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Climate Change Adaptation: A Thematic Analysis of Fishermen Narratives from PARI

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ABSTRACT

The escalating global warming of the planet is aggravating the consequences of climate change particularly among the marginalized sections of the population dwelling in poverty. The drawing of climate change adaptation policies often subverts locally immersed practitioners' perspectives. While there is some research on indigenous communities' capabilities to make adjustments to climate change, such literature is scant ly available in mainstream science. The gaps are discernible with specific reference to acknowledging the social element in the context of adaptation and in precluding knowledge beyond academic parameters from the debate. The proposed research intends to draw from the stories documented by People's Archive of Rural India (PARI), from the point of view of Risbey *et al.* (1999) stages of public adaptation. As this study will deal with revelatory, non-statistical realities, a qualitative method will be used to render social robustness. The initial tier of research involves a thematic analysis of four climate change narratives documented by PARI using the method of constant comparisons. For the purpose of this research we intend to present the findings from the analysis of the fisher folk stories from PARI. Analysis will be done using Open and Axial Coding methods to derive themes from these climate change concerns and adaptation practices, to inform our interview protocol in the second tier of the proposed research at a later time.

Key words: *Climate Change, Adaptation, Fisherfolk*

Adaptation to Changing Climate

The escalating global warming of the planet is aggravating the impacts of climate change particularly among the marginalized sections of the population dwelling in poverty (IPCC, 2014). Adaptation as defined by the Intergovernmental Panel on Climate Change as cited in Ayers and Dodman (2010) "describes the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." The term adaptation is now more extensively used to delineate endeavors to enable sections of communities in peril to manage vulnerability in the contexts of stress created by adverse changes in climate (Orlove, 2009; Lemos *et al.*, 2007; Agarwal, 2009). As against mitigation, adaptation occurs at a series of levels, from global to local, catering to level specific concerns and drawing from the capacities and resources available to the specific cohort of actors (Adger, 2001).

Taxonomies on Adaptation

Several taxonomies on adaptation have emerged through research (Feenstra *et al.*, 1991). Klein (1998,

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2003) differentiates proactive adaptation from reactive adaptation and also distinguishes between public adaptation and private adaptation. The timing of adaptation determines whether it is proactive or reactive with reference to whether adaptation is driven by a prediction of a climate event at an indeterminate point of time to come or by the outbreak of such an event. Private versus public adaptation talks about the agents and thereby tries to determine who are the actors involved in adaptation. Adaptation can also be incremental or transformative (Pelling, O'Brien and Matyas, 2015). Incremental adaptation works on maintaining the existing systems, while making minor adaptive modifications. Transformative adaptation on the other hand attempts to modify the basic attributes of the existing systems as a response to the actual or anticipated effects of change (IPCC, 2012).

Stages of Adaptation

Four stages of the public adaptation process were outlined by Risbey *et al.* (1999). These include the signal detection stage where what needs to be adapted to is chosen along with identification of what needs to be ignored; the evaluation stage in which the climate change signal is interpreted along with an evaluation of anticipated consequences; the stage of decision and response involves an overt modification in the performance of the systemic entity; the stage of feedback which monitors the offshoots of the decisions (Risbey *et al*., 1999).

Climate Change Adaptation and the Local Communities

Connecting the vulnerability of communities and systems to the impacts of climate change to determine adaptation measures is a complex socio-political process. Therefore, outcomes of climate change adaptation are dependent on the participants in decision-making and the framing, justification and operationalization of the processes (Morchain, 2018).

The framing of climate change adaptation policies often subverts locally immersed practitioners' perspectives. While there is some research on local communities' capabilities to adapt to climate change (Cruikshank, 2001; Maynard, 1998; Nuttall *et al.,* 2005), such literature is scant available in mainstream science. The gaps are discernible with specific reference to acknowledging the social element in the context of adaptation and in precluding knowledge beyond academic parameters from the debate (Morchain, 2018). However, there is an increasing acknowledgement of this disconnect along with the urgent necessity to embed indigenous observations into climate change research among members of the scientific community and to connect research and adaptation requirements on the field.

These local communities have been admitted to be ingenuous observers of the change phenomenon and their interdependence on living and nonliving ecosystems (Fox, 2002; McNeeley, 2009; McNeeley and Shulski, 2011). It is thereby imperative to critically explore the diverse climate change challenges for indigenous communities and the structural roadblocks that restrict the capacity of especially the marginalized people to adapt to climate change, more so in times of resource insufficiency (McNeeley, 2017). Climate change adaptation that is sustainable transpires when strategic community actions are initiated to reduce the adverse impacts on critical flow of natural resources for the current times and the future (McNeeley, 2012). Adaptation therefore needs to be consultative with reference to mainstreaming marginalized knowledge (Morchain, 2018). Moreover, framing adaptation priorities on the basis of technical solutions leads ironically to the distrust of the targeted sections of the vulnerable population (Otto-Banaszak *et al.,* 2011) and effectively prevents them from informing the holistic picture of adaptation (Morchain, 2018), rendering adaptation efforts inefficient (Nagoda, 2015). Empowering local communities through self-governance to control resources including land and water and to draw up climate change adaptation initiatives is of critical significance (Eriksen and Brown, 2011; Eriksen and O'Brien, 2007; McNeeley, 2017), as conceptualization of adaptation cannot be delineated from an integral perception of well-being. However, it is also critical to acknowledge the pros and cons of traditional knowledge and scientific understanding to arrive at a meaningful hybridization (Lebel, 2013).

Objectives and Methodology

The proposed research intends to draw from the stories documented by People's Archive of Rural India (PARI), on climate change adaptation among coastal fisher folk, from the point of view of Risbey *et al.* (1999) stages of public adaptation process and through the lens of collective action as proposed by Ostrom (2000). Adaptation is also contextualized within the framework of Incremental and Transfor-

mative change As this study will deal with revelatory, non-statistical realities, a qualitative method will be used to render social robustness. The researchers will use the archival method and open form key informant interviews. The researchers went into this inquiry without a priori commitments, which allowed for built-in flexibility and to factor in the iterative complexity of the research subject. The initial tier of research involved a thematic analysis of four climate change narratives documented by PARI using the method of constant comparisons. The issues related to climate change included extreme climatic events and consequent disasters, rising temperatures and loss in species quality among other aspects related to climate change. Subsequently, we propose to interview the key informants of these narratives guided by an interview protocol to develop a deeper understanding of the challenges, community perceptions of these challenges and collective action initiated if any along with perceived benefits. The generalizations from this study therefore will be qualified, conditional and situated.

The objective of the proposed research is to scientifically document these archived stories along with best practices if any that will help develop a discernment of the phenomenon, its consequences and adaptation initiatives of the local communities in the relatively marginalized terrains and sections of the population in rural India from a bottom-up perspective rather than a policy driven viewpoint.

For the purpose of this paper, we intend to present the findings from the analysis of the fisher folk stories from PARI. These include (a) The Shrinking Pomfret of Suburban Mumbai; (b) Today we seek those fish in Discovery Channel; (c) A fishy Catch-22 in the Bay of Bengal; (d) The Great Coral Grief of Lakshadweep Islands. Analysis is done using Open and Axial Coding through the constant comparisons method to derive themes from these climate change concerns and adaptation practices. This will inform our interview protocol in the second tier of the proposed research at a later time.

Signal Detection, Evaluation and Response

A thematic analysis of the PARI stories involving fishing communities, using Braun and Clarke's (2006) six steps revealed that these communities did perceive a change in climate and have evaluated that climate change had and continues to impact them. Several of the fisher folk reported that in considering the impacts of climate change, they have arrived at certain responses and are attempting to adapt to the scenario to overcome the adverse impacts. Thereby, we can deduce that these fisher folk went through the stages of Signal Detection, Evaluation and Decision and Response stages of public adaptation as outlined by Risbey (1999). However, the themes, as shown in Table 1, do not report these communities reaching the fourth stage of public adaptation, namely feedback, which monitors the offshoot of these decisions and responses. However, these communities were able to identify several constraints hindering the adaptation process.

Perception of Change

The communities perceived climate change even when they could not articulate using the exact phrase. Changes were noticed in the biological oxygen demand of the waters that hosted the schools of fish. The fishermen have also comprehended that some change occurred due to natural processes as an offshoot of climate change in referring to destruction of mangroves and other habitats which acted as natural protection systems against adverse weather conditions, migration of fauna, mutation of species, surge in sea-level, increased frequency and intensity of severe weather events like the El Niño, changing patterns of precipitation and rise in ocean temperature and increased number of hot days in a year. Anthony Samy who has been fishing from age 10 notices:

It is also much hotter than before. Previously it was never so warm when going to the seas. Today, the heat is making it more difficult for us (Muralidharan, 2019).

Several adverse effects were the consequences of human intervention, including the run off of effluents and industrial waste into the water bodies and construction dotting the coastlines in violation of Coastal Regulatory Zone. Bhagwan Namdev Bhanji recollects:

Fishing in the Khadi [creek] today is barely possible. When we were young, the coast here was like the one in Mauritius. If you threw a coin into the water, you could still see it… . The water was that clean (Jiwani, 2019).

Fishermen who were part of this occupation for several decades could discern the change while drawing from their knowledge of history, cultural and local politics. Change according to them was so evident that even the women in their families who provided support services also discerned the impacts. Murali of the Bestha fishing community com-

ments:

Everything is different…the sea, the fish, our work…everything (Simlai, 2019).

In summarizing the change perceived in climate by the fishing communities, Nijamudheen grumbles:

Twenty years ago there were so many fish that we could be done at work in 4 or 5 hours, but now it takes us days to fill the boat. Monsoons have shifted, and we don't know when to expect rain. The seas are rough even in the fishing season. We used to move our boats fully onto the shore – a hard task – in June because we thought that's when the monsoon comes. But then the monsoon takes another month! Our boats were just stuck on shore, and we don't know whether to move them again or wait. So we are stuck too (Daga, 2020).

The communities also evaluated and reported a volatility and decline in their income from fishing and a fall in their profit margins as a sequel.

Table 1. Codes, Themes and Stages of Adaptation

S. No.	Codes	No. of observations	Themes	Stages of Public Adaptation
1	Scarcity of fish/low catch/size/disappearing	NS, SJ, KM, SD	Scarcity	Signal detection
2	Perception of Change	NS, SJ, KM, SD	Change	Signal detection
3	Change in BOD	NS, SJ, SD	Change	Signal detection
4	Natural Process	NS, SJ, KM, SD	Change	Evaluation
5	Human Intervention	NS, SJ, KM, SD	Change	Evaluation
6	Vulnerable Communities	NS, SJ, KM, SD	Constraints	Evaluation
7	Migration	NS, KM	Adaptation	Decision and response
8	New Skills and Networks	NS, KM, SD	Adaptation	Decision and response
9	Fluctuation/ fall (Income & profits)	NS, SJ, SD	Change	Signal detection
10	Value addition/ preservation	NS, SJ, SD	Adaptation	Decision and response
11	Political or administrative boundaries	NS	Constraints	Decision and response
12	Competition from Mech. Processes	NS, SJ, KM, SD	Constraints	Evaluation
13	Rise in input costs/investments	NS, SJ, SD	Constraints	Evaluation
14	Decline in Species Diversity	NS, SJ, KM, SD	Scarcity	Signal detection
15	Shifting to other occupations/ livelihoods	NS, SJ, SD	Adaptation	Decision and response
16	Over Fishing	NS, SJ, KM, SD	Constraints	Evaluation
17	Plastic, petrol, diesel Pollution/sewage/ industrial sludge	SJ, KM	Change	Evaluation
18	Deep Sea & Predatory Fishing	SJ, KM, SD	Adaptation	Decision and response
19	Women noticing change	SJ, KM	Change	Signal detection
20	Knowledge of history, culture & local politics	SJ	Change	Signal Detection
21	Destruction of mangroves/other habitats	SJ, SD	Change	Signal detection
22	Development/ Constructions along coastline	SJ	Change	Evaluation
23	Rise in Ocean Temp./ hotter days	SJ, KM, SD	Change	Signal detection
24	Movement of Species in response to Change	SJ	Change	Evaluation
25	Change in Biology of fish	SJ	Change	Signal detection
26	Increase in fishing time	SJ, KM, SD	Adaptation	Decision and response
27	Rise in Sea-level/increase in freq. of storms/El nino	SJ, KM, SD	Change	Signal detection
28	Boats not equipped for deep sea	SJ	Constraints	Evaluation
29	Reclaim of land for construction	SJ	Constraints	Evaluation
30	Technology (weather update. Temperature etc)	KM	Adaptation	Decision and response
31	Change defying knowledge	KM, SD	Constraints	Evaluation
32	Natural Protection from extreme weather	KM, SD	Change	Evaluation
33	Women in fishing	KM	Adaptation	Decision and response
34	Traditional Knowledge and its loss	KM, SD	Constraints	Evaluation
35	Monsoon Dependence and change in pattern	SD	Change	Signal detection
36	Change in catch season of bait fish	SD	Constraints	Evaluation
37	Changing patterns in bait fish catch	SD	Constraints	Evaluation
38	Ecosystem resilience and unable to cope up	SD	Constraints	Evaluation

Reported Scarcities

The fishermen reported a current scarcity of fish in the vicinity of the waters where they would cast their nets previously. Consequently, there were frequent instances of low catch hitting at their livelihood and sustenance. Priya Bhanji, who has been selling fish for several years now reports:

We've seen a difference of 65-70 per cent in the catch. If we're taking 10 tokris [baskets] to the market now, we used to take 20 tokris earlier. It's a huge difference (Jiwani, 2019).

The size of the fish too has significantly decreased, impacting their market and incomes. Priya Bhanji states:

Earlier, we used to get bigger pomfret, but now we're getting small ones. It's had a huge impact on our business (Jiwani, 2019).

They also reported a disappearance of several species of once popular fish, resulting in a loss of species diversity from the vicinity of their fishing areas, thereby resulting in low market price of their catch. Madhumita from the fishing community explains:

Varieties like ooral, sira, velakamban… have completely vanished. Some like paal sura, kalveti, komban sura continue to exist, but in greatly reduced numbers (Muralidharan, 2019).

Leena, an elderly woman from the fishing community narrates:

Till the 1980s, we used to get kattaiseela, komban sura and other such varieties, in tons. Today we seek those fish on Discovery Channel. My grandparents [who used non-mechanized country boats] would say engine sounds chase the fish away. And that petrol or diesel poisoned the waters and altered the taste of the fish (Muralidharan, 2019).

Attempts at Adaptation

Fishing communities seem to initiate behavioral adaptation to climate change, albeit an incremental one. Migration of the fisher communities seems to be a predominant attempt at adaptation. Fishermen tend to migrate to landscapes that provide access to deep sea fishing which allows relatively better catch quality and quantity. Also, attempts are being made to catch predatory fish which are larger in size, thereby fetching a better price. Fishermen also spend longer time than they were doing previously to catch quantities of fish similar to their catch in the past. Muniyamin, a 61-year old fisherman observes:

There's less fish these days. We didn't have to travel so far out for our catch back then, the shoals were all close by. But now people are gone for days, sometimes weeks, searching for fish (Daga, 2020).

Several fishing communities have also built cross-sectional networks with specific reference to seeking information about availability of seasonal catch and variety of species. This knowledge sharing promises to emerge as one of the dominant mechanisms of adaptation to the impacts of climate change. These fishing communities have acquired new skills including language skills in an attempt at networking and information seeking as well as new techniques of casting nets and use of information technology. Additionally, the communities attempt to prolong the shelf life of their catch by adding value through processing practices including drying. They are actively considering livelihood diversification to spread the risks of climate change (Banerjee et al., 2013). They are also supplementing their incomes through a partial shift to other seasonal and permanent occupations, for instance, fishing boat repair and maintenance. Additionally, while women played a predominant role thus far in selling the catch on the shore, they are now also involved in offshore fishing to supplement the catch of their male folk.

Reported Constraints

Fishing communities are highly vulnerable to climate change, a fact acknowledged by these fisher folk in no indefinite terms. These communities are marginalized owing to poverty and disenfranchisement in certain instances due to arbitrary political and administrative boundaries. These boundaries additionally also constrain these communities from casting a wider net for the fish catch. Their attempts at adapting to the vulnerabilities thrown at them by climate change by deep sea fishing are also thwarted by mechanized trawlers which can take away a larger catch and go deeper into the sea. These trawlers therefore overfish thus leaving the traditional fishing communities in the lurch. To compete with these trawlers would mean better equipped boats with increased input costs and investments to which these communities do not have access. Fisherman B. Hyder observes:

There are also many more big boats coming in from the mainland, even from other countries, with bigger nets. We are not able to compete with them on our small boats (Daga, 2020).

Another constraint involves reclamation of marine lands for construction, thereby effectively reducing the fish drying area for the traditional fishermen. Harsha Rajhans Tapke who sells fish notes:

Because the fish catch has become less, people [builders and locals] have reclaimed the land where we would dry our fish and started building houses there [on the sand] (Jiwani, 2019).

Fisher folk of generations carrying traditional wisdom related to their occupation report that the current changes defy their understanding of the trade and so the indigenous knowledge that these communities possess is losing its way. Anthony Samy recollects:

The seas have definitely undergone a huge change [since then]. Earlier, we used to calculate the winds and the weather as we set out. None of our calculations hold good today. The changes are so drastic, they defy our knowledge (Muralidharan, 2019).

A heretofore unacknowledged constraint that these fisher communities also report involves changing patterns of baitfish catch. While previously bait fish is caught post the breeding season, these schools are now being increasingly caught before they lay their eggs, thus hitting at the rate of reproduction of these fish. Abdul Rehman, a fisherman for over 30 years laments:

We used to catch bait fish only after they had finished depositing their eggs, but now people just capture them anytime. The number of boats has increased but catch has decreased (Daga, 2020).

Fisher folk finally report that while the ecosystem seems to develop some resilience to climate change, the changing patterns of the ecosystem are also rendering them high and dry. A.K. Sesu Raj frets:

It is no longer like the old days. The sea was friendlier. We knew what to expect in terms of catch and weather. Today, both are unpredictable (Muralidharan, 2019).

Conclusion

Connecting scientific research with adaptation needs of the indigenous communities is of critical significance to avoid the risk of disempowering the actors that these initiatives seek to support (Cochrane and Tamiru, 2016). This is especially so in the context of communities that predominantly comprise climate-susceptible livelihood sectors including fisheries and agriculture and thereby confront more severe constraints on their ability to adapt (Feng, Krueger and Oppenheimer, 2010; Thornton *et al.*, 2008). From the current research, it can be concluded that fishing communities along the coastlines in India in perceiving climate change have responded through incremental adjustments. However, continuing changes in climate may exceed the capacity of these communities to successfully adapt through incremental adaptation mechanisms. Vulnerable communities like farmers and fisherfolk need to essentially locate their adaptation efforts within the framework of transformative adaptation, which attempts to modify the basic attributes of the existing systems as a response to the actual or anticipated effects of change. The transformational strategy presents options that these communities can explore to reorganize institutions and structures when incremental adaptation reaches its limits.

Limitations

This study is limited to perspectives drawn from secondary sources of data and therefore is inherently self-limiting with reference to the depth of narratives. However, we chose to use these narratives and their analysis to generate an interview protocol to facilitate an in-depth empirical study of adaptation to climate change by coastal fisherfolk in the south-east coastal region of India from a socio-ecological perspective.

Implications for research and policy

The short-term objective of the proposed research is to scientifically document these archived stories along with best practices if any that will help develop a discernment of the phenomenon, its consequences and adaptation initiatives of the local communities in the relatively marginalized terrains and sections of the population in rural India from a bottom-up perspective rather than a policy driven viewpoint. In the medium to long-term this research will continue to identify similar instances and document them in the form of detailed case studies. Factoring in the National Action Plan on Climate Change and the State Action Plans by the respective state governments in India, this research proposes to inform policy with special reference to a consultation framework that includes local knowledge and emphasizes collective action at the community level with the state catalyzing community action following a bottom-up approach. This helps make adaptation efforts efficient, equal and just.

Conflict of Interest: None

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