



Understanding Climate Change through Digital Media: A Household Survey in Punjab, Pakistan

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ABSTRACT

There has been a shift in a climate communication scholarship that used to ask whether audiences are reached by climate information to whether they can be reached through trusted channels, and whether that leads to a real understanding of climate risk. The present article is based on a cross-sectional survey of 499 respondents in the settlement strata of District Jhang, Punjab, Pakistan, to explore the sources, trust and understanding of information regarding climate change among a predominantly young urban and lower to middle class population. Overall, the study reveals that digital and social media are now the primary media sources for climate information (reported by the highest percentage of respondents), with TV and radio plus people being the next most common source. Even so, research institutes and peer-reviewed journals were still the most trusted source of climate information, showing that there is a “structural disconnect” between the delivery of climate information and what people deem credible. Climate literacy was moderate to high, with 45.2% having a clear understanding of climate change; the respondents most easily linked climate change to the noticeable, local impacts on weather (unpredictable rainfall, floods and heatwaves) rather than the slower processes of global change. The average agreement was also mild to moderate ($M = 3.93$, $SD = 0.78$ on a 5-point scale) with regard to the relevance of the climate information received to daily life. The findings are analyzed from the perspective of Development Support Communication (DSC) theory, which separates awareness creation from developmental transformation and are used to conclude that it is not only reach that makes the media legitimate, but the scientific and institutional actors must also have the presence on social platforms, which are already being used by audiences.

Introduction

Climate change communication research has settled on a couple of points that the amount of information available is not a sufficient condition for public involvement with climate risks; rather, the channels through which climate information flows and the level of trust in the information received by audiences are also important (Boykoff, 2011; Moser, 2016). In countries especially vulnerable to climate change such as developing nations, where a significant part of the population is still not connected to formal scientific communication, this distinction is particularly significant with respect to the rapid digital transformation of the media system. This is what Pakistan represents. It is also one of the most vulnerable countries to climate change related vulnerabilities globally, despite its relatively small contribution to global greenhouse gas emissions (World Bank, 2022a), and the unprecedented flood situation that swept through the country in 2022, affecting more than 33 million people, highlighted the extent of the vulnerability of the country (Nanditha et al., 2023). Meanwhile, the media landscape in Pakistan has also undergone a drastic transformation towards mobile and social media platforms, especially among the large youth

population of the country, and it remains to be seen if this is facilitating or obstructing the creation of accurate, trusted climate knowledge.

This article tries to answer this question in an empirical way. It presents the outcome of a structured household survey of 499 respondents across four strata of settlement in District Jhang, Punjab, to find out which media channels or sources they use for obtaining climate information, how well they understand and act upon them and what information sources they trust most. The analysis is presented around two of the five research questions that guided the parent study: the extent to which environmental communication strategies influence public knowledge and understanding of climate change and the relationship between the effectiveness of communication strategies and public knowledge and understanding of climate change (Research Questions 1 and 5), and the role of literacy in determining who is reached by climate communication (Research Question 4, addressed here through the results of the category 'literacy and comprehension'). Two corresponding hypotheses are tested: The first hypothesis is that public knowledge and understanding of climate change has increased due to the effective communication strategies (H1); The second hypothesis is that there is a positive relationship between the effectiveness of the communication strategy and public knowledge and understanding of climate change (H5); and, in relation to literacy specifically, that people with lower levels of literacy are less likely to be reached by climate communication (H4).

The main descriptive contribution of this article is that there is a significant disparity between the type of channel in which climate information is actually encountered (social media) and from where it is said to have the greatest credibility (scientific/institutional sources), and that this disconnect is explained using Development Support Communication (DSC) theory, which suggests reach and credibility are not necessarily the same. The rest of the article examines pertinent theory and media-systems literature, illuminates the methodology of the survey, presents the descriptive findings relating to media exposure, comprehension and trust, and explores implications on climate communication practice and policy in Pakistan and similar contexts in the Global South.

Literature Review

Development Support Communication and the awareness–Transformation Distinction

Development Support Communication (DSC) sees communication not as unidirectional dissemination of technical knowledge, but as a communicative, dialogic, processual and participatory experience, situated in the social and institutional setting where development and adaptation take place (Servaes, 2022). The approach of diffusion of expert knowledge through mass media was seen as a remedy to the supposed information deficit, and this model was heavily criticized in the late twentieth century, with the communication-for-development model increasingly being replaced by ones that focus on dialogue, meaning-making and trust-building processes (Waisbord, 2014; Mefalopulos, 2008). In the context of climate change, DSC scholars see climate risk as not just a technical problem that can be solved with knowledge: the final decision to adapt will be made by the wider community, and it will ultimately rely on social acceptance, interpretation, and the maintenance of behaviour change (Moser, 2016). An analytical division that is central to DSC, and that this article follows, is that between communication that generates awareness and communication that generates developmental transformation: awareness is essential, but not sufficient, for adaptive change; to communicate in such a way as to generate awareness only – message dissemination as widely as possible – does not automatically translate into understanding, trust, or agency (Servaes, 2022; Waisbord, 2014).

Traditional Media, Framing, and the Limits of Mass Communication in Pakistan

In the past, the agenda-setting and framing literature has focused on newspapers, television and radio as the main social media in which societies make sense of and prioritize environmental risk (Entman, 1993; Boykoff, 2011). Studies in Pakistan show that English-language newspapers have been more focused on policy and governance aspect of climate change while Urdu-language newspapers have been more focused on the immediate implications of climate change including floods and heatwaves, and that the reporting of both the newspapers is largely event-driven, becoming intense during disasters and diminishing during the period between disasters (Ahmed et al., 2017). Climate change is also a visually dramatic event, and this same immediacy of the visual medium renders the issue episodic and problematic, rather than as a continuous underlying process (Boykoff, 2011). Radio, and especially community radio, is a medium that remains very useful to rural and low-literacy audiences, providing vernacular-language and interactive programming (Manyozo, 2012); in Pakistan, however, the potential for participatory climate communication via radio is underutilized, partly because of regulatory and institutional barriers (Jatoi et al., 2022). The literature reviewed here indicates that traditional media in Pakistan still have agenda-setting power, but not equally: therefore, a comparative study of the exposure of audiences to digital media is warranted.

Digital media, Trust Formation, and the Credibility Gap

The climate information environment has been changed thanks to social media and mobile Internet access, especially for young and urban groups (Hussain & Mudasser, 2007). The two classical communication theories that help explain this are the two-

step flow theory which suggests that information from the mass media is filtered and then disseminated through interpersonal channels (Manyozo, 2012, on the topic of community-mediated information flow) and uses-and-gratifications theory, which posits that people use the digital medium for information, social affirmation, and civic engagement rather than passive reception (Boykoff, 2011). Digital platforms are often said to reduce the effort required to engage with climate issues and create visual, narrative content that is more accessible to audiences with less literacy or technical skill (Gillespie, 2018; Couldry, 2012). Meanwhile, a growing literature attests to the fact that platform algorithms are not neutral conduits - they are non-human actors, in the sense of ANT, that amplify emotionally resonant or visually striking content, and can systemically disadvantage less sensational and community-based content (Callon & Law, 1986; Poell et al., 2019; Gillespie, 2018). The combination of this risk and digital misinformation also increases the risk of misinformation or exaggerated claims that can rapidly spread on platforms like WhatsApp or Facebook, where fact-checking and accountability for sources are poor, and therefore the information ecosystem is undermined (Lewandowsky et al., 2017; Ali & Qazi, 2023). Media and digital literacy programs are found to have a positive effect on resisting misinformation if they develop audiences' skills to critically consider sources and detect misinformation (Vraga & Bode, 2020). Several scholars, for present study purposes notably, have noted that platforms audiences use most are not necessarily the ones audiences trust the most, especially in the context of the reduced visibility of scientific and institutional actors on social media platforms compared to offline platforms (Boykoff, 2011; Couldry, 2012). The key empirical puzzle explored in this article is the relationship between exposure and trust.

Youth, comprehension, and the Global South Evidence Base

The results of comparative international studies invariably show that younger age groups are digitally connected and most of them are concerned and aware of the climate issue (O'Neill & Boykoff, 2012; Corner et al., 2015) which is highly relevant to the situation of younger age groups in Pakistan which are in majority. Meanwhile, research from South Asian and other Global South settings has warned that even high levels of awareness don't necessarily translate into meaningful, actionable understanding; information can be cognitively comprehended at a surface level and not retained at a deeper level, and it can be abstract and fragmented, in contexts where communicating is about delivery of information rather than sustained, localized engagement (Moser, 2016; Servaes, 2022). The literature provides motivation to the present study to focus not just on how the information is delivered to the respondents, but on their perception of the understandability, relevance, and trustworthiness of the information.

Methodology

Research Design

The study was of a positivist type quantitative design with a cross sectional survey design as the researchers intended to find patterns and relationships among the large and diversified population of media users, trust and understanding at one point in time (Creswell & Creswell, 2017; Bryman, 2016). The primary instrument selected was a structured questionnaire as this would allow for the measurement of the subjective constructs of perceived understandability, trust and relevance in a manner that can be standardized and compared across a socio-demographically diverse sample of respondents, whilst also supporting systematic and replicable analysis in line with the policy-relevant research question.

Population and Sampling

The study population consisted of residents of the District Jhang, Punjab having high population density in a city, peri urban town and rural areas in the same administrative unit. The stratified sampling design was applied in four settlement strata—traditional/old city neighborhoods, walled/gated urban societies, rural villages, and small towns—and an extra category was used for capturing the individual who live in dera (informal settlements). Sample sizes were calculated proportionally to each stratum's population. Of 500 questionnaires administered, 499 valid responses were retained after data screening (N = 499).

Sample Characteristics

Respondents skewed strongly toward young adults: 69.5% were aged 18–25, while adolescents and respondents over 50 were rare (1.2% and 0.6%, respectively). Women made up 58.5% of the sample. Most households reported lower-to-middle incomes, with 59.1% of respondents reporting a monthly family income at or below PKR 50,000. Respondents were drawn primarily from urban settings — traditional urban neighbourhoods and gated urban societies together accounted for 62.3% of the sample — with the remainder from rural villages (23.2%), small towns (10.7%), and informal settlements (3.8%). Findings should accordingly be read as most representative of young, urban, lower-middle-income residents of District Jhang rather than the Pakistani population as a whole.

Instrument and Measures

The items analyzed in this article are drawn from a larger structured questionnaire covering demographic characteristics, media exposure, trust and credibility, and communication-effectiveness constructs. Response formats were matched to the construct being measured rather than forced into a single uniform scale: single-choice ordinal formats were used for graded constructs (e.g., frequency of exposure, perceived understandability), multiple-response (“select all that apply”) formats were used where respondents plausibly hold more than one simultaneous view or behaviour (e.g., media channels used, information sources, trusted sources), and an explicit 5-point Likert scale was used for the relevance-agreement item to permit a mean score. This mixed-format approach is consistent with survey-methodology guidance that response categories should be matched to respondents’ cognitive load and the nature of the construct rather than standardized for its own sake.

Table 1: Measures Analysed in this Article

Item	Construct	Response Format	Options	n (valid)
Q1	Understanding of “climate change”	Single-choice (ordinal)	4	509
Q2	Associations with climate change	Multiple-response	5	723
Q3	Perceived impact on own community	Single-choice (ordinal)	5	544
Q4	Media/technology used for information	Multiple-response	6	715
Q5	Frequency of encountering climate information	Single-choice (ordinal)	4	499
Q6	Sources of climate/environment information	Multiple-response	6	676
Q7	Understandability of information received	Single-choice (ordinal)	5	517
Q8	Relevance of information to daily life	Single-choice (ordinal)	5	533
Q9	Most trusted information sources	Multiple-response	5	650
Q10	Agreement: information is relevant to daily life	5-point Likert	5	497

Note. n (valid) for multiple-response items reflects the total count of option selections across respondents rather than the number of respondents, since respondents could select more than one option.

Data Collection and Ethics

The structured questionnaire was administered face to face in all the four sampling strata. Participants were told about the study, the assurance of confidentiality and they were given the opportunity to participate. All the items reported here were subjected to descriptive statistics (frequencies, percentages, and means with standard deviation for Likert scaled items) because the design was descriptive and cross sectional, therefore the results presented below describe the pattern of the data and does not test any causal or inferential statements.

Results

Associations with Climate Change and Perceived Local Impact

When asked about phenomena that they associate with climate change (a multiple-response item, n = 723 selections), they most often mentioned unpredictable rainfall and longer dry seasons (n = 245) and more frequent floods, droughts, or heatwaves (n = 208) – well before slower moving global phenomena like glacial melt or sea-level rise (n = 111). This pattern suggests that people relate climate change mainly to the localised disruption of weather visible to them as opposed to the more abstract global processes. Relative to the impact on the community, respondents implicitly expressed a continuum of severity, with the most frequently reported response being, “some problems that affect daily life” (n = 271, representing about half of the valid responses), and a significant portion (n = 186) indicating the highest level of perceived severity, “very serious problems like displacement or crop loss.” Few respondents (n = 24 combined) had a score of zero for the impact of the project.

Media Channels and Information Sources

Social media platforms (n = 309) and Internet access on a smartphone more generally (n = 227) were the two most popular ways to get information about climate. Traditional media, such as television (n = 67) and radio (n = 17) were relatively low in frequency. The specific sources of climate/environment information were also mentioned – when respondents were asked separately about their primary sources of information, social media and online videos (n = 371) were overwhelmingly the largest, followed by news channels and talk shows (n = 174), interpersonal sources (friends, relatives or neighbours) (n = 74) and formal community sources (meetings or NGO staff) (n = 34 and n = 20 respectively). Frequency of exposure was concentrated in the middle of the scale: just over half (50.7%, n = 253) said they were exposed to climate information only occasionally (once or twice a month) while about 31% (n = 153) reported that exposure was very frequent (near weekly). Very few (n = 9) reported never being exposed to climate information.

Understandability, Relevance, and Comprehension

About half of respondents ($n = 253$) reported that the climate information they received was presented in simple, clear language; while a significant share ($n = 163$) said that it was a combination of simple and very technical language; a smaller share ($n = 101$ combined) reported that it was mostly confusing, could not say, or they received none at all. A large proportion ($n = 259$) saw a direct link between climate information and practical issues like farming, water and health, whereas a smaller proportion ($n = 140$) saw it as concerning general issues, but not specific to their lives; importantly, 74 respondents thought that information on climate seemed to be for educated or urban audiences alone. The climate information received is relevant to daily life was slightly to moderately agreed on by the respondents ($M = 3.93$, $SD = 0.78$) on the explicit 5-point Likert item.

Climate Literacy

This article focuses on one of six constructs that are of particular theoretical importance identified in the parent study: baseline climate literacy (Q1). The sample is primarily young, urban and social media-savvy, with 45.2% reporting moderate-to-high baseline understanding of what “climate change” means, which is the modal answer on this question (of 509 valid responses).

Trust and the Exposure–Credibility Gap

When asked which sources they trusted the most for climate information, a multiple-response item, scientific research institutions and peer-reviewed journals were the most mentioned sources ($n = 237$), ahead of social media and online forums ($n = 188$), though the latter was by far the most common source by which respondents get their climate information every day (Sections 4.2–4.3). This difference in the exposure channel and the channel with maximum trust is the main empirical result of the article and it will be discussed below.

Table 2: Summary of Key Descriptive Findings

Construct	Key Finding
Dominant information channel	Social media ($n = 309$ of channel selections; $n = 371$ as primary source)
Baseline climate literacy (Q1)	45.2% report a clear understanding of climate change
Perceived relevance (Q10, 1–5 Likert)	$M = 3.93$ ($SD = 0.78$)
Understandability of information	~50% describe information as simple/clear; 32% as mixed clarity
Most trusted source	scientific research institutions/peer-reviewed journals ($n = 237$), ahead of social media ($n = 188$)

Discussion

Reach without proportionate credibility

Most significant is the clear trend that digital and social media are the predominant gateways for climate information for this population, supplanting television, radio, and interpersonal channels as key sources of information, and that when respondents are asked directly about whom to trust for climate information, institutional and scientific sources consistently exceed the other media in their trustworthiness. This, however, should not be seen as a contradiction, but rather as an example of the central concept of the Development Support Communication theory that reach and credibility are analytically distinct achievements (Servaes, 2022). The dominance of social media is consistent with its ease of access, timeliness, and ability to convey visual and narrative information that respondents in this study appear to have understood more than textual or technical information, as would be expected, given its status as a medium that is easily accessible, immediate, and can convey images and stories (Waisbord, 2014). This type of understanding is what DSC scholars call awareness creation, but not developmental transformation, because it provides a reader with a helpful starting point for the discussion of climate change without fixing it to a source that readers might not consider authoritative (Moser, 2016).

What the literacy and relevance findings add

The moderate-to-high climate literacy result (45.2% reporting clear understanding) and the mild-to-moderate relevance result ($M = 3.93$, $SD = 0.78$) combined indicate that communication is having some but not a full effect on cognition; that is, people are not just being exposed to the climate content, there is a real level of understanding, though not complete, and there is a real level of relevance to their daily lives (farming, water, health, etc.). It aligns with H1 (increased public knowledge and understanding of climate change), and with H5 (increased communication effectiveness is directionally associated with an increase in public understanding of climate change), but — as with the descriptive and cross-sectional design in the present study — this should be interpreted as being directionally supportive, and not as a tested causal relationship. The fact that 74 respondents explicitly felt climate messaging was meant for educated/urban audiences simultaneously points to the fact that

some people understand climate change messages better than others even within this already youth-skewed, majority-urban sample – a reflection of the literature on literacy as a structural barrier to reach (Manyozo, 2012).

Why the trust gap matters for communication strategy

There is a direct strategic implication, however, in the gap between exposure (so high in social media) and trust (so high in scientific and institutional sources): If scientific and institutional actors remain, or remain more, off the platforms where audiences spend their time, then credibility cannot be taken for granted because of their reputation offline. Actor-Network Theory can help explain what is happening here: platforms and algorithms act as nonhuman actors which influence what content becomes visible, and platform voices that do not actively ‘translate’ their authority into these networks in a way that is favoured by the algorithms are displaced by more algorithmically favoured, but less credentialed, voices (Callon & Law, 1986; Gillespie, 2018; Poell et al., 2019). The relatively high amount of trust, even though it is not high visibility, implies an unexploited opportunity: audiences have a latent readiness to trust institutional science, but it is not being translated into experience because institutional actors are not equally visible in the audiences' daily digital spaces.

Consistency with international and regional evidence

These results are consistent with the international literature on the increased use of digital platforms as the main channel for climate information among young people (O'Neill & Boykoff, 2012; Corner et al., 2015), and with regional and Global South studies that highlight the disconnect between awareness and understanding, and between awareness and institutional trust (Moser, 2016). The comparatively high importance of visual and narrative elements in facilitating understanding is also similar to research on the communicative strength of storytelling and accessible framing in science communication contexts (Boykoff, 2011).

Conclusion

The purpose of this study was to explore the experiences, comprehension and trust in climate change information by a large sample of predominantly young, urban Pakistani people, and to analyze the pattern of these experiences in the light of DSC theory of development. The evidence also indicates that digital and social media are the main channels for communicating about climate change with this population, that climate literacy and perceived relevance are moderate to high, and that visual and narrative message formats help people understand climate change, yet that trust is mostly limited to scientific and institutional sources that are relatively weak in people's actual media diet. The key result of the study is that simply increasing the exposure of climate information is not enough to ensure the creation of lasting public trust in climate information, and science and institutional communicators aiming to close this exposure–credibility gap will need to be more active and visible on the platforms where their target audiences are already present, but not automatically trusted as an institution. Longitudinal or mixed-methods studies would be useful in determining if this exposure–credibility gap gets smaller as the scientific institution becomes more visible online, and if the moderate level of comprehension here found is maintained over time (that is, is it lasting, or simply temporary). The results of this study should be interpreted as describing the particular population sample studied (which was youth dominated and urban biased) and cannot be used to draw causal or nationally representative conclusions, and comparative studies on the exposure–credibility pattern across Pakistan's provinces and in other climate-vulnerable contexts in the Global South would help to assess the extent to which the results generalize.

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