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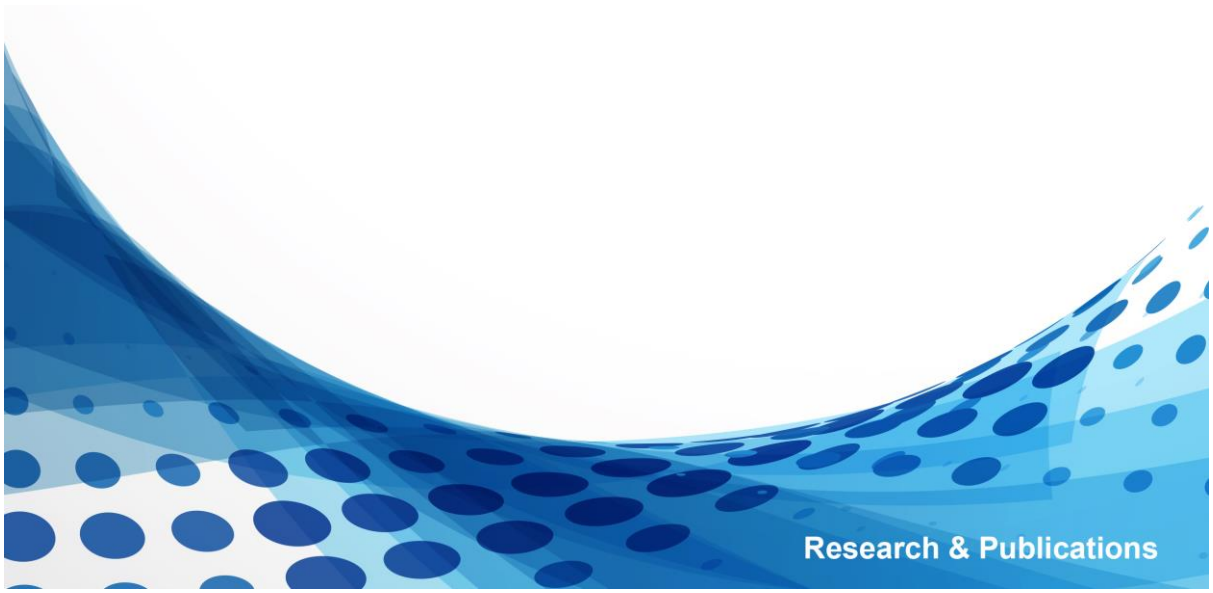

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Abstract

There are numerous studies that have examined the role of gender on differential perceptions on various aspects of energy, including those related to nuclear plants. Yet, few studies have explored the role of changing perceptions and the interaction of conditional factors in shaping the gendered effects, especially from a developing country. This enquiry is critical for the administrative state to understand targeted policy prescriptions. This paper examines the differences in perceptions and related reactions of both men and women living in the vicinity of Kakrapar Atomic Power Station in the Indian state of Gujarat. Although women's disproportionate sensitivity to and lower tolerance of risks is embedded in the broad cultural milieu, the presence of the nuclear plant in their vicinity was not perceived as a larger risk than the possible flooding from the nearby dam or losing livelihood opportunities due to dwindling returns from agriculture. This study challenges the gendered binary thinking in nuclear energy domain in terms of engagement and administration of nuclear energy projects.

Keywords: nuclear energy, gender perceptions, risk assessment, Kakrapar Atomic Power Station, livelihood

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INTRODUCTION

Securing sustainable and environmentally benign energy supply has assumed high importance in recent years. This is largely due to economic development that sustained through the use of fossil fuels, now impacting the earth's climate in adverse ways. On account of threats posed by traditional polluting fuels, many countries consider using nuclear energy, as it offers reliable base-load power, and have high capacity factor, and hence aids in reducing dependency on fossil fuel (Park, Jung, Kim & Lee, 2016). As a contested energy source, nuclear energy has both proponents and opponents. Proponents argue that nuclear power production results in only low emissions and hence has relatively minor environmental impact (Pioro & Duffey, 2015). Opponents on the other hand, show the potential risks citing three significant nuclear disasters (Fukushima, Japan in 2011; Chernobyl, Ukraine in 1986; and Three Mile Island, US in 1979) which caused significant social and environmental destruction (Rogner, 2013; Roh & Lee, 2017).

In terms of adopting nuclear technology, as early as 1940s India initiated the nuclear programme, currently having twenty-two nuclear reactors in operation, having a total installed capacity of 6,780 MW and pursue extensive medical and non-energy applications as well. Six more reactors are under construction with a combined generation capacity of 4,300 MW. In recent times, however, these green field sites have witnessed public protests (Khan, 2017; Venkat 2017), suggesting new constructions, unlike the older ones, will have to deal with issues of public acceptance. Scholars have identified that the determinants of acceptance are driven by factors such as risk perception, attitudes, trust, and knowledge (Chung & Kim, 2009; Stoutenborough, Sturgess & Vedlitz, 2013).

Even though public support for nuclear power remains lukewarm and is driven by various factors, the influence of gender on the acceptance of a nuclear plant has historically been, and continues to be a key issue, particularly in the light of the perceived disproportionate impacts. The relationship between gender and attitudes towards nuclear plants has since been confirmed by a number of studies (Mobley and Kilbourne, 2013; Keller et al., 2012; Whitfield et al. 2009), which observe that women are more suspicious towards nuclear plants than men. Another well-known pattern in literature suggests that women are significantly less supportive of nuclear energy than men (Kenar, 2013; Sundstrom & McCright, 2016; Henwood & Pidgeon, 2015)

and are considered to favour soft energies like renewables (Longstreth et al., 1989). Explanations for this pattern are often linked to ideas about different conditioning of men and women with regard to perceptions about safety, security and risk.

Some studies characterise women as inherently more risk averse (Fothergill, 1996), while others have attributed gender gaps to difference in levels of knowledge between men and women (Jenkins-Smith et al., 1991). Studies have even revealed that knowledge is not a significant marker of concern (Brody & Fleischman, 1993). However, most of the studies have found that differences in risk perceptions have often been traditionally attributed to social conditioning and customary roles – with men as providers and women as caregivers. Since women's social responsibilities are still typically defined in terms of their reproductive roles which primarily concern child bearing and child rearing along with other activities in the domestic sphere, they are more likely than men to acknowledge nuclear risks (Alexievich, 1999; Greenbaum, 1995). In contrast, the perceptions regarding men's social responsibilities as the breadwinners and their increased engagement in the public sphere of business, politics and science are known to put more trust in the authorities and less concerns about risks in general (Satterfield et al., 2004; Palmer, 2003).

While there are an ample number of studies that explore gender differences in risk perceptions in nuclear energy, there has been little attempt to unbundle the changing perceptions and the interaction of conditional factors in shaping the gendered effects especially in the South Asian context. There is no ambiguity about differences in women's perception *vis-à-vis* that of men, which is largely attributed to societal values and responsibilities; however, the social values and norms leading to the engendering of such perceptions are also subjected to changes over time. Further, our literature review brings out a stark difference in terms of origin of all gender and nuclear literature that almost all comes from the developed countries. In recent years, though there are few studies from China, hardly any study exists from other developing countries. This work is an attempt to fill that gap from a major nuclear power country, India. In this background, our study differs from other studies in a major way. In exploring perceptions, opinions and behaviours, we move away from typical survey-based 'Knowledge, Attitude and Practice' research in this field, and focus on a more qualitative narrative within the realm of gender and 'ethics of care' to understand the behaviour, needs, aspirations and responsibilities. Using the case of Kakrapar Atomic Power Station in Gujarat (KAPS), India, we attempt to unravel the narrative of social processes and interactions at the community level that help shape gendered risk evaluations of nuclear energy. KAPS witnessed an incident in

2016 and with an additional two reactors under construction, thus providing a fertile ground to conduct a nuanced understanding of the conditions shaping the gendered perceptions. To position our understanding, we adopt Adams (1995) definition of risk which states that 'risk concerns both the probability for and the consequences of the happening of an event' and since have been used extensively (Adams & Thompson, 2002; Sjöberg & Moen 2004). And our study does not pretend to compare nuclear risk to any other form of risks in the given context.

AIM OF THE STUDY

As reflected in the previous section, there is a clear need for research not only to capture the gender differences in perceptions but also to explore the influence of the contemporary situations and factors in understanding the changing gender dynamics. Hence, we seek to identify not only the gendered risk perceptions but also factors that help in shaping perceptions. In particular, we focus on the extent to which people's opinion of risks and benefits depend on their perceptions of advantages and disadvantages of the nuclear plant and their trust in the information obtained through various sources. In doing so, the study considers the influence of social processes and interactions at the community level which shape perceptions of gender roles and responsibilities. Do men and women assess risk differently? Will women continue to reflect the repeatedly confirmed 'traditionally female' concerns about family health, safety and security or will they begin to show higher levels of risk taking economic concerns that have traditionally been found among men? These are some of the issues on which our qualitative enquiry is nested.

THEORETICAL UNDERPINNINGS: UNDERSTANDING GENDER DIFFERENCE IN PERCEPTIONS

Most of the well-known literature since 1970s suggest a pattern that women are significantly less supportive of nuclear power than men across a range of countries (Ansolabehere & Konisky, 2009; Corner et.al. 2011; Jackle & Bauschke, 2011). This gender divide – where women perceive greater risks than men from nuclear power generation is also robust across a range of attitudes about nuclear power. Scholars have largely attributed the difference in perceptions to the socially and culturally assigned roles and responsibilities of men and women which are deeply embedded in the realm of gender and care ethics.

The ethics of care basically dwell on the principle that men are traditionally socialised to be autonomous and independent, while women are supposed to be passive but loving caretakers

for the members of their group. Studies by Gilligan (1977) argue that these differences lead to different sets of values for men and women and that the ethical outlook stems largely from the psychological makeup associated with gender. Her work can be explicitly linked with traditional attempts to explain the risk and gender effect through focussing upon 'women as care givers', or the phenomenon known as 'motherhood mentality' (Pratt, Golding & Hunter, 1988). According to Davidson and Freudenburg (1996), these considerations are commonly expressed as the 'safety concern hypothesis' which is attributed to women's role as nurturers of family and community. On the other hand, men become more concerned with their ability to be 'economic providers'. Ethics of care have been characterised as a phenomenon associated mostly with women by other scholarly studies as well (Lyons, 1983). Research by Noddings (1985) also suggests that innate tendencies of 'natural caring' can have a significant basis in women's experience. This difference in socialisation which places women as flag bearers of care-giving predisposes them to be more concerned about the risks of nuclear power than men. Hence literature is primarily concerned with recording evidence for and against the existence of gender differences in risk perceptions of nuclear facility as is reflected in numerous quantitative empirical studies.

The foundation upon which gender in care ethics should be based is, however, routinely contested for reinforcing rather than questioning gender dualism and constructing gender essentialism. It is often observed that the ethic of care ignores the other virtues of a woman, reinforces traditional gender roles and inhibits a person from becoming autonomous (Keller, 1995; Davion, 1993). As a result of such contested views, what we attempt in our study is to understand and explore what can be arbitrated upon gender difference alone in the wake of contingencies and complexities that govern men and women's life in a changing economy. This will help us to create a more grounded knowledge for theoretical synthesis in approaching the gender-risk relationship in relation to nuclear power.

DATA AND METHOD

Study Location

KAPS is located in Surat district in the Western state of Gujarat, India. Gujarat is one of the most industrialised states in India, which arguably experienced an economic "miracle" since the 2000's (Panagariya and Rao, 2015). It is also known for hosting large reserves of natural resources (forestry, minerals, water), and for the long-lasting social and environmental conflicts that arouse from their exploitation (Lobo and Kumar, 2009).

In KAPS two old reactors of 220MW each have been in operation since 1993, and two new reactors of 700 MW each are under construction. In 2016, there was The International Nuclear and Radiological Event Scale[1] (INES) Level 1 incident leading to shutting down of two operational reactors which restarted only in September 2018.

In terms of specific location, KAPS is on the southern bank of Kakrapar weir, approximately 4 km from the Kakrapar dam. The Kakrapar weir is approximately 29 km downstream of the Ukai Dam on the river Tapti. The source of cooling water for the two units is the Kakrapar left bank canal, which originates from the Kakrapar weir. Although, the plant is named KAPS, Kakrapar village is situated at a distance of 7.5 km.

Image 1: Location

Approach and methodology

It is often argued that qualitative methods are more appropriate for studies related to gender since it is contextual and they are best suited to capture the lives and experiences of men and women with the aim of understanding the social reality of individuals, groups and cultures in a contemporary society by allowing subjective knowledge (Gordon, 1989; Depner, 1981). This allows the researchers to capture their descriptions in context of the position occupied by women compared to men in different dimensions of everyday life (Maldonado et al., 2013).

In our study, to gather risk perceptions we employed Focus Group Discussions (FGDs) which is considered as valuable tool for collecting rich qualitative data, and have proven to be effective and appropriate in understanding the views of women, in particular as it allows them to speak more openly among their peers (Jayapalan et al., 2018).

Further, this approach gives researchers an opportunity to understand the space better, considering multiple viewpoints. It allows penetrating deep into the daily lives of the respondents, and witnessing the expression, and even sometimes the construction of collective beliefs and discourses about risk (Wynne & Waterton, 2010). This methodology provides the comparative advantage of having an 'inherent social nature' (Cyr, 2016: 252), and hence provide strong material for analysing the social context and cultural values that shape the gender identity in risk perception studies (Morioka, 2015). Hence, FGDs were used as a "self-contained" method rather than in combination with other methods like surveys that seek quantitative data[2]. Additionally, we also spent some time in each village to cognize with the community and discover any new leads that were relevant to our study.

Study Setting

The following guidelines (Table 1) were followed while setting up and conducting the FGDs.

Table 1: Criteria and Guidelines followed

Criteria	**Guidelines followed**
Pilot visit	Before undertaking actual field work, we piloted an exploratory visit to understand the vicinity surrounding KAPS. . Assistance from local community and village head advice was taken to proceed with the research. The pilot visit helped us to strengthen our research questions and select the study villages. It also aided in formulating a detailed guiding questions/check list for the community.
Identification of study villages	After the pilot visit , seven villages were selected based on distance. All the villages were within ten km radius of the plant and were selected from emergency zones classified by AERB "which provides geographical framework for decision making on implementing measures as part of a graded response in the event of an off-site emergency": (Safety of Nuclear Reactors: Preparedness for Nuclear Emergency, http://www.barc.gov.in/pubaware/snr_pne.html)

Criteria	Guidelines followed
	Details of selected villages - Moticher (1.02 km) was the only village in the exclusion zone; Nanicher (2.02 km), Uchamala (4.21 km), Rataniya (4.24 km), and Bedkuvadur (4.96km) were in the sterilized zone; Jamankuva (6.34km) and Kakrapar (7.25km) were in the emergency planning zone. Convenience and approachability also became the deciding factors in selecting the villages.
Identification/inviting of participants	Separate FGDs were conducted with one group of men and women from each village amounting to fourteen FGDs in total. The segregation was done to understand gender perceptions better and to avoid influence of perception of one on the other. Participants for FGDs in each village were identified with the help of local leaders/panchayat members and also were chosen from local prominent places like - milk collection booth, and grocery stores amongst other places. The snowball effect aided us to gather enough participants to obtain useful data. .
Group composition	FGDs in each village were conducted with a mixed group of people in the age group of twenty to seventy. FGDs (Women) - Comprised of women belonging to various socio-economic strata. Efforts were made to include marginalised, employed (including plant), homemakers, members of groups/SHGs and local leaders. Women from different locality within the village representing diverse caste groups were considered. The education level of most of the participants varied from being illiterate till having completed 10^{th} grade. Only few participants had pursued education till graduation. FGD (Men) – Comprised of men belonging to various socio-economic strata. Efforts were made to include farmers, landless and marginalised, employed (including plant), panchayat members and local leaders. Men representing different political affiliations and

Criteria	Guidelines followed
	diverse caste groups were considered. The education level of most of the participants varied from being illiterate till having completed 10^{th} grade. Only few of them had pursued higher education and were either diploma holders or graduates.
Number of participants	While eight to twelve participants are considered an ideal number for conducting an effective FGD, our FGDs often had more than twelve or as few as five participants. In an effort to be inclusive no participant was turned away. Each FGDs lasted between twenty to sixty minutes. The number of participants in a meeting also varied across the duration of the meetings as people often joined in out of curiosity while others left half-way because of other pressing engagements/ personal reasons.
Location	The FGDs were conducted in neutral and familiar environments identified by participants themselves. The chosen location included agriculture fields/courtyard of village community. Such environment allowed participants to respond in an uninhibited manner as they were in the company of their peers in a known place.
Records of FGDs	The researchers were accompanied by translators to understand the interview responses better and the FGDs were recorded in the following ways with consent of the participants - ▪ Field notes ▪ Audio and video recording ▪ Photographs

Criteria	Guidelines followed
Checklist for discussions	A specific checklist was used to maintain and direct the flow of discussions. The checklist was divided into 4 main sections and were aimed at assessing the following - • Perception of risk and benefits • Trust on institutions • Public engagement • Incident
Role of facilitators	Each FGD was conducted by facilitators and translators in order to: ▪ Guide the discussion through key questions and follow up questions ▪ Record data through audio and video ▪ Note taking
Research ethics	Participation in the FGDs was entirely voluntary, and all the participants were informed about the purpose and nature of the research and prior consent was taken. They were free to join in or withdraw from meetings at any time.
Data analysis	All the FGD recordings were converted into English scripts and these scripts were bifurcated further on the basis of common themes, village and gender. All the recurring views on each topic were tabulated. . The essence of the qualitative data was retained by using verbatim quotes representing common viewpoints wherever applicable.

RESULTS AND DISCUSSIONS

Activities, social role and information: the gender divide

The men and women who took part in our FGDs represented those who live in the selected study villages. They were not experts in either nuclear energy or technology; rather they occupied a range of social and economic positions. Agriculture and associated casual work was the primary source of employment, with women and men engaged as agricultural labour, or as in a few cases, cultivating their own farms. Though women were actively engaged in agricultural activities, men formed the dominant labour force. Dwindling returns from agriculture and lack of alternative livelihood opportunities had an impact on local employment opportunities, and this drove members of the local community to look for jobs in cities (Kundan Pandey et. al., 2018). Some of our respondents including women who participated in FGDs were also employed as casual workforce in the plant and they enjoyed better wages than MGNREGA[3]workers or the wages obtained by agricultural labourers.

The plant has been operative since 1993 and even though some people had witnessed its commissioning, knowledge and information about the functioning of the plant seemed to be varied. A few men, during interactions, took up authoritative and confident positions as potential informants and as people who were interested in talking about their village and the plant. On the other hand, the women though not as confident and commanding as men, actively participated in discussions and were keen to share their thoughts and ideas. We found that though the tone and tenor of men differed from women, their responses to certain questions were not any different from women's responses. For instance;

"Yes, we know electricity is generated inside the plant". They also manufacture bombs inside the plant; we have seen them carrying the materials for bombs in the truck!!"

> Common observations of men during FGDs from Uchamala, Kakrapar, Nanicher and Motiher,

"*Electricity is produced inside the plant. We also get to hear from others that bomb is also manufactured and few of them have in fact seen the raw material for manufacturing bomb inside the plant!!"*

Responses of women during FGDs from Jamankhua, Kakrapar and Moticher

While some men, during interactions in the group, expressed doubts and uncertainties, others firmly opined that the raw materials required for manufacturing bombs was also produced inside the plant and also the raw materials were sent to distant places like Hyderabad. One of the male respondents who worked in the plant as a casual labourer for a brief period remarked that all these activities were carried out for the development of the nearby areas; though he was not sure what kind of development it would entail.

As it can be noted that responses from women-folk during FGDs were no less different and most of them expressed that they have never been to the plant to check what was happening inside the plant. Nevertheless, women seemed confident about electricity and bomb production inside the plant. Even the women who were employed in the plant as casual work force seemed to resonate with the widely shared mis-perception about bomb production.

Our observations in this case deviates from the central evidence of gender gap which highlights that techno-scientific knowledge about nuclear energy/plant as a form of masculine subjectivity and that the women's average self-reported knowledge about nuclear was lower than that of men (Hunt 2012; Karen & Pidgeon, 2014).

Similarly, the observations of men and women on the issues related to information seeking regarding the functioning of the plant did not differ notably. Both seemed to seek and relatively trust any information provided by the management of the plant rather than the local governing body like panchayat[4]. Lack of trust on the panchayat was articulated by the community in many ways. Women in certain villages like Rataniya and Limbarda opined that the *Sarpanch*[5] was not trustworthy and may not even have any information since he/she is technically only the head of the village and not the plant. Men also stated that the *Sarpanch* might conceal certain information because the plant authorities would have bribed him/her to hide controversial evidence. . However, a matter that had become of particular concern or rather a grievance for both men and women was the lack of provision of information by the plant authorities/ panchayat on matters related to potential employment opportunities for the local community in the plant. Our pertinent inquiry of the plant and its potential risks was more often challenged with concerns of local employment and livelihood by both men and women, though risk was also voiced, but as a lesser concern.

For instance during the discussions, Santhaben a home maker and a mother of two opined: "*the plant authorities on priority should provide employment to local people. On one hand we don't get jobs and on the other hand there is always a risk of blast".*

Lack of gainful employment opportunities was voiced in few other villages also by women during discussions. Men in villages like Kakrapara and Rataniya also stated that whenever Sarpanch gets information about potential employment opportunities in the plant he /she will always favour their own people for the jobs.

It is understandable that men prioritized their responsibilities as the bread winners of their families and studies have also noted that men are more likely than women to see risk as being counter-balanced by economic benefit (MacGregor et al., 1994). The interesting aspect is that the narrative in our study clearly departs from gender essentialism or fixed account of gender binaries where women are expected rather than men to consider the negative consequences/risks out of concern for the well-being of children and family (e.g., Greenbaum, 1995). This approach towards embracing autonomy appear to conflict with the theoretical expectations of 'care ethics'. Rather it relates to more contextual short term gains of potential employment opportunities rather than long term anticipated potential risks of health or other nuclear related disasters.

More broadly when we tried to understand differences in risk perception between men and women in terms of its contemporary social and economic context and its implication on the social fabric, we also found that social multiplier effect seemed to have had some influence on the community. The people (both men and women) who worked in the plant as casual labour force did not explicitly complain either about risk or about their employment status. The plant could not have employed a large number of locals, and people are well aware of it, and still we find the multiplier effect is in force. As might be expected in an area with few alternative employment opportunities especially for women, our qualitative inquiry clearly indicates employment opportunities in KAPS had considerable salience for women as much as for men.

Unbundling the gendered risk effect: responsibility or care?

The power plant has been acknowledged for its safety and performance and has won many national and international awards (NPCIL Industrial Report, 2017, NPCIL Annual report 2016-17). Yet, the plant which began its commercial operation in 1993 has witnessed two incidents – in 1998 one unit of the plant was switched off because of a leakage in the cooling loop and more recently in 2016, the plant experienced another leakage from the coolant channel resulting in closure of the reactor. The Atomic Energy Regulatory Body (AERB) classified the leakage as Level – 1, which is the lowest in a seven-rung classification scheme internationally used to rate the severity of the nuclear mishaps. AERB also had issued a statement indicating there

have been no major safety concerns and there has also been no radioactivity release exceeding the specified daily limits for normal operation. The reactors were, however, restarted in September 2018.

While pressure groups, internet and social media have been increasingly drawing attention to incidents related to nuclear plants, our discussions surprisingly reveal that the community did not express high degree of concern on a range of environmental and health risks. Few of them (both men and women) even seemed to be either indifferent or unaware of the incidents. This is exemplified by the fact that two more units of the power plant are being constructed at the same site and any discussions around it is conspicuously absent among the community. For instance, few of the opinions expressed by women during FGDs were –

In Kakrapara village – "*We have to live here only, fear or no fear!! We don't even get labour work if we move out of this village"*

In Limbarda village – "*Only when there is leakage in the plant, we would be affected by radiation"*

These opinions clearly reveal that the information provided to the community by KAPS were either inadequate with respect to understanding the issue or have not been communicated in a way the community could comprehend. Women also expressed random apprehensions and fears about hearsay related to radiation from the plant and deaths of livestock and even humans. They voiced fear about the water bodies getting contaminated due to radiation which in turn caused health problems like muscle and joint pain, blood pressure and paralysis. Some of them opined that radiation will even cause infertility.

Some other common beliefs expressed by women-folk were -

Bedkuandar village - *"Radiation affects only those who go inside the plant!"*

Kakrapar village – *"The land is not the same as before, it has become drier and the yield levels have gone down"*

Nanicher village – *"Water is contaminated; the plant dispose water affected by radiation in the village pond"*

Yet, all these hesitations and concerns were not raised as major fears and we found these observations of the women-folk to be in stark contrast with the Kundankulam and the Jaitpur

struggle. The Kundamkulam nuclear plant has received the maximum attention in India due to several bouts of sustained protests mainly on grounds of health and environmental concern, especially by the women-folk since the plant was conceived in the late 1980's (Srikant, 2009).

During discussions with women-folk we could also gather that most of them were completely unaware of the nuclear struggle in other parts of the country where women were the frontrunners. Absence of active participation of civil society in the region and limited exposure/lack of interest in keeping up with current affairs and news through mass and print media could be attributed to women's limited knowledge of such issues.

In addition, during our interaction we noticed a majority of the women-folk did not conceive risk as multi-dimensional in terms of its catastrophic potential or controllability or even threat to future generations. What we found challenging in our present study was to find literature (other than grey literature) on risk perception or the understanding of this phenomenon in the Indian context. This also constrained us to draw parallels or compare and contrast with other gendered risk perception studies to draw some meaningful contextual challenges. Other scholarly works have also clearly mentioned that fewer risk analysis studies have taken place in the developing world (Bronfman & Cifuentes, 2003).

Nonetheless, in order to further have a broader angle of risk perception, we also asked women about the potential risks of the nearby Ukai and Kakrapar dam. Ukai dam constructed in 1972 is approximately thirty kilometres away from KAPS and Kakrapar dam was constructed in 1954 and is approximately 4 kilometres in aerial distance.

Some of the responses obtained from various villages were -

"We are scared of both – nuclear plant and the dam, both are equally dangerous as one can cause flood and the other can blast anytime"

"When there will be a blast or flooding, everything would get destroyed and we will directly go to heaven (upar)"

"If anything happens to the dam, there would be a flood and the whole village will sink!"

We also tried to compare and contrast the beliefs and propositions of women with men since same set of questions were administered to both during the FGDs. Some of the excerpts of the conversation which illustrated men's viewpoints in different villages are as follows -

Bedkuandur village – *"What will we do by feeling tensed? One day is booked for all; we are all going to die one day, it is not in our hands! Feeling tensed is just useless!!"*

Rataniya village - *"You see dam's water directly enters our village (indicating problems of flood and water logging) and there are chances of leakage with the nuclear power plant. So, either ways we are going to suffer!"*

Nanichar village – "*Yes, we are afraid of the plant. In case of any fault, it would be harmful for all humankind, children are also greatly affected"*

Although women's disproportionate sensitivity to and lower tolerance of risk is apparent in the broad cultural milieu, the presence of the nuclear plant in their vicinity was not perceived as a larger risk than the possible flooding from the nearby dam. On the other hand, men also engaged in care point of view, where men especially with young children expressed concerns of health threat from radiation in a non-essentialising way. The possibility of pollution of farm lands and water bodies and the livestock getting affected bothered men also. The influence of hegemonic masculinity in prioritising only the financial future of the children and the family was not observed in any of our study villages. Hence, there did not seem to be a possible identity protective role for our participants where the concern levels expressed by men and women did not differ distinctly and what we noticed was an erosion of boundaries between 'concern, risk and care'.

In particular, what we find interesting is the observation where women are simultaneously faced with the potential concerns over economic well-being of the family as well as potential threats and risks to family health and safety. Women although reflected traditional female patterns of responsibility of care in terms of ensuring household water, food and fuel wood security along with the responsibility of tending to the sick and the old, they also showed higher levels of economic concern that have traditionally been associated with men. Hence women expressed no fears in any family member taking up job opportunities in the plant if it were made available for them. These kinds of responses and reactions clearly suggest a more complex pattern where the salience of material well-being and economic concerns seem to counterbalance health and safety concerns.

The views expressed by women-folk in our study tend to challenge the sanctity of conservative ideologies of care ethics, as expressed in unitary caring or providing parenting roles. Such observations also contest gender essentialism, a common narrative in nuclear risk perception

literature which largely agrees to the Gilligans (1978) interpretations of gender claims and care ethics where women exhibited greater concern than men. Rather our study reflects the growing complexities affecting men's and women's role in contemporary family relationships and in wider society which is defined by everyday realities and personal hope and aspirations. The post-modernist approach in gender studies has consistently contested and superseded the concept of binary differences and emphasised that gender identities or positions come in multiple varieties and they alter over time shifting with shifts in practices and affiliations. Certain scholars have also argued that gender identities may be constituted less by the contrast with the other gender and more by contrast with other versions of the same gender (Cameron, 2005). What is also interesting in our study is the fact that women's views about risk perceptions were similar across different age groups and was not overpowered by the established essentialist gender patterns where older women with children and extended families expressed higher risk concern about the plant.

Effects of gender towards risk and nuclear plant

In our study villages the judgements of potential risks and benefits of the plant by men and women was a product of complex and complicating effects shaped by hopes and aspirations for a better living and a better future for their children. For instance, men and women expressed unified anxieties about the lack of good quality education of their children.

Parents aspired to enrol their children in the English medium schools of nuclear plant township where they believed good quality education is imparted to the children. They also opined that plant authorities at best should support the local schools and *anganwadis*[6] with educational material. Another persistent expectation of the women-folk was provision of job opportunities in KAPS for educated youths in the region. Our respondents clearly did not seem to fathom the kind of education and the recruitment policies followed by KAPS. . Further, on an average every household in the vicinity of the KAPS who were even just above the BPL category[7] paid an electricity tariff of Rs 400/month and their common demand from the plant was that at least electricity should be given free of cost to all the neighbouring villages.

The nuclear plant, in complying with the corporate governance guidelines issued by the department of public enterprise, regularly accomplishes CSR activities and implements projects related to sustainable development. In the recent past they have undertaken various activities like organising medical camps, aid for restoration of schools, conservation of local flora and fauna and infrastructure development amongst other activities. . The plant incurred

an expenditure of Rs. 41376320 (USD 596307) during the financial year 2016-2017 for undertaking CSR activities (NPCIL 30th Annual Report 2016-17). When, asked what the plant should do to demonstrate concern for local communities, women were vocal in opining increased contribution towards welfare activities like health care and education and provide casual employment to the uneducated poor. Communication of plants operations or its risks and benefits, observing regulations and respecting sectorial safety standards were not seen as a priority by the community. . Although women voiced concerns related to pollution of farm lands and water bodies and the livestock being affected, due to activities of the plant, the commitment of the plant towards environmental protection was still not flagged as a significant aspect. This observation is in stark contrast to a number of interpretations which reinforce women's care ethics where women tend to care about children and the environment, and especially about the environment surrounding their children.

All these responses, especially of women, showed there is a set of concerns that are identified but not articulated under the single concept of 'nuclear risk' that could be linked and synthesized in relation to the radiation from the plant. These evidences again illustrate that women are predisposed to accept that nuclear plant has a responsibility to efficiently undertake CSR activities. However, it also illustrates that the community, including women, have not begun to fully understand and appreciate the necessity of risk communication by the plant despite having an incident in 2016.

Nevertheless, what we evidently noticed in our study was perceptions of nuclear risks were overpowered by other prevailing demands like provision of better job opportunities, increased CSR activities and even the demand for free electricity to the nearby villages. In a dominant agricultural economy, with marginal land holdings and dwindling returns, men and women who took part in our FGD's either lived below poverty line or was just above the poverty line with an annual income of 150-200 USD. Inadequate irrigation facilities, lack of skills and dearth of alternative employment opportunities further intensified their underprivileged living conditions. In such contemporary circumstances, women's gender values as care givers and their roles as wanting to become economic providers, work independently and dependently to evaluate and shape such indifferent attitudes perceptions towards nuclear risk. The norms and myths associated with dualism of traditional male/female roles and connotations seem to be changing and adapting to deal with the changes and challenges of contemporary life. Hence nuclear plant is not considered a risk by both men and women as long as they promise some job opportunities and immediate short term gains in terms of CSR activities. These findings

tend to deviate from the normative discourse on nuclear risk perception that essentialise, dichotomise or universalise gender.

CONCLUSION

The findings from qualitative enquiry of differences in risk perception and related reactions of both men and women living in the vicinity of KAPS in Gujarat provide an intriguing degree of support for the possibility that for women economic security of the family is as important as providing other care and well- being responsibilities in the contemporary scenario. Although women's disproportionate sensitivity to and lower tolerance of risk is apparent in the broad cultural milieu, the presence of the nuclear plant in their vicinity was not perceived as a larger risk than the possibility of flooding from the nearby dam leading to obvious questions about the concerns over technological risk and economic well- being. Both men and women expected greater employment opportunities in the plant in addition to greater CSR commitments from the company. Women are willing to fill in economic roles as breadwinners of the family which have traditionally been associated with men. This very outlook of women where economic security and financial stability are viewed as equally or even more important than physical well-being consequently challenges the many preconceived notions of gender essentialism and care ethics. In an economy with dwindling returns from the agriculture sector coupled with lack of skills and alternative employment opportunities, the issues of livelihood and economic security were observed to be the overriding factors over differential risk perceptions among men and women. Our study, hence, challenges the dualism - women vs. men and the feminisation of nuclear risk perceptions. Rather, it illustrates the contextual factors influencing the meaning of risk which is embedded in everyday social life, which in turn is filled with hopes and aspirations for a better future for the households with material benefits.

Our findings reflects the interplay of contextual factors, gender roles which should receive more attention in other contexts, as well. Hence, the significance of our study lies in underlining the possibility that gendered binary thinking in the nuclear energy domain may rest on a contestable value base. Nevertheless, the topic of gender differences in risk perception and risk interpretation is worthy of further rigorous methodical inquiry in its own right to see if any patterns or tendencies reveal themselves, especially in the Indian context which lacks robust empirical evidences of the gender-risk effect.

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[1] International Atomic Energy Agency introduced INES in 1990 as "a tool for communicating the safety significance of nuclear and radiological events to the public". See https://www.iaea.org/topics/emergency-preparedness-and-response-epr/international-nuclear-radiological-event-scale-ines

[2] Sociological abstracts have quoted that the proportion of studies that rely solely on focus groups has been increasing in recent years (Morgan, 1996).

[3] Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a social security employment act which guarantees employment to the poorest people in India.

[4] Panchayati Raj Institution denotes the local governance structure established under the 73rd Amendment Bill and is prevalent across India in all villages.

[5] A sarpanch is an elected leader who heads the village level constitutional body of local self-government called as gram panchayat.

[6] Anganwadi is a government sponsored mother and child care centre in rural India. It caters to children in the 0-6 age group.

[7] Below Poverty Line (BPL) is an economic benchmark used by the government of India to identify individuals and households who are disadvantaged and in need of government assistance and aid.