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Climate Change as A Catalyst for Disaster Risk Reduction and Emergency Preparedness

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Abstract

Climate change is a profound phenomenon that influences our environment in ways that not only create new problems but also intensify the existing ones. Drawing from comprehensive research, this article explores how climate change fosters change in policies and practices to counter such risks. A mixed method approach was implemented for this study, the first phase includes a quantitative analysis of existing policies, and the second phase includes a qualitative analysis. For this research paper, only qualitative findings of research are presented and discussed. Thematic areas include the impact of climate change on natural disasters, socio-economic implications, resilient urban planning and infrastructure development, mainstreaming climate science into DRR and emergency preparedness, international collaboration and policy formulation, and community-based approaches and indigenous knowledge integration. Study shows complicated interdependencies and cause-and-effect interactions between climate parameters and natural disasters.

Keywords: Disaster Risk Reduction (DDR), Climate Change, Ethnography, Resilient Urban Planning, Sustainable Management, Green Climate Fund, Disaster Mitigation, Indigenous Knowledge Integration, Sendai Framework

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Climate Change as A Catalyst for Disaster Risk Reduction and Emergency Preparedness

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Abstract

Climate change is a profound phenomenon that influences our environment in ways that not only create new problems but also intensify the existing ones. Drawing from comprehensive research, this article explores how climate change fosters change in policies and practices to counter such risks. A mixed method approach was implemented for this study, the first phase includes a quantitative analysis of existing policies, and the second phase includes a qualitative analysis. For this research paper, only qualitative findings of research are presented and discussed. Thematic areas include the impact of climate change on natural disasters, socio-economic implications, resilient urban planning and infrastructure development, mainstreaming climate science into DRR and emergency preparedness, international collaboration and policy formulation, and community-based approaches and indigenous knowledge integration. Study shows complicated interdependencies and cause-and-effect interactions between climate parameters and natural disasters.

Keywords: Disaster Risk Reduction (DDR), Climate Change, Ethnography, Resilient Urban Planning, Sustainable Management, Green Climate Fund, Disaster Mitigation, Indigenous Knowledge Integration, Sendai Framework

Introduction

The term "climate change" refers to the long-term variations in weather patterns and temperatures. These fluctuations may be attributable to significant volcanic eruptions in the sun's activity. However, human activity, particularly the combustion of fossil fuels such as coal, oil, and gas, has been the primary cause of climate change since the 1800s. The combustion of fossil fuels results in the release of greenhouse gases into the atmosphere, which encircles the earth and absorbs solar heat, thereby increasing global temperatures.

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For instance, these can manifest when a vehicle is powered by petroleum or a building is heated with coal. Energy, industry, transportation, construction, agriculture, and land use are among the primary industries that generate greenhouse gases (United Nations, 2024).

Rising sea levels, modifications to atmospheric and ocean circulation, a long-term, sustained, widespread decrease in snow and ice cover, increases in global air and ocean temperatures, and regional weather patterns that influence seasonal rainfall conditions are among the few changes that have been prominent over the past century. The climate system is experiencing these modifications as a result of the additional heat that greenhouse gas emissions have introduced to the atmosphere. Human activities, including the combustion of fossil fuels (coal, oil, and natural gas), deforestation, agriculture, and changes in land use, are the primary causes of these additional greenhouse gases (World Bank, 2021).

With great sureness, scientists forecast that during the next few years, greenhouse gases caused by human activities will be the main driver of the sustained increase in global temperatures. The severity of the effects of climate change will depend on the future direction that human activity goes (NASA, 2024).

Climate change has substantially navigated the course of traditional approaches to crisis management and emergency preparedness. Historically, most of the Disaster Risk Reduction (DRR) approaches were reactive and aimed at recovering from single immediate occurrences and crisis management. However, the gradual change in climate and weather patterns has quickened the pace of potential ramifications on such approaches. It is for this reason that the traditional approaches have been vastly discredited, owing to the recurrent, severe, and unpredictable climate disasters in the contemporary world (Buergelt et al., 2017).

Among the nations most impacted by extreme weather occurrences brought on by climate change between 1999 and 2018 is Pakistan. Over 30 million people were affected by the terrible floods of 2022, which caused widespread inundation, infrastructure destruction, and fatalities. By 2040, main crop yields in Pakistan, such as rice and wheat, are expected to decline dramatically due to climate change, potentially costing up to 7% of agricultural productivity. Pakistan is extremely sensitive to the effects of climate change because of its sizable rural population and economy, which is based mostly on agriculture. Climate-related migration to urban areas is being driven by extreme weather and economic disruption (UN, 2024).

Pakistan has accepted the Paris Agreement, Kyoto Protocol, and UNFCCC. It is also actively participating in international climate negotiations. In order to alleviate loss and damage, it has urged for additional climate finance as well as improved global climate action and cooperation (World Bank, 2021). Pakistan has been disproportionately affected by climate change, even though its share of greenhouse gas emissions worldwide has been relatively small. To help the nation adapt and become more resilient to these escalating challenges, immediate action is required.

Rapid industrialization and urbanization have gradually evoked societies toward greater susceptibility to climate-led disasters. These occurrences ultimately triggered improvements in engineering, city design, as well as crisis management, with time. However, the problems of the present age of climate change are quite different and represent a new level of complexity compared to the experiences of previous generations. Climate change, which is characterized by enhanced global temperatures, shifts in the occurrence of precipitation, and a surge of extremely powerful storms, further intensifies the number of disasters and widens the vulnerability faced by developing countries.

The primary focus of this article is on how traditional approaches to disaster risk reduction (DRR) and emergency preparedness have been profoundly impacted by climate change. These historically reactive methods are currently under threat from the more frequent and unpredictable natural disasters brought on by climate change.

The objectives of the present study were to examine the current state of National DRR policies and Emergency preparedness in responding to the challenges of climate change and the needs of the communities. To evaluate the degree of participation of communities within DRR and resilience development programs, in order to

recommend how such engagement and associations can be strengthened between the communities and government departments. To identify how social disparities and other demographics can make some people more susceptible to climate change discuss how culturally tailored policy can be an effective method of achieving equity to analyze the potential of involving indigenous knowledge and traditional activities and to determine how to incorporate such knowledge into National Action Plans through an ethnographic study.

Methodology

The research design for this study adopts a mixed-method approach in analyzing National DRR policies with an ethnographic design in order to capture the communities' views on the policies. This sequential explanatory design first entails a quantitative phase that comprises an extensive review and analysis of national DRR policies at various ministries and departments. This involves assessing policies, laws, and governance structures at the national level. Furthermore, there is a review of official policy documents, reports, and literature to identify and analyze the historical development, purpose, and deployment of such policies.

The qualitative phase of the research then includes the selection of study sites based on purposive sampling techniques for addressing geographical distribution, disaster risks, and socio-economic settings. Ethnographic fieldwork is then carried out in these chosen areas through participant observation, in-depth interviewing, and focus group discussions. Participant observation is used whereby the research involves daily interactions with the people in the community to learn more about their practices, culture, and social structures concerning disaster risks and climate change.

The qualitative information is subject to thematic analysis to look for patterns, trends, or themes that help to explain community responses to DRR policies. National policies are then compared to local practices in order to evaluate a policy-practice gap, where the gaps and possible solutions are identified. This methodological approach is eventually expected to offer a comprehensive and rich perspective of how national DRR policies are engaged and implemented at the community level, with a focus on policy implementation and opportunities on how it can be made more inclusive and effective.

Results and Discussion

Impact of Climate Change on Natural Disasters

Rising global temperatures contribute to frequent and prolonged periods of extreme heat, with cascading effects on ecosystems, agriculture, human health, and vulnerable populations. As a result, in light of shifting climatic dynamics, standard risk assessments may become out of date, underscoring the significance of proactive and adaptive measures. For example, a significant increase in sea surface temperatures has led to an increase in strong storms and typhoons. These climate shifts not only increase the frequency but also the potency of natural disasters by changing precipitation patterns, which causes both protracted droughts and strong floods (Mercer et al., 2012). There is growing evidence that there is a clear association between changes in weather patterns and an increased frequency of extreme events as global temperatures rise. In low-lying coastal locations around the world, the consequent rise in sea level brought on by the melting of the polar ice caps and the thermal expansion of seawater presents a new risk of storm surges and coastal flooding.

Events brought on by climate change may also set off feedback loops that intensify already-occurring environmental changes, resulting in a vicious cycle of rising risk. Permafrost, for instance, can thaw and release stored greenhouse gases, which can contribute to climate change and affect the frequency and severity of disasters (Kinnane, n.d.). To prevent and mitigate compounding effects that could result in more severe and unpredictable results, it is essential to identify these feedback loops. Thus, the effects of climate change go beyond specific danger types and frequently take the form of intricate, chain-reaction events that increase the probability of disaster overall. Thus, comprehending these ecological effects is essential to creating policies that protect both human populations and the larger environment.

Socio-Economic Implications

Significant socioeconomic effects of climate change include altered migratory patterns, water availability, agricultural productivity, and human security (Ali et al., 2021). Climatic shifts hold ripple impacts that are most evidently felt by populations situated in vulnerable regions. For instance, vulnerable populations, such as women, children, the elderly, and marginalized groups, are often disproportionately affected, facing heightened risks of displacement, increased susceptibility to health issues, and reduced access to essential services.

Disruptions interconnectedness of social and economic consequences, highlighting how disruptions in one domain can amplify challenges in the other. For example, economic downturns resulting from a disaster can contribute to social unrest and strain social cohesion, while social disarray may impede economic recovery efforts (Sadownik, 2023). In addition, agriculture happens to be one of the most sensitive sectors in climate change, where changes in precipitation and extreme weather conditions substantially affect crop production and food security. In this case, culturally marginalized groups may prove particularly vulnerable as their cultural knowledge and practices are often tied to the local irrigation system (Carter& Fuller, 2015). For this reason, in those areas where farming depends solely on rain, a long period of drought results in considerable losses and a shortage of food products, which in turn contributes to poverty and migration. Moreover, the rise in temperature and changes in rainfall distribution may ultimately lead to frequent occurrences of wildfires, ultimately, threatening both natural biomes and populated areas.

In this way, recognizing and respecting these socio-cultural dimensions is vital for developing inclusive and culturally sensitive approaches to disaster risk reduction and response.

Resilient Urban Planning and Infrastructure Development

The process of allocating land for development and building operations needs to be reassessed in light of climate change. The requirement of robust arrangements, adaptable urban projects, and the application of ecological practices to minor hazards is underlined by the augmented risks of climate-related tragedies. At the instant, governments are integrating climate fears into land-use development, zoning, and building essential structures (Hankivsky et al., 2014).

Mainstreaming Climate Science into DRR and Emergency Preparedness

The development of quick warning systems and risk examination skills depends seriously on developments in data processing, satellite, and climate modeling expertise. This contains advances in our awareness of natural hazards from a technical perspective, variances in the occurrence and strength of catastrophes, and the socioeconomic components that affect the experience of risk and ability to adapt (Sawalha, 2020).

Efficient early warning systems that assimilate climate science can help offer detailed and timely data about the disaster, letting administrators and the general people take the required safety actions. For example, better climate modeling and weather foretelling can anticipate likely multifaceted climate occurrences like hurricanes and floods (Ismail-Zadeh et al., 2016). (Sangha et al., 2018) declare that these systems are vital for risk calculation and disaster readiness. Understanding the important occurrences, governmental acts, and policy selections that have formed the disaster organization field is also essential for research on the conception of disaster risk reduction (DRR) strategies. This argues how national disaster risk reduction policies are defined and how "soft laws" are influenced by international treaties and charters, such as the widely accepted Sendai Framework for Disaster Risk Reduction (Paulus& Jessica Nina Lester, 2015).

International Collaboration and Policy Formulation

Diplomatically, the consideration of climate change as a global subject has substantially led to alliances between countries, the sharing of experience, and the raising of funds. Multilateral treaties such as the 2015 Paris Agreement remain instrumental in coordinating international cooperation in improving overall preparedness for climate-related disasters (Moore et al., 2018).

For instance, there are many successful stories in the past where international cooperation has been seen in the development of regional early warning systems and integrated Disaster Response mechanisms. These collaborative activities allow the country to cooperate with other nations/firms and direct efforts, time, and capital jointly, to address cross-border threats. In the present era, almost all countries have incorporated modern technologies like geospatial technology, remote sensing, and data analytics into their policies for enhancing detection, early warning systems, and decision-making (Buergelt& Paton, 2022).

Furthermore, international funding bodies like the Green Climate Fund offer substantial funding to developing countries to propagate climate change adaptation and mitigation projects that strengthen their ability to manage climate-related disasters (Paton et al., 2013).

Community-Based Approaches and Indigenous Knowledge Integration

Disaster management frameworks, rooted in sound governance policies and supported by community involvement, are essential in determining the fate of vulnerable populations. The study highlights the need for community-centered and localized initiatives in DRR and disaster preparedness as well as the participation of indigenous knowledge systems. Indigenous populations and other local people at the grassroots level have unique lessons from their experiences that they have accumulated for generations (Williamson& Weir, 2021). Such knowledge can enhance the existing scientific evidence and improve disaster risk reduction and management policies, frameworks, and interventions that are sensitive to culture.

Disaster of the various communities in the planning and decision-making processes of the disaster mitigation, preparedness, and response framework is crucial in developing grassroots community resilience. Participating communities in achieving risk assessment evaluating readiness, and creating early warning systems ensures they are empowered. In addition, supplementing this knowledge base with local practices like traditional weather predicting methods or appropriate methods of land cultivation can improve the applicability of DRR programmed and make adaption better, because it will suit the cultural contextual setting of the intended region better (Sithole et al., 2019).

Conclusion

One cannot dispute that climate change has a catalytic impact on disaster risk and emergency preparedness. The analysis of links between climate change and disaster risk investigates the complexity of interdependencies between climate factors and the risks of natural disasters as well as their cause-and-effect relation. It refers to how climate change acts as a potent contributor, which can escalate the risk profile by altering the nature of occurrences and their hazards.

The findings of this study highlight the need to incorporate climate change knowledge into DRR initiatives, increasing cooperation at the global level, and adopting rational and sustainable urbanization and construction. Similarly, appreciating the importance of 'bottom-up' perceptiveness as well as cultural practices is vital for fostering resilience at the grassroots level. Such strategies are crucial for the protection of societies versus the increasingly complicated situations arising from climate change.

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