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Affects of Communication Technology on Climate Resilience: How Digital Communication Shapes Flood Disaster Preparedness in Remote Communities of South Punjab

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ABSTRACT

This study examines the effects of communication technology on climate resilience, with a particular focus on how digital communication tools shape flood disaster preparedness in remote communities of South Punjab. The research explores the role of mobile phones, social media platforms, and early warning systems in strengthening adaptive capacities and supporting timely responses during flood emergencies. Data were collected through 20 semi-structured interviews with households, community leaders, and disaster management officials in flood-affected areas, supplemented by secondary sources such as government reports and NGO initiatives. A thematic analysis of the narratives revealed that digital communication significantly improved preparedness by enabling rapid dissemination of flood alerts, fostering awareness of safety measures, and enhancing community-level coordination. Mobile phones and messaging apps emerged as the most accessible and widely used tools, while social media extended outreach to a broader audience. Nevertheless, barriers such as limited connectivity, low digital literacy, and unequal access to devices restricted the overall impact of technology. Communities with better access to communication tools demonstrated stronger resilience, quicker evacuation responses, and more effective coordination with disaster management authorities.

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1.0 Introduction

The growing number and intensity of climate-related disasters have become one of the most acute problems of the twenty-first century, and floods represent one of the most harmful threats in the world. South Asia due to its climatic and geographical features is very susceptible to frequent floods which often interfere with lives, livelihoods and local economies. In Pakistan, flood disasters are highly susceptible in the province of Punjab, and South Punjab is one of the most affected areas because of its positioning along major rivers and the rural patterns of settlement. The remote communities in South Punjab are more vulnerable due to the poor infrastructure, accessibility to government services, and marginalization of these communities socio-economically (Ahmad, 2022). Over decades, these communities have been very dependent on the conventional modes of communication, e.g. word of mouth and community meetings, to disseminate information in case of flood emergencies. Nonetheless, the growing adoption of digital communication technologies, in particular, mobile phones, messaging applications, and social media platforms, has presented new possibilities of improving preparedness, coordination, and resilience in the face of climatic shocks. It is on this backdrop that the contribution of these technologies to the preparedness of the disaster in the susceptible rural context is of significant academic and practical significance (Oh & Lee, 2020).

The floods in South Punjab are not only a climatic threat but also an institutional and community adjustment, responsiveness and recovery challenge. Historical influence on the escalated morbidity and destruction of property by floods has been the inability of the traditional early warning systems to reach the most marginalized groups. Since the government agencies and humanitarian organizations have been putting money on the physical infrastructure, embankment and relief operations, the communication aspect has been a major area of resilience that has not been considered. The last few years have also seen the increase of mobile communication in rural Pakistan and even low-income households are currently paying attention to the availability of the basic cell phones (Khan et al., 2024). Simultaneously, the advent of low-cost internet-enabled devices has facilitated even the sluggish penetration of digital platforms in remote areas. This transformation means that there is a shift in the way communities receive information, interact with the disaster management authorities and mobilize action. To explain this change, it is important to take a closer look at communication technology as the means of exchanging information, as well as a variable that essentially interacts with socio-cultural systems, institutional systems, and environmental systems to determine disaster preparedness and adaptive capacity (Samarakkody et al., 2023).

Conceptually, the current research is concentrated on two fundamental variables that are communication technology and climate resilience, and specifically, disaster preparedness sub-dimension. Communication technology is defined as the digital tools, platforms, and systems, such as mobile phones, messaging applications, and social media, that are used in the sharing of information within and across communities. It includes hardware (devices and network infrastructure) and software (applications, platforms and services) dimensions. Climate resilience, conversely, refers to the capacity of persons, households and communities to expect, endure, react

and recuperate of climate-induced shocks like floods (Berhanu, 2025). Under this general notion, disaster preparedness is the collection of anticipatory measures, knowledge and arrangements that are taken before the occurrence of a flood to minimize the risks and facilitate prompt and efficient response. The two variables are connected in the mediating process of dissemination of information, creation of awareness and coordination. That is, communication technology can be considered as an enabling process, which improves resilience through increasing preparedness capacities at household and community levels (Marshall et al., 2023).

Communication technology and climate resilience can be theorized in several perspectives. According to the systems theory, resilience is not an attribute of the sturdiness of the infrastructures, but rather the emergent feature of interconnected social, ecological, and technological subsystems. The communication technologies here are connective infrastructures where information passes in and out of the different nodes of the system at high rates thereby enhancing adaptive capacity. Similarly, the diffusion of innovations theory may also be used to get data on how new communication patterns such as WhatsApp group use as a method of flood warnings or Facebook pages as a method of community mobilization can spread in rural communities and influence risk perception and collective action (Earl et al., 2022). Also, the social capital theories underline that digital technologies can strengthen bonding, bridging, and linking relationships and thereby enable communities to mobilize resources, engage with external actors and develop trust during crisis periods. These theoretical relationships lead to the fact that communication technology is not a passive instrument, but a dynamic variable that demonstrates how communities organize and respond to floods, which have context-specific impacts on resilience (Esposito, 2025).

Even though more value is being put on the importance of communication technology in disaster management, research gaps still abound. Much of the current body of climate resilience research in Pakistan and South Asia has focused on the physical adaptation options, including embankments, crop diversification, or livelihood diversification, and ignored the importance of digital communication in determining social and institutional capacities. Research which has dealt with the issue of communication during disasters frequently involves urban populations or is a top-down study of government early warning mechanisms, but does not consider the experiences of remote rural populations. Furthermore, although the application of social media and mobile platforms in reducing disaster risks have been studied internationally, much of the information is based on high-income countries or urban areas in middle-income countries, where digital penetration and literacy rates are relatively high (Wheatley, 2024). The specific issues of poor connectivity, low literacy and unequal access to technology in the marginalized areas such as South Punjab are still under researched. Also, the majority of empirical research depends on quantitative surveys that can simplify complex processes of communication technology utilization and perception by communities during floods. This creates a research gap of qualitative and context-sensitive studies that involve local voices, practices, and perceptions (Pham Xuan & Håkansson Lindqvist, 2025).

To address such gaps, the present study will focus on discussing how digital

communication technologies can shape the preparation to flood disasters among remote communities in South Punjab. This research problem can be as follows; despite its enormous potential to improve a climate resistant, the real contribution of the communication technology in isolated rural areas is mediated by access barriers, literacy barriers and inequality and raises crucial issues of inclusiveness and efficacy. Specifically, how can mobile phones, messaging applications, and social media platforms contribute to sharing the news about floods, awareness of safety measures, and arranging the socio-community-level response in South Punjab? What are the obstacles that offer challenges to their efficiency and how they are being practiced in the community along those lines? They are the key questions not only applicable in advancing the scholarly knowledge on resiliency in marginalized scenarios, but also in policy and practice in the management of disaster risks in Pakistan and other resilient areas.

The study is significant because it is capable of contributing to the theory as well as practice. Theoretically, it clears way to understanding communication technology as an ingredient of resilience and not a subsidiary and ancillary factor. It links systems theory concepts, diffusion of innovations and social capital concepts to prove that resilience creation is a capability of material infrastructure along with the capacity of communities to generate, diffuse and react well to information in a coordinated and timely way. The qualitative interviews adopted methodologically provides depth and context sensitive data of how communication technologies are very actually being used and perceived in rural flood affected communities which overcomes the drawbacks of purely quantitative or top-down analysis. In practice, the findings can inform the creation of more accommodating and more place-specific communications approaches on catastrophe preparedness to ensure that the benefits of digital technologies can be accessible to all classes of the society, even the most marginalized ones. The proposed research will contribute to the broader set of the agenda to present equitable climate resilience in vulnerable regions by illuminating the enabling and structural constraints of the aspects of digital communication. Lastly, the paper points out the aspect that communication technology is a good tool in raising preparedness yet its fundamentally transformational capabilities can be realized at best through a confluence of participatory policies, community-oriented approaches as well as investment in internet literacy and connectivity.

2.0 Literature Review

The analysis of community preparation and response towards disaster regarding climate change is built on theoretical knowledge of the resilience and communication technologies. Resilience theory understands resilience as dynamic, with its sole ability to absorb shock and be able to change structures when subjected to incessant threats. In this regard, what is being communicated is not the flow of information alone but a decisive factor of adaptative capacity on the basis that it cuts across awareness, direction, and action on a larger scale. It also highlights the fact the systems theory that resilience is a result of interrelations of social, ecological and technological subsystem and hence the presence of strong communication technologies will improve the connection between subsystems (Kurent & Avsec, 2024). The diffusion of innovations theory comes up with one more good dimension because the theory refers to the diffusion of new

technologies and practices within the communities, the way it influences risk attitudes, preparedness behaviors and adjustment strategies. Finally, the social capital theory highlights the aspects of resilience regarding relationships and trust that emphasize that communication technologies can strengthen bonding, bridging, and linking relationships that render networks of support crisis-resilient. These theories allow to develop a compound approach to the intersection of the communication technology, climate resilience and disaster preparedness and understand how these forces affect the outcomes in the rural flood-prone regions (Manatsa et al., 2025).

The empirical research undertaken in different environments has suggested that the communication technologies have been found to be versatile in terms of enhancing disaster preparedness and management. It has been established that social media in the high-income nations facilitates the rapid dissemination of official warnings, crowd-source information, and real-time updates on the situation, both of which, respectively, complement individual and group decisions. Similarly, mobile phones have been credited as trying to save the lives in case of a tsunami, hurricane, or a flood due to responsive evacuation (Hunt, 2025). The Global South research has also developed to indicate how the proliferation of mobile phones has provided new opportunities of resilience building regardless of the dearth of resources. The case studies in Bangladesh indicate that the community members rely on SMS alerts and voice messages as the major source of early alerts, where it rescued many people in case of a cyclone. Similar results in East Africa indicate that mobile money and messaging services were important in the recovery of post-floods through remittances, resource sharing, and coordination. Through these studies, it is confirmed that communication technologies do not just deliver information but also facilitate social and economic resilience (Demestichas & Daskalakis, 2020).

To be more specific to the South Asian region, an increasing amount of research has studied the connection between communication technologies and disaster risk reduction. In India, researchers have discovered that in rural areas, mobile penetration has assisted the grassroots warning systems during monsoon floods, especially where the state-level channels of communication were untrustworthy. Community radio with mobile messaging has been demonstrated to raise local awareness of the risk of floods and enable early evacuation in Nepal even in mountainous areas with limited connectivity. On the same note, a study in Sri Lanka reports that digital platforms played a significant role in recruitment and organization of relief in flash floods (Tillekaratne et al., 2021). In Pakistan, the literature is relatively limited, and the majority of the studies are devoted to the importance of physical infrastructure, relief efforts, and institutional failures in managing disasters. In areas where communication technologies are discussed, the focus is usually top-down (the government sends SMS alerts) and there is less focus on how rural communities themselves adopt and use these technologies in their daily preparedness activities. This skewed endowment signals the presence of a profound discrimination of the local forces of digital communication in marginalized areas with the high risk of floods like South Punjab (Sachdeva, 2025).

The most recent studies are focusing on the communication technologies vested in Pakistan and the outcomes of this study are contradictory. On the one hand, it can be seen that mobile

phones have facilitated disseminating flood warnings at a greater speed as well as provided answers in better coordination between the disaster management and other communities. Social media has, also, enabled NGOs to contact, raise awareness and mobilize resources in times of emergencies. On the contrary, another significant side of the challenge posed by the presence of some long-standing problems was noted by researchers as the lack of network have in rural areas, low digital literacy rates, and unequal access to devices, which do not contribute to the usefulness of all these technologies together (Junod et al., 2025). Gender disparity is particularly high with women in rural areas being less likely to have access to a mobile phone or share digital technology with any limitations to receiving the information required and rely on the male population or associates to find out the necessary details. This finding indicates a valuable fact whereby the potential communication technologies can achieve a lot but again dependency lies on the structural and social conditions that that define inclusivity and accessibility that ascertain whether they will add to resilience (Kasinathan et al., 2022).

Other developing regions beyond South Asia have certain worthy parallels outside the region. The Sub-Saharan Africa study has shown that the mobile penetration has offered new channels of weather response through weather forecasts, agricultural guidelines as well as early warning-systems. Nevertheless, these benefits have not reached even the poorest and most marginalized groups due to similar barriers of affordability, connectivity, and literacy (Bailey & Nyabola, 2021). The Latin American experiences also show that, although social media may raise the official disaster warnings and mobilize communities, it may also misinformation if not managed properly. These international lessons are close to the Pakistani situation, where people usually do not trust the institutions and the credibility of information is a question. Thus, the influence of the communication technology on the disaster preparedness is not uniform but is mediated by socio-economic, cultural, and institutional factors (Nnanna et al., 2025).

Community-based disaster risk management has been used to examine the relationship between communication technology and climate resilience. The scholars state that communication technologies do not only convey information, but also change the manner in which communities coordinate and react to threats. An example given is a participatory study about Indonesia that indicated that the WhatsApp networks of the locals are essential community-level disasters preparedness centers whereby the community leaders for communicate alerts to and organise efforts as well as emoting support to one another. In Kenya, government disaster organizations have been connected to the rural populations through digital platforms where accountability and responsiveness are improved (Omweri, 2024). These results suggest that the communication technologies consideration not only strengthen the vertical affiliations of the formal institutions, but also the horizontal connection in communities, thereby contributing to the resilience at diverse relations. Such theoretical and empirical evidence indicates that it is critical to explore how the rural population in South Punjab can know how to apply the digital tools based on their socio-cultural and environmental backgrounds (Sharma et al., 2025).

In spite of these contributions, there are a number of gaps in research. First, there is a lack of qualitative data regarding the actual use of digital communication tools by remote communities

in Pakistan in flood preparedness and response. Current literature is generally quantitative and does not reflect the complex meanings, practices, and issues related to the use of technology. Second, the literature has not completely addressed the intersection of communication technology with the problem of inequality, especially gender, class, and literacy, which determine different access and outcome. Third, the contribution of the social media platforms to rural disaster preparedness is under-researched because the majority of the scholarship is devoted to their application in urban settings (Petraroli et al., 2025). Lastly, although theoretical frameworks point out the possibilities of communication technologies in enhancing resilience, there is a need to have empirical evidence of the marginalized areas such as South Punjab to base the arguments on actual practice. To fill in these gaps, there is a need to have a context sensitive approach that preempts the voices and experiences of the community (Bates et al., 2020).

Based on these findings, the current research hypothesizes that communication technologies play an important role in flood disaster preparedness among remote communities in South Punjab. Informed by theoretical frameworks of resilience, diffusion of innovations, and social capital and based on empirical data of both global and regional research, it can be theorized that the community with more access to and use of communication technologies will exhibit more preparedness capacities. In particular, three hypotheses are put forward. To begin with, the availability of mobile phones and messaging applications is positively correlated with the timely response to the flood alerts and the implementation of the safety measures. Second, there is a positive relationship between the use of social media platforms and the improved community coordination and awareness in flood preparedness. Third, the relationship between communication technologies and resilience is moderated by barriers, including limited connectivity, digital literacy, and unequal access to devices, where marginalized groups gain less out of communication technologies. These hypotheses offer a theoretical framework of empirical research, which will further enhance the knowledge of the role of digital communication in promoting climate resilience among South Punjab communities affected by floods.

3.0 Methodology

The current research utilized the qualitative research design to examine the impact of digital communication technologies on the preparedness to flood disasters and climate resilience among remote communities in South Punjab. Due to the context-specific and socially embedded nature of resilience, it was considered adequate to use a qualitative approach in order to capture the lived experiences, practices, and perceptions of community members. The villages located along the major river belts in South Punjab were used in the data collection where household seasonal flooding is a common occurrence and has limited infrastructural and institutional support. The sites were selected purposively and were restricted to the areas which had been severely hit by recent floods hence the relevance and richness of the data. During the research process, informed consent, confidentiality and cultural sensitivity embraced the ethical issues.

The main data has been received with the help of 20 semi-structured interviews of 3 categories of participants such as households, community leaders, and the ones working with the disaster management. This triangular perspective allowed having a thorough reading on the role

that communication technologies play when preparing practices both in the grass rooms and in institutions. The interviews would be conducted using the local language to ensure that clarity and ease are brought to the respondents and that the interviews would be transcribed and translated which would undergo analysis. The secondary data in addition to interviews were also adopted to place the findings in perspective and reinforcement of the tales of the duty bearers in the form of government reports, NGO publications, and media articles on disaster management. The mixture of the primary and secondary sources improved the data set and introduced the micro-level insights and macro-level perspectives on communication technologies in disaster preparedness.

Data analysis was carried out through the approaches of thematic analysis that enabled relationship, identification of common patterns and themes in the narratives. The formulated blinded transcribed interviews took place through the coded interviews: the deductive codes relied on the theoretical approaches of resilience, diffusion of innovations and social capital, and the inductive ones were built on the answers of the interviewees. Trends, in such aspects as rapid dissemination of alerts, the community, the formation of consciousness, the digital divide, and inequality in access, were narrowed as many times as they were statistically analyzed. The thematic analysis also helped the study create subtle information about the facilitator and inhibitor of resilience brought about by communication technologies. The methodology was able to provide depth, rigor, and credibility in answering the research problem by incorporating the voices of various stakeholders and cross-validating the findings with secondary sources.

Results and Findings

1. Dissemination of Flood Alerts

It was evident that mobile phones and messaging applications were always highlighted by the respondents as the core of receiving information in time regarding the impending floods. Digital communication tools were attributed to making more quick responses possible as compared to previous years when warnings used to take long to reach remote villages or they did not reach them at all.

‘‘In the days when we did not have phones, we used to hear about the floods when the water was at the doorstep. Today I receive a message at the district office the day before’’.

‘‘The SMS messages by the government assisted us in making the decision to sell our livestock earlier this time’’.

‘‘My son read on Facebook that there was a flood coming and he informed us to pack our belongings. That saved us’’

‘‘By the WhatsApp, our family members in a different village were able to alert us early enough when the river began to swell’’.

‘‘The mosque loudspeaker continues to announce things, but I prefer the phone alerts as they are more direct and are the ones issued by the officials’’.

‘‘The phone messages were late in 2022, but this year they came in time, and we were able to evacuate the women and children first”

These quotes depict the fact that preparedness actions were greatly enhanced by mobile-based alerts and messaging services in terms of timeliness.

2. Awareness of Safety Measures

The participants emphasized that the use of communication technologies contributed positively to the knowledge about protective measures, including evacuation routes, safe shelters, and first-aid practices. The use of online communication was considered particularly helpful in sharing the standardized safety information.

‘‘A video on the use of drinking water during floods was taught to us on WhatsApp’’.

‘‘The Facebook page of the NGO enlightened us on where the safe shelters are situated and how one can access the safe shelters’’.

‘‘What to bring up was not known to us in the past years and currently are going by the checklist that they called us on the phone’’.

‘‘I have viewed the photos on the social media of how to secure important documents in plastic bags in order to preserve them’’.

‘‘Voice note was then received by the health worker on what we are supposed to have ready as far as medicines are concerned’’.

‘‘Through the messages, I realized that the snakes normally emerge after floods and as such, we had sticks around beds of the people.”

‘‘These reactions show that digital communities provide necessary awareness that cannot be created through warnings, but instead through direct learning of protective behaviour’’.

3. Community Coordination

Among the strongest themes that were manifested in all the interviews included the role of communication technology to improve the level of coordination within households, and in the community leaders and authorities in relation to flood preparedness. The respondents said that digital tools played more crucial roles in making decisions collectively.

‘‘I had forwarded the alert by using my WhatsApp group to all my neighbors’’.

‘‘The village head man created a community in which all the families would share their developments about the level of water’’.

‘‘The help of the phone calls made us carry out the evacuation with the aid of tractors’’.

‘‘We spread the news quick and fast and the district official informed us through messages to meet at the school’’.

‘‘Using mobile phones, families were able to stay in touch with the relatives who had already been in secure shelters’’.

‘‘During the previous flood, we had a plan, which was done over the phone, on the people who would be assisted in the cases of the elderly and the disabled.”

‘‘These descriptions explain how communication technology facilitated quick and coordinated responses at both the household and community levels’’.

4. Barriers of Access and Literacy

Although there were positive aspects, the respondents also found major obstacles to successful utilization of digital technologies, especially network issues, low literacy, and the inability to use advanced technologies.

‘‘There are times when the message arrives, which is incomprehensible to us since we are

not educated''.

''The village does not have a signal when it is raining heavily and hence, they do not receive the alerts all the time''.

''I do not have a smartphone, I have a simple one, and, therefore, I cannot use WhatsApp''.

''The signal was in English and we failed to comprehend it appropriately''.

''I use my children to interpret the messages since I cannot read''.

Some families here have a single phone, and as such, the alert might go off but the owner may not be at home."

These reactions highlight structural issues that constrain the coverage of digital preparedness systems, irrespective of their potential.

5. Inequalities in Technological Use

The analysis also demonstrated differences in access and use of communication technology especially gender, income and age lines.

"The phones are normally in the hands of men in the village and thus women wait until the husband is back at home to tell them the news''.

''My neighbor does not have a phone and so she is dependent on me to inform her about the alerts''.

''The young boys understand how to utilize Facebook, yet the older people do not have confidence in it''.

''Only the rich can afford smartphones, the poor continue to use simple phones''.

''Females are not comfortable inquiring about flood messages, as they are not accustomed to using phones''.

''The workers in the city bring information back, and the poorest who remain here are dependent on them''.

''These results indicate that communication technologies can facilitate resilience, but they can also recreate the existing inequalities in case inclusive approaches are not implemented''.

Summary of Findings

Overall, the thematic analysis indicates that digital communication technologies have had a transformative effect on flood disaster preparedness in South Punjab by improving the speed of alerts, awareness of safety measures, and community coordination. However, persistent barriers of connectivity, literacy, and inequality continue to constrain their full potential. Communities that overcame these barriers demonstrated stronger preparedness and greater resilience, while marginalized groups risked being left behind.

Discussion and Conclusions

The findings of the study provide good grounds to assume that digital communication solutions become the focal point of the flood disaster preparedness formation and, consequently, climate resilience among Punjabian remote South communities. The thematic analysis revealed that the rapid dissemination of flood alerts and creation of awareness of safety precaution measures and enhancement of coordination at the community care was made through the use of mobile phones, mobile messaging apps and social media sites. These outcomes can be greatly echoed on

the resilience theory, which hinges on the ability by localities to preempt, absorb, and adjust to shocks. Information sharing and coordinated response in a timely manner became the possibility with the help of the communication technologies, so the communication technologies were regarded as the inevitable enablers of adaptive capacity, and the concept of resilience as the outcome of not being predetermined by physical infrastructure but the mean of being a system of social and technological networks was demonstrated. Simultaneously, the results also highlight that technological advantages are not distributed equally, and any obstacles of connectivity, literacy, and inequality restrict the possibility of vulnerable groups accessing and taking action based on digital information, which softens the overall effect on resilience.

Significance of communication technology as emphasised in this study is congruent with the previous empirical studies in South Asia and other regions. In line with findings of other studies, including those conducted in Bangladesh, where mobile alerts have been found to save lives during cyclones, the respondents in South Punjab highlighted the importance of mobile phones and messaging applications in facilitating evacuation in good time. In the same manner, the application of social media in spreading the safety information can be traced back to the research conducted in Indonesia and Kenya, where WhatsApp and Facebook were used as centers of coordination during floods. Nevertheless, the current research contributes to the existing literature by placing the given dynamics in the context of rural Pakistan, where the success of technological tools depends on such structural factors as low network coverage, low digital literacy, and gendered disparities. In that regard, the results are expanding the model of diffusion of innovations as they demonstrate that digital practices realization in disaster preparedness is not merely a problem of perceived usefulness, but also socio-economic incorporation and cultural values. The societies with a higher degree of access to equipment and networks were quick to acquire the new communication patterns, as the marginalized communities still trusted in the secondary or indirect paths of information.

The other noteworthy finding is related to the mediating position of the social capital about the effectiveness of the communication technologies. The participants said that notifications to one of the families were immediately forwarded to WhatsApp groups that this actually signaled that technology optimally engaged when properly incorporated into sound social networks. This conforms to the social capital theory that focuses on bonding and bridging relationships in the mobilization of resources and information dissemination. Meanwhile, discrepancies in access point to the fact that not every member of the community is equally situated in such networks. Women, the elderly, and the low-income households tended to use intermediaries to obtain digital information, which highlights that technology may strengthen the social hierarchy as long as it is not accompanied by inclusive policies. The findings thus imply a subtle connection between technology and resilience: on the one hand, digital tools increase preparedness, but on the other hand, their advantages are mediated by social structures that define access, control, and ability to respond to information.

Such results also indicate the existence of the digital divide in disaster preparedness. The fact that literacy barriers, language barriers, and unequal access to devices were mentioned by the

respondents shows that technology is not the sole solution to resilience. Instead, the success of communication technologies is based on the complementary aspects of communication like digital literacy training, inclusive community practices, and infrastructural investments. This subtlety is essential since it questions the fact that the dissemination of mobile phones inevitably leads to the better disaster results. Rather, resilience is the result of access to technology coupled with awareness-building, institutional support, and community involvement as the current study indicates. Findings therefore support the systems theory by demonstrating that resilience is the result of interactions among technology, institutions, and social practices and not the result of any of the factors.

To sum up, the paper has established that communication technologies have greatly improved disaster preparedness to floods in remote communities of South Punjab by providing quick alerts, generating awareness, and coordinating communities. Nonetheless, their potential is limited by the presence of the persistent obstacles connected with connectivity, literacy, and inequality. The identified research problem at the beginning of the study, which is that communication technology is essential but not equally distributed, was validated by the results, which reveal both the transformative opportunities of digital tools and the threat of marginalization of disadvantaged populations. The results can contribute to the theoretical paradigm of resilience as a multi-faceted procedure which is affected by both technology and social structures, and also they provide the empirical evidence in a part of the world which has remained insufficiently researched. The paper provides a realization of the need of immediate policies and practices that will not only expand access to technology but rather aim to look to the structural injustice that hold down resilience in vulnerable regions.

The findings of this study provide solid arguments to assume that the digital communication technologies play the center of the development of the flood disaster preparedness and therefore, climate resilience of the remote communities in South Punjab. The thematic analysis revealed that the rapid dissemination of flood warnings, more awareness measures on safety precautions and more community-level coordination occurred using mobile phones, messaging applications and social media platforms. Such findings are also much harmonizable with the resilience theory that is specialized in capacity of communities in anticipating, absorbing, and adapting to the shocks. Communication technologies enabled information to be shared in time and response to be coordinated, which is why the communication technologies were regarded as crucial enablers of adaptive capacity, and the concept of resilience as not being dependent on the physical infrastructure but more of a system of interconnected social and technological systems turned out. Simultaneously, the results also highlight that technological advantages are not distributed equally, and any obstacles of connectivity, literacy, and inequality restrict the possibility of vulnerable groups accessing and taking action based on digital information, which softens the overall effect on resilience.

Significance of communication technology as emphasised in this study is congruent with the previous empirical studies in South Asia and other regions. In line with findings of other studies, including those conducted in Bangladesh, where mobile alerts have been found to save

lives during cyclones, the respondents in South Punjab highlighted the importance of mobile phones and messaging applications in facilitating evacuation in good time. In the same manner, the application of social media in spreading the safety information can be traced back to the research conducted in Indonesia and Kenya, where WhatsApp and Facebook were used as centers of coordination during floods. Nevertheless, the current research contributes to the existing literature by placing the given dynamics in the context of rural Pakistan, where the success of technological tools depends on such structural factors as low network coverage, low digital literacy, and gendered disparities. In that regard, the results expand the frames of the diffusion of innovations, since they reveal that perceived usefulness is not the only factor of implementing digital practices in disaster preparedness, but also socio-economic inclusion and cultural beliefs. Communities which had more access to sensors and networks were quick to embrace new communication lifestyles and the marginalized groups either used other secondary or extracted communication channels.

The other important finding relates to the mediating effect of the social capital determine the effectiveness of communication technologies. As respondents provided, alerts appeared in one family and were relayed to WhatsApp groups, so mosque announcements or personal calls immediately, which pointed to the fact that technology was the most effective when embedded in strong social networking. This conforms to the social capital theory that focuses on bonding and bridging relationships in the mobilization of resources and information dissemination. Meanwhile, discrepancies in access point to the fact that not every member of the community is equally situated in such networks. Women, the elderly, and the low-income households tended to use intermediaries to obtain digital information, which highlights that technology may strengthen the social hierarchy as long as it is not accompanied by inclusive policies. The findings thus imply a subtle connection between technology and resilience: on the one hand, digital tools increase preparedness, but on the other hand, their advantages are mediated by social structures that define access, control, and ability to respond to information.

Such results also indicate the existence of the digital divide in disaster preparedness. The fact that literacy barriers, language barriers, and unequal access to devices were mentioned by the respondents shows that technology is not the sole solution to resilience. Instead, the success of communication technologies is based on the complementary aspects of communication like digital literacy training, inclusive community practices, and infrastructural investments. This subtlety is essential since it questions the fact that the dissemination of mobile phones inevitably leads to the better disaster results. Rather, resilience is the result of access to technology coupled with awareness-building, institutional support, and community involvement as the current study indicates. Findings therefore support the systems theory by demonstrating that resilience is the result of interactions among technology, institutions, and social practices and not the result of any of the factors.

To sum up, the paper has established that communication technologies have greatly improved disaster preparedness to floods in remote communities of South Punjab by providing quick alerts, generating awareness, and coordinating communities. Nonetheless, their potential is

limited by the presence of the persistent obstacles connected with connectivity, literacy, and inequality. The identified research problem at the beginning of the study, which is that communication technology is essential but not equally distributed, was validated by the results, which reveal both the transformative opportunities of digital tools and the threat of marginalization of disadvantaged populations. These findings add to the theoretical framework of resilience as a complex process that is influenced by both technology and social systems, as well as they supply empirical data in an area that has been under-researched. The paper highlights the necessity of urgent policies and practices that will not only increase access to technology but also focus on the structural injustices that restrain resilience in vulnerable areas.

Muhammad Sajid Nadeem: Research Idea, litrature

Maryam Khursheed: Writeup**,** Data Analysis

Maria Zafar: Problem Identification, data collection, analysis and Theoretical Framework

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References

Ahmad, A. N. (2022). Infrastructure, development, and displacement in Pakistan's "Southern Punjab". *Antipode*, *54*(5), 1407-1428.

Bailey, L. E., & Nyabola, N. (2021). Digital equity as an enabling platform for equality and inclusion. *Pathfinders for Peaceful, Just, and Inclusive Societies/NYU Center on International Cooperation, June 2021, https://cic. nyu. edu/resources/digital-equityas-an-enabling-platform-for-equality-and-inclusion*.

Bates, A., Hobman, T., & Bell, B. T. (2020). "Let me do what I please with it... Don't decide my identity for me": LGBTQ+ youth experiences of social media in narrative identity development. *Journal of Adolescent Research*, *35*(1), 51-83.

Berhanu, A. A. (2025). Vulnerabilities, Response Strategies, and Resilience of Smallholder Farmers to Climate Change in the Upper Blue Nile Basin of Ethiopia.

Demestichas, K., & Daskalakis, E. (2020). Information and communication technology solutions for the circular economy. *Sustainability*, *12*(18), 7272.

Earl, J., Maher, T. V., & Pan, J. (2022). The digital repression of social movements, protest, and activism: A synthetic review. *Science advances*, *8*(10), eabl8198.

Esposito, D. (2025). A Ladder of Urban Resilience: An Evolutionary Framework for Transformative Governance of Communities Facing Chronic Crises. *Sustainability*, *17*(13), 6010.

Hunt, R. L. (2025). *Aotearoa New Zealand's Tsunami Warning System: Considerations for Enhancing Hazard Communication and Response* UCL (University College London)].

Junod, A. N., Scally, C. P., Sawo, M., & Ferrara, L. (2025). *Expanding Digital Opportunity: A Framework and Road Map for Strengthening Digital Inclusion*.

Kasinathan, P., Pugazhendhi, R., Elavarasan, R. M., Ramachandaramurthy, V. K., Ramanathan, V., Subramanian, S., Kumar, S., Nandhagopal, K., Raghavan, R. R. V., & Rangasamy, S. (2022). Realization of sustainable development goals with disruptive technologies by integrating industry 5.0, society 5.0, smart cities and villages. *Sustainability*, *14*(22), 15258.

Khan, Y., Rahman, F., & Ahmad, A. H. (2024). The digital divide in Pakistan: Access to technology and its socio-economic implications. *ASSAJ*, *2*(4), 1221-1235.

Kurent, B., & Avsec, S. (2024). Synergizing Systems Thinking and Technology-Enhanced Learning for Sustainable Education Using the Flow Theory Framework. *Sustainability (2071-1050)*, *16*(21).

Manatsa, D., Bowora, J., Mukwenyi, P., Pedzisai, E., & Gomo, M. (2025). Intersectional Vulnerabilities in Disaster Resilience: Gender, Geography, and Poverty in Zimbabwe's Agrarian Communities. *International Journal of Disaster Risk Reduction*, 105771.

Marshall, A., Wilson, C.-A., & Dale, A. (2023). New pathways to crisis resilience: solutions for improved digital connectivity and capability in rural Australia. *Media International Australia*, *189*(1), 24-42.

Nnanna, U., Mohammed, A., Abubakar, T., Yunus, J., Eleke, U., & Sennuga, S. (2025). The role of technology in transforming rural social systems: An insightful review. *Journal of Nutrition and Food Processing*, *8*(1), 1-8.

Oh, N., & Lee, J. (2020). Changing landscape of emergency management research: A systematic review with bibliometric analysis. *International Journal of Disaster Risk Reduction*, *49*, 101658.

Omweri, F. (2024). A systematic literature review of e-government implementation in developing countries: examining urban-rural disparities, institutional capacity, and socio-cultural factors in the context of local governance and progress towards SDG 16.6. *International Journal of Research and Innovation in Social Science*, *8*(8), 1173-1199.

Petraroli, I., Nagahama, A., Baars, R. C., & Terumoto, K. (2025). Ready for the worst: awaiting disaster in ageing rural Japan. *Disasters*, *49*(2), e12680.

Pham Xuan, R., & Håkansson Lindqvist, M. (2025). Exploring Sustainable Development Goals and Curriculum Adoption: A Scoping Review from 2020–2025. *Societies*, *15*(8), 212.

Sachdeva, G. S. (2025). *The Philosophy of Space Policy: With a Case Study of India*. Taylor & Francis.

Samarakkody, A., Amaratunga, D., & Haigh, R. (2023). Technological innovations for enhancing disaster resilience in smart cities: a comprehensive urban Scholar's analysis. *Sustainability*, *15*(15), 12036.

Sharma, V., Bhardwaj, S., Farheen, V., & Agarwal, P. (2025). Rural Consumer Behavior in Developing Economies: A Review of Social and Marketing Interventions. *Journal of Marketing & Social Research*, *2*, 313-328.

Tillekaratne, H. I., Werellagama, I., Madduma-Bandara, C. M., Bandara, T. W., & Abeynayaka, A. (2021). Hydro-meteorological incident and disaster response in Sri Lanka. Case study: 2016 may rain events. *Earth*, *3*(1), 1-17.

Wheatley, M. C. (2024). Navigating the digital divide: A global perspective. *Premier Journal of Computer Science*, *1*, 100003