, Mazhir Nadeem Ishaq, Muhammad Abdullah, and Zeeshan Ahmad, "Agricultural Exports Competitiveness of Pakistan in Global Market," *Journal of Northeast Agricultural University (English Edition)* 25, no. 2 (2018): 77-87.
[164]"Pakistan Exports of Cotton - 2022 Data 2023 Forecast 2003-2021 Historical," Trading Economics.TradingEconomics.2022.
[165]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[166]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[167]Mustafa, "Structural causes of vulnerability to flood hazard in Pakistan."
[168]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."

Landlords' utilization of labor practices in rural Pakistan is a central tenant enhancing poverty. Landlords hire rural households without their own land to tend to crops.[169] However, landlords have designed systems of bonded labor where "individuals are in long-term debt with loans with very high and abnormal interest rates."[170] In this system, rural households and individuals become tied to landlords and their land, preventing them from building resiliency as low-income individuals rely on landlords to supply the income and resources necessary to recover from and prepare for disasters.[171] Debt bondage of landless households is a lived reality of most communities in Sindh and Balochistan; for example, 64% of rural households in Sindh are landless and felt they could not "discontinue work… without paying back their loans."[172] These conditions are exacerbated by the lack of regulations on "minimum wages or on the power of feudal lords in these areas…[as] landlords have extorted the lands from the poor farmers, and their complaints to police and government officials result in further physical attacks from landlords."[173]

Furthermore, building resilience to disaster is a significant challenge for female heads of households. Social norms, which pressure women to stay in the household and prevent community interaction, present a further challenge to women's agency and employment:[174] "Women's external work opportunities lie disproportionately in part-time, temporary and low-status occupations which place them at greater risk of poverty."[175] As a result, natural disasters further enhance women's vulnerability, as generating sources of income before and after disasters, which can help their households rebuild in the wake of flooding, is made unfeasible by cultural norms. Again, the

[169]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[170]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[171] Maliha H. Hussein, "Bonded labour in agriculture: a rapid assessment in Sindh and Balochistan, Pakistan," No. 993675363402676, International Labour Organization, 2004.
[172]Hussein, "Bonded labour in agriculture."
[173]Muhammad et al., "Barriers to the development and progress of entrepreneurship in rural Pakistan."
[174]Elaine Enarson and Maureen Fordham, "From women's needs to women's rights in disasters," *Global Environmental Change Part B: Environmental Hazards* 3, no. 3 (2001): 133-136.
[175]Enarson and Fordham, "From women's needs to women's rights in disasters."

interactions between poverty and poor land use and labor practices that reinforce vulnerability become clear as landlords facilitate cultural norms of dependence and servitude that bond low-income farmers to wealthy landlords, prevent sustainable agricultural development, and isolate women from receiving already restricted sources of income. This is especially true in Sindh and Balochistan, where landlords look to extract the maximum value from cheap agricultural labor without the opportunity or framework for upward mobility.

Forests are crucial in protecting communities from flooding, as forests often act as the first line of defense, slowing floods down and decreasing potential devastation. Forests can limit "physical exposure to natural hazards and provid[e] [people] with the livelihood resources to withstand and recover from crises… [as a result], the damage potential of agricultural land from severe floods is high" when forests are felled.[176] Economy-first agricultural practices have increased rates of deforestation in Pakistan. As a result of deforestation for agricultural activity, low-income communities no longer have access to crucial resources that limit flooding and provide households with resources for subsistence before and after a disaster.[177] In Pakistan, the rate of deforestation is 2.1% annually; this means Pakistan loses 27,000 hectares a year – the highest rate of deforestation in Asia.[178] This decrease in forest cover heightens risk for low-income households living in flash flood zones along river banks, as deforestation causes an increased risk of soil runoff and landslides.[179] Here, the cost of poor land use practices prioritizing cash cropping is apparent. The agricultural economy of Pakistan focuses on extracting value from its land rather than creating sustainable agricultural practices that support rural communities and reduce risks inherent in

[176]Rafiq and Blaschke, "Disaster risk and vulnerability in Pakistan at a district level."
[177]Hussain et al., "A comprehensive review of climate change impacts, adaptation, and mitigation."
[178]Khalid Ahmed, Muhammad Shahbaz, Ahmer Qasim, and Wei Long, "The linkages between deforestation, energy and growth for environmental degradation in Pakistan," *Ecological Indicators* 49 (2015): 95-103.
[179]Hussain et al., "A comprehensive review of climate change impacts, adaptation, and mitigation."

climate change.[180] While most deforestation happens in northern Pakistan, as the agricultural areas of Sindh and Balochistan are predominantly rangelands that have already been deforested, loss of forest cover in the north allows floodwaters to move faster through the Indus River valley where it can hit Sindh and Balochistan with greater intensity.[181]

Cash cropping, deforestation, and labor practices deepen poverty and increase vulnerability. Without proper checks and balances on agricultural or labor practices in Pakistan, landlords can hoard wealth generated from cash crops and further marginalize low-income farmers without access to fertile land or independent sources of income. Additionally, increased deforestation heightens the vulnerability of low-income communities as forests no longer provide protection from soil runoff – which lowers soil fertility – and landslides.[182] Together, poor land use and labor practices decrease communities' resilience to climate change, and flooding as "exposure to environmental hazards and poor socio-economic conditions lead to vulnerability, [where] vulnerable communities transform hazard into disaster."[183] These natural disasters do not have to turn into humanitarian crises. With equitable labor regulations and agricultural practices that allow low-income farmers to grow valuable cash crops themselves, not for landlords, low-income communities can reduce their poverty levels while enhancing their resilience to floods.

Conclusion

In order to realize the true devastation of the 2022 Pakistani floods, especially in Sindh and Balochistan, a multidisciplinary analysis of environmental, political, and economic factors that heighten the vulnerability of low-income, rural communities is necessary. Most developmental

[180]Mahmood and Hamayon, "Geo-spatial assessment of community vulnerability to flood."
[181]Mahmood and Hamayon, "Geo-spatial assessment of community vulnerability to flood."
[182]Mahmood and Hamayon, "Geo-spatial assessment of community vulnerability to flood."
[183]Mahmood and Hamayon, "Geo-spatial assessment of community vulnerability to flood."

literature separates climate research from developmental policy goals. As a result, it is often challenging to comprehend how climate change interacts with political and economic factors of development. With an analysis of climate change and poor political policies, an emphasis on human-environment interactions clarifies the true impact of natural disasters and the root causes of increased vulnerability. As climate change generates more volatile weather patterns, low-income communities in the global south will bear the brunt of the burden, as they do not have the resources or knowledge to mitigate the impact of disasters. This article provides a novel approach to understanding natural disasters and how they are transformed into humanitarian crises precipitated by oppressive political, economic, and developmental approaches. Only by analyzing environmental phenomena and political factors together can a holistic image of disaster truly be appreciated.

A conception of the environmental phenomena vital to the livelihood of billions of people provides a foundation for understanding the potential impacts of climate change. With this understanding of global environmental factors, focusing on one specific region within this interconnected space highlights crucial changes in traditional climatic factors that devastate local communities. The importance of the multidisciplinary approach in understanding disaster becomes apparent through an examination of the quantitative and qualitative impacts of flooding. The Pakistani floods in the summer of 2022 provide a fitting context to apply this novel approach. While an explanation of the impacts of flooding in Pakistan is powerful itself, combining this with an acknowledgment of the factors behind the increased severity of flooding generates a greater appreciation for the influence of climate change. With an analysis of the downstream social and health consequences caused by climate change and extractive political ideologies, the interactions between developmental policies and climate changes necessitate an awareness of political factors

that leave 33 million people vulnerable to flooding that is somewhat predictable – as Pakistan usually witnesses heightened levels of flooding during La Niña years.[184] Here, a review of Pakistan's feudal system of governance, perpetuated by landlords, explains how the vulnerability was enhanced rather than moderated. Finally, by highlighting crucial leverage points landlords utilize to ensure the disempowerment of millions of individuals living in rural Pakistan, a comprehensive understanding of flooding, the climatic factors behind its severity, and the political policies that generate heightened levels of risk presents a conceptual model for evaluating vulnerability to natural disasters.

Both climate change and oppressive political forces can independently expose marginalized communities to an increased risk of disempowerment. However, building resiliency and generating sustainable development for low-income communities becomes nearly impossible when these two factors work together. The 2022 Pakistan floods are a perfect example of this, as deteriorating climatic factors are exacerbated when at-risk communities are starved of support from their local government. Here, a natural disaster was transformed into a humanitarian crisis. Pakistani landlords, who cultivate adverse developmental conditions to hoard profits from agricultural labor for themselves, inadvertently placed poor households at the epicenter of a disaster. By creating adverse economic and social conditions that prevent high levels of education, exclude individuals from accessing potentially life-saving resources, and maintain traditional and extractive agricultural practices, landlords prevent rural households from building resilience to climate change.

These significant roadblocks make implementing transformative political change challenging. While it is tempting to suggest the implementation of micro-level structural changes

[184]Cai et al., "ENSO and greenhouse warming."

that could enhance access to education and health services, gender rights, and fair labor laws, macro-level political practices in Pakistan eliminate any meaningful hope of eroding the structural causes of vulnerability. Creating long-term resilience in Pakistan would require a two-pronged approach of overhauling oppressive political practices and creating progressive social rights for low-income communities. The increasing volatility and severity of climate change make implementing these policies a race against the clock. This novel approach comprehensively exposes the role of human-environment interactions in enhancing vulnerability to natural disasters. However, a paradigm shift is necessary to generate hope that institutionalized economic and political policies that enhance factors producing climate change and oppress low-income communities will change. As a result, this novel approach to understanding disasters must encourage further research into analyzing the role of human-environment interactions on the micro-level. Future research must examine how political factors exacerbate vulnerability from increased volatility of natural disasters and work to highlight how marginalized groups and communities – like women, children, refugees, and people with disabilities – face enhanced risk. This approach would allow humanitarian groups and international institutions to further support adaptation and mitigation projects and pressure governments to better support their citizens.

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