

Gender Differences in Climate Change Perception and Adaptation Strategies: An Intra-Household Analysis in the Context of Coastal Area of Bangladesh

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Abstract

The paper aims to examine the perception of climate change and the local adaptation strategies based on gender differences to reduce climate risks and vulnerabilities. This study explores the local adaptation knowledge based on the observed climate risks using a survey of 128 respondents and a case study of 13 respondents of the coastal area in Bangladesh. This study finds that all respondents witness a change in climate and both male and female respondents report flood and heat stresses are the most serious environmental problems in the study area. To build resilience, households undertake various adaptation strategies, and a higher percentage of females are found to adopt in maintaining food security, homestead gardening and rearing poultry and cattle, while husbands employ changing planting time, infrastructural development and crop-related adaptation strategies to climate change. This paper suggests that access to information about appropriate strategies should be improved that helps to support adaptation processes locally.

Keywords: Climate Change, Gender Differences, Perception, Intra-Household Analysis, Climate Change Adaptation.

Introduction

Climate change is considered as the most emerging challenges for the world community which can change the composition of global atmosphere over a comparable period. International community agrees that humankind faces the most difficult challenges by climate change. Basically, the developing and least developed countries have faced a heard reality by climate change (IPCC, 2007). Bangladesh is regarded as the most susceptible countries to the effects of climate change (Barnett, 2001). Because of the geographical location, it is predicted that about 18 million people will be displaced by sea level rise within the next 40 years.

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If the sea level of Bangladesh will increase by 3.2 feet, one fifth lands in Bangladesh will be undergone in water. Bangladesh ranked 7 among the most affected countries by extreme weather events (1999-2018) (Eckstein, Vera, Laura, & Maik, 2019). The coastal area is regarded as a vulnerable area to climate change in Bangladesh. Among the coastal districts, *Barguna* is a disaster-prone district which has been threatened by natural calamities. In Barguna district, around 70 percent of the total area falls under the high-risk area (SUET-BIDS, 1993; Tamima, 2009). The impact of climate change is different due to different sufferings and vulnerabilities (Jostet al., 2015). So, to illuminate the adverse effect in this country, adaptation strategies of climate change are more important (Alam, Alam, & Mushtaq, 2017).

Climate change and gender are two interrelated themes and many international development agendas showed its concern on the issues (Alston, 2013; Constable, 2017; Kisauzi, 2012). People's perception, experiences and responses to climate change are varied by gender dimensions, people's livelihood and sense of wellbeing. In climate change adaption process, perception and adaptation strategies regarded as the two important components (Maddison, 2007). To mitigate vulnerabilities and sufferings, villagers need to perceive the nature of climate changes to take appropriate adaptation strategies (Bryan, Deressa, Gbetibouo, & Ringler, 2009). Although various research studies and initiatives are emerging in this critical condition, more scientific work is required. There is a gap in existing research to know how men and women perceive climate risks and use local adaptation strategies at the intra-household level to reduce risks and vulnerabilities (Roehr, 2007; Perez et al., 2015). This study aims to identify whether there is any gender differences in perception of climate change and local adaptation strategies to climate change.

Gender Differences in Climate Change Adaptation Strategies

Adaptation is considered the best way to moderate climate change related risk and it helps people to adjust or survive in extreme natural conditions to moderate harm (Smit &Wandel, 2006; IPCC, 2007; Alam, 2016; Niles, Lubell,& Brown, 2015; Gandure, Walker, Laura, &Maik, 2013; Rosenzweig et al., 2013; Adgeret al., 2009). Adaptation strategies to climate change are situation specific and change over time depending on differences in areasand societies (Malone, 2009; Smit & Wandel, 2006; Berry, Rounsevell, Harrison, & Audsley, 2006). Generally, the two main elements of the adaptation processin climate change are perception and adaptation strategies (Maddison, 2007). Rural inhabitants need to perceive the climate risk to take proper adaptation strategies to moderate their vulnerability (Bryan et al., 2009). To take proper adaptation strategies, the policy makers need to consider the issues of gender relations, gender experiences, power, social flexibility, liabilities and

capitals. These issues can influence adaptive capacities negatively or positively (Djouidi & Brockhaus, 2011; Sharif, Nasir, Khanum, & Khan, 2016). Ngigi, Mueller, and Birner (2017) presented that intra-household gender analyses are very essential to find out to perceive the climate risks and to use different risk-managing tool to adjust in climate change. Their study findings also showed that gender roles, experience, social norms, and capitals influence climate change adaptation process (Ngigi et al., 2017). McKinley, Adaro, Rutsaert, Pede, and Sander (2018) founded that women are more active to take necessary steps in climate change and involved in various activities such as receiving bank loan, returning loan payment, using savings, while men are more likely to do nothing. However, a strong difference noticed here between husbands and wives in surviving strategies in both individual and household level (McKinley et al., 2018). Men and women have shared perceptions and perspectives where some aspects of climate change are concerned. Even where perceptions are similar, the responsibilities of men and women in many social roles and financial situation are different. Women's major challenges appear to be limited access to credit, lack of access to technical knowledge and overwhelming demands on time due to home and family responsibilities (McKinley et al., 2016; Constable, 2017).

A gender perspective on climate change informs that how climate change affected men and women differently, how their interpretations and concerns on climate change differentiates and what they do to prevent further change of climate. It also enlightens the inequality of decision-making processes (Hässler-Hermansson, 2009). Based on theoretical knowledge discussed so far, this study assumes the conceptual framework of this current study as follows:

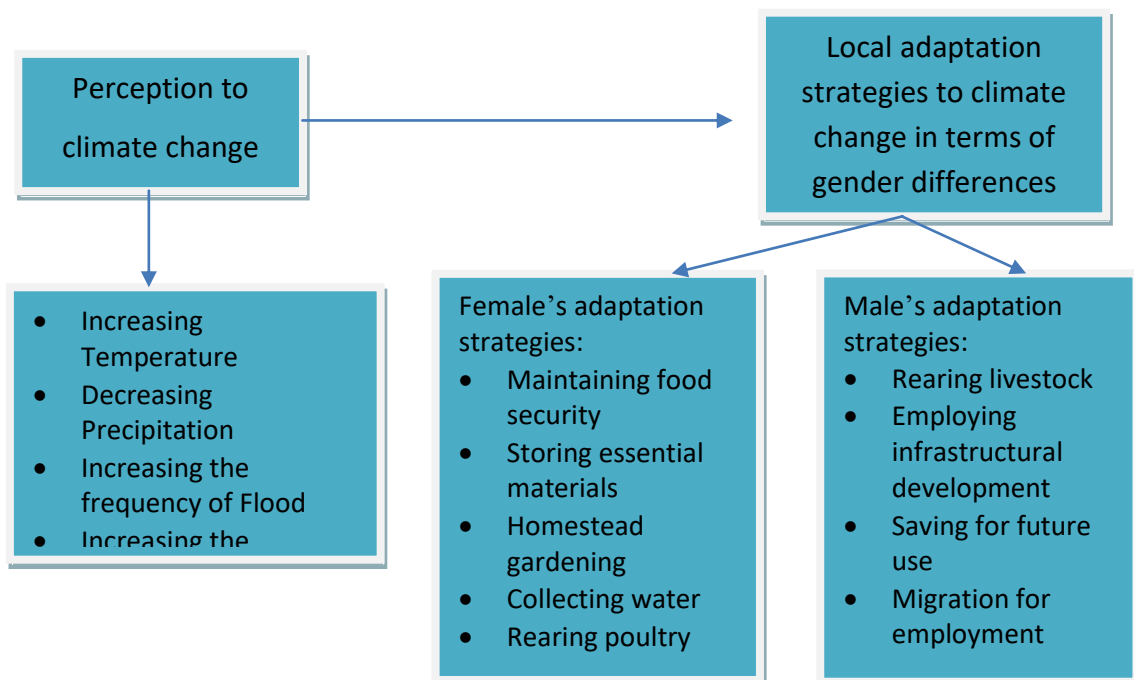


Figure 1: Conceptual framework of the study.

Methods

The study used mixed methodology. Survey method was used as a quantitative data collection technique, while case study method was employed for collecting qualitative data.

The study was carried out at Barguna district (please note: district is a local administrative unit in Bangladesh) since Barguna is one of the worst affected areas, where over the years a serious damage has been occurring due to climate change such as heat, flood, salinity, storm surge, cyclone, sea level rise, and river-bank erosion. The study involved systematic random sampling technique to draw the necessary sample from the target population. At first, Pathorghata Upazilla was selected randomly from the six upazil as in Barguna district. There are seven unions in Pathorghata Upazilla, Kakchira union was selected randomly from the unions. In Kakchira union, there are 19 villages under 9 wards. Among them, the four villages are more affected by climate change- Kakchira, Majher Chor, Rupdhon and Vaijarotti villages. This study selected MajherChor village randomly. We created a list of total number of households in the village. There was total 543 households in the village. Since we used systematic random sampling technique, we first put number on each household in the sampling frame [as Neuman (2006) suggested the technique]. Then we determined the sample size purposively. We selected 68 households (128 respondents) from the total households. The sampling interval was $543/64=8.48(k=N/n)$ and then randomly select a number between 1 and k (8). After that we randomly recorded the household number 6 and every 8 number after 6, until 543 were reached. For instance, the interviewed members of the sample were 6, 14(6+8), 22(14+8), 30(22+8), 38(30+8)...543. In this study, the unit of analysis was the household (i.e., a husband and a wife), and each household is taken as one pair of spouse, resulting in 128 respondents in total. So, the total number of respondents was 128 included both female (50 %) and male (50%). Perceptions of climate change to the past years were collected using a 5-point Likert scale: strongly agree, agree, neutral, disagree and strongly disagree. A simple survey questionnaire was used as the main data collection instrument. Using a semi structured questionnaire, face to face interview with a series of close- and open-ended questions were used to gather survey data from the respondents.

To collect qualitative data, 13 in-depth interviews were conducted from 13 respondents. Each interview was taken in-person in respondents' suitable places. The duration of the interviews was 1 hour, on average.

Results

The results of the study are presented in two parts: perceptions of climate change and gender differences in adaptation strategies to climate change in terms of gender differences.

Perceptions of Climate Change in Terms of Gender Differences

The study indicates that respondents observed climate change over time. Both husband and wife within the same household have perceived changes in climate. Some attention-grabbing findings from this study are that all participants have observed a frequent change in climate in recent years than a decade ago.

Although climate change is an alarming issue in Bangladesh but table 1 shows that only 31% male and 16% female listen to the name of climate change before this interview and only 5.5% male and 1.6% female understand climate change meaning and 16.4% male and 10.20 % female recognize to some extent about climate change meaning. But most of among them (i.e.19.5% male and 21.1% female) do not understand the importance of climate change and about 15.6% respondents do not know about it.

Table 1: Respondents who listen to the name of climate change and perceive the importance of climate change.

Respondents who listen to the name of climate change	Male %	Female %
Yes	31.25	15.63
No	15.63	34.37
Perceiving the importance of climate change	Male %	Female %
Yes	5.5	1.6
To some extent	16.4	10.2
Not really	5.5	2.9
No	19.5	21.1
I don't know	4.7	10.9

Source: Field Survey, 2019

The following table 2 shows both husband and wife has noticed climate changes in the same household. The findings present a little similarity among husbands and wives perception about that the average temperatures are increasing (i.e., male 38.3% and female 28.1% are very strongly agree). Further, husbands (32.8%) and wives (30.5%) agreed that average temperatures have been decreasing. However, they also noticed the changes in rainfall and rain comes early. 14.84% husbands and 28.9% wives disagree that average rainfall is increasing, and 21.1% husbands and 22.7% wives agree that average rainfalls are decreasing. Furthermore, 21.1% husbands and 32.0% wives perceived that average rainfall is declining. So, the incidence of droughts is increasing. In contrast, a larger

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number of wives (24.2%) compared to husbands (18%) perceive that there is availability in groundwater, while 30.5% husbands than 24.2% wives perceive that there is availability in surface water. A higher percentage of wives (38.3%) than husbands (26.6%) agree that the frequencies of flood are increasing and at the same time they (37.5% husband and 31.2 wives) agree that the frequencies of cyclone are also increasing. But both husbands and wives are neutral in the cases of frequency of thunders.

Table 2: Respondent's perception about climate change in terms of gender differences

Perception about Climate Change	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Increase in temperatures	38.3%	28.1%	10.9%	14.8%	.8%	3.9%			.0%	3.1%
Decrease in temperatures	.0%	3.1%	7.8%	3.9%	1.6%	9.4%	32.8%	30.5%	7.8%	3.1%
Increase in average rainfall	2.3%	.0%	8.6%	8.6%	12.5%	10.9%	14.84%	28.9%	11.7%	1.6%
Decrease in average rainfall	17.2%	15.6%	21.1%	22.7%	2.3%	7.8%	9.4%	3.9%	.	.
Rains come early			5.5%	5.5%	16.4%	15.6%	24.2%	26.6%	3.9%	2.3%
Rains come lately	12.5%	10.9%	28.9%	32.0%	6.2%	7.0%	2.3%	.0%	.0%	.0%
More droughts	17.2%	20.3%	18.0%	19.5%	14.8%	8.6%	.0%	.0%	.0%	1.6%
Availability of groundwater	8.6%	3.9%	18.0%	17.2%	4.7%	5.5%	13.3%	15.6%	6.2%	7.0%
Availability of surface water	7.0%	12.5%	30.5%	24.2%	5.5%	10.2%	7.0%	3.1%		
Frequency of flood	21.1%	9.4%	26.6%	38.3%	2.3%	2.3%				
Frequency of cyclones	7.8%	14.1%	37.5%	31.2%	2.3%	4.7%	2.3%	.0%		
Frequency of thunders	7.8%	7.0%	8.6%	12.5%	15.6%	25.0%	18.0%	4.7%	.0%	.8%

Source: Field Survey, 2019

Gender Differences in Adaptation Strategies to Climate Change

Table 3: Agricultural level adaptation strategies to climate change.

Taking agricultural adaptation strategies to climate change	Types of agricultural adaptation strategies to climate change	Sex of the respondents		Total N=103
		Male	Female	
Yes (80.5%)	Changing planting time	18.8%	14.8%	33.6%
	Cultivating vegetables	24.2%	51.5%	75.7%
	Planting various fruits tree	35.2%	44.5%	79.7%
	Floating gardens	11.7%	7.0%	18.7%
	Embankment cropping	28.9%	22.7%	51.6%
	Homestead gardening	28.9%	44.5%	73.4%
	Saline accepting crops (such as chili, mustard, maize and potato)	18.8%	13.3%	32.0%
No (19.5%)		11.7%	7.8%	19.5%

Source: Field Survey, 2019

The above table 3 shows that 80.5% respondents answered that they have taken agricultural level adaptation strategies to climate change. Among the respondents 18.8% male and 14.8% female changes their planting time, 24.2% male and 51.5% female were cultivating vegetables, 35.2% male and 44.5% female were planting various fruits tree, 28.9% male and 44.5% female were cultivating homestead gardening. On the other hand, 11.7% male and 7.0% female were cultivating floating gardens, 28.9% male and 22.7% female were planting crops in embankment (e.g., farming chili, beans, eggplant, gourds and other vegetables on the embankments) and 18.8% male and 13.3% female were planting saline accepting crops (e.g., chili, mustard, maize and potato) for agricultural level of adaptation.

Table 4: Household level adaptation strategies to climate change.

Taking household level adaptation strategies to climate change	Types of household level adaptation strategies to climate change	Sex of the respondents		Total N=117
		Male	Female	
	Store food	25.8%	43.0%	68.8%
	Store essential material	41.4%	45.3%	86.7%

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Yes (91.4%)	(rope, match, candle)			
	Store crop residues for livestock	37.5%	42.2%	79.7%
	Store pure drinking water	26.6%	47.7%	74.2%
	Store firewood	33.6%	44.5%	78.1%
	Repairing house	39.1%	33.6%	72.7%
	Constructing road	36.7%	27.3%	64.1%
	Making bridge for communication	35.2%	32.0%	67.2%
	Repairing embankment	17.2%	5.1%	22.3%
	Prepare portable mud stoves	18.8%	44.5%	63.3%
	Save money	26.6%	20.3%	46.9%
	Seek alternative source of income	17.2%	15.6%	32.8%
	Migration for employment	18.8%	6.2%	25.0%
No	7.1%	1.5%	8.6%	

Source: Field Survey, 2019

Table 4 shows that 91.4% respondents have taken various household level adaptation strategies to climate change that was considered more effective to reduce the loss of climate change. Villagers have taken various adaptation strategies such as storing food, storing essential materials (rope, match, and candle), cropping residues for livestock, and preparing portable mud stoves. They also store crop harvest, pure drinking water and repair house. Most of the respondents encountered extreme/unusual weather events such 1988, 1998 floods, SIDR 2007, AILA 2009 etc. and taken various types of steps to address extreme weather events. Among them 36.7% male and 27.3% female constructed road, 35.2% male and 32.0% female made bridge with bamboo and betel nut trees for everyday communication. On the other hand, only 18.8% male migrate for employment, 17.2% male and 15.6% female seek alternative sources of income, 26.6% male and 20.3% female save money for household level adaptation to climate change.

Table 5: Ways to collect drinking water during flood or other natural climates.

Collecting drinking water during flood or other natural climates	Ways to collect drinking water during flood or other natural climates	Sex of the respondents		Total N=92
		Male	Female	

Yes (71.9%)	Deep Tube Wells	13.2%	18.6%	32.0%
	Boiling pond water	3.1%	36.7%	39.8%
	Using Potassium sulfate	4.7%	27.3%	32.0%
	Using Water purifying tablet	1.6%	10.9%	12.5%
	Harvesting Rainwater	6.2%	46.1%	52.3%
No (28.1%)		27.3%	.8%	28.1%

Source: Field Survey, 2019

The study also presents that 71.9% respondents collect drinking water during flood or other natural climates. There are different ways to collect drinking water during flood or other natural climates. Among them, a greater number of female than male reserve rainwater, boil pond water, collect deep tube wells water, use purify water Alum (phitkiri) and purifying tablet so that they can use this water during flood or other natural calamities. In contrast, many of them must use pond water for the purpose of drinking, cooking, and washing.

Economic level adaptation strategies are also important to moderate climate change vulnerabilities. This study also finds that respondents follow different types of economic adaptation strategies. For instances, rearing poultry (38.3%), livestock selling (42.2%), saving (29.6%), off-farm working (such as van, rickshaw, auto and tempo driving for the case of male and sewing nokshikhata, making paper packet, making mat by *hogala* leaves by females), doing petty business (16.4%) self-insurance (8.6%) and investing in cyclone center (5.5%). Some female respondents collect cow dung from the field in dry season and then made *gute*. They can sell one-piece *gute* in five taka (USD .059). After SIDR cyclone 2007, many respondents sold cows and poultry to adapt economically.

Table 6: Economic adaptation strategies to climate change.

Taking economic adaptation strategies to climate change	Types of economic adaptation strategies to climate change	Sex of the respondents		Total N=75
		Male	Female	
	Saving for future use	20.3%	9.37%	29.6%
	Self-insurance	7.03%	1.6%	8.6%
	Poultry and livestock rearing	13.3%	25.0%	38.3%
	Investment on cyclone shelter	5.5%		5.5%

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Yes (58.6%)	Sell some livestock	25.7%	16.4%	42.2%
	Selling fruits and vegetables	27.3%	23.9%	51.3%
	Off-farm work for male (van, rickshaw, auto and tempo driving)	17.2%		17.2%
	Off-farm work for female (<i>nakshi kantha</i> , mat, bamboo basket etc.)		20.3%	20.3%
	Petty business	10.9%	5.5%	16.4%
No (41.4%)		17.1%	24.2%	41.4%

Source: Field Survey, 2019

Table 7: Sources of information that helps respondent to understand about climate change.

		Sex of the respondents		Total N=128
		Male	Female	
Sources of information that helps respondent to understand about climate change	Mobile phone	35.9%	24.2%	60.2%
	Radio	9.4%		9.4%
	TV	32.8%	16.4%	49.2%
	Newspaper	10.9%		10.9%
	Internet	4.7%		4.7%
	Social Media	4.7%		4.7%
	Relative /neighbor	39.8%	31.2%	71.1%
	Observed Changes	35.9%	39.1%	75.0%
	Local Volunteers	35.2%	21.9%	57.0%
	I do not know	2.3%	9.37%	11.7%

Source: Field Survey, 2019

Table 7 also shows the sources of information that helps villagers to understand about climate change are mobile phones, television, observing nature, relatives, neighbors, and local volunteers. However, only male

respondents have access to radio (9.4%), newspaper (10.9%), internet (4.7%) and social media (4.7%) to get climate change related information.

Discussion and Conclusion

As we discussed earlier, the objective of paper is to find the perception of climate change and local adaptation strategies based on gender differences to reduce climate risks and vulnerabilities. The study shows that gender roles, experiences, sources of information, norms and resources influence climate change adaptation process. Like Ngigi et al. (2017), this study finds some similarity among respondents' observation that temperatures have been increasing, and average rainfall has been decreasing. Like Alam et al. (2017), this study finds that 69.4% respondents agree that the frequency of flood and cyclone has increased. Despite various climate change difficulties, almost all the households were taking a range of adaptation of strategies to improve their livelihood.

Sharif et al. (2016) examined that households have taken various copying strategies such as storing food and essential materials, repairing house, rearing livestock (mainly cows, poultry, local chicken, goat, and duck), which helps to support their livelihood. 91.4% respondents take more than one adaptation strategies to adapt to climate change. The most common strategies are taken to adapt to altering planting time, storing food, cultivating crops, homestead gardening and planting trees. They also store different dry foods such as parched rice, puffed rice, tea, biscuit, nut, pulse, dry fish, and essential materials [e.g., rope, candle, match, *hariken* (local lighting device which is covered by glass and use kerosene as fuel), blanket, essential paper and medicine] in high place such as on almirah. They also store crop harvest (e.g., potato, garlic, onion, rice) and make movable mud cookers for future use. Most of the female respondents store pure drinking water in jug, bottles and pitcher and gather wood to stock in dry and high places for next use as a strategy in rainy season. Most of the female respondents plant various vegetables in high places such as tub, sack fill in soil, *thabna* and *pira*. Women also stock seed and fodder for domestic animal on high platform that are used to protect cattle and poultry during disaster. During floods, most of the household members take shelter on *chouki* (a kind of traditional high bed) and all the activities such as eating; sleeping, washing, and cooking are done on *chouki*.

Migration is the most common adaptation strategies and temporary migration is normally seen in the disaster-prone areas of Bangladesh. Alam (2016) and Alam et al. (2017) presented that due to land losses, most of the areas experience rural to urban migration in Bangladesh as a

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common copying strategy. To search alternative livelihoods, people move one area to another for a few months, and about 56% of the respondents answered that they used to this strategy.

To moderate climate change vulnerabilities, economic level adaptation strategies are also considered important strategies. McKinley et al. (2016) found that respondents were interested in small businesses for example a tea stall, grocery shops and venturing, and driving vehicles that require less capital. This study also finds that respondents follow different types of economic adaptation strategies to reduce risk of climate change. Among them 38.3 percent reported undertaking poultry rearing and 42.2 percent undertaking livestock selling as a source of income to diminish the risk of climate change. Villagers also adopted to rearing poultry, working in off-farm (such as van, rickshaw, auto and tempo driving for male and sewing *nokshi kantha* (a kind of local covers that is featured by intricate design) and making packet, making mat by *hogala* leaves), petty business, self-insurance etc.

The information through media (i.e., radio and TV) and local volunteers about climate change are very useful to learn about it and to take different adaptation strategies (Sharif et al., 2016). The study also shows the sources of information that helps villagers to understand about climate change are mobile phone, observing nature, relative and neighbor, TV and local volunteers. On the other hand, only male respondents have access to radio (9.4%), newspaper (10.9%), internet (.4.7%) and social media (.4.7%) to get climate change related information.

Adaptation is considered as the best way to moderate climate change related risks in Bangladesh. In adaptation process, people first need to observe the nature of climate change, then they can take necessary steps to reduce these risks.

The paper concludes that men and women respond differently to the climate change adaption process. The results of the study imply that having different social positions, men and women observe climate change risks differently, and they use different adaptation strategies to moderate risks although they live within same household.

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