



## Adaptation and Mitigation Knowledge of Climate Change Impacts Among Residents of Mollahat, Bangladesh

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**Abstract:** Nowadays climate change is a global concern, causing disruptions in weather patterns, resulting in more extreme weather events and escalating sea-level rise. Adaptation and mitigation knowledge are crucial for minimizing its impacts and reducing greenhouse gas emissions. This survey aimed to assess the knowledge, attitudes, and practices of residents in Mollahat, Bangladesh, regarding climate change adaptation and mitigation. Data was collected through a structured questionnaire survey, with primary data from 200 respondents in seven unions and secondary data from various sources. The survey revealed diverse perceptions and behaviors within the community regarding climate change, with 76% acknowledging it as a pressing issue and 25% doubting it. The majority believe in local preparedness, but there is a need for enhanced resilience measures. The study highlighted the importance of diverse information sources, with news media and social media playing significant roles in shaping community knowledge. While a majority acknowledged climate change as a pressing issue, a notable proportion expressed skepticism or disbelief. Engagement in climate change adaptation and mitigation practices varied, suggesting the need for enhanced community resilience measures and sustainability initiatives. Based on the findings, the study recommends strengthening community-based climate adaptation and resilience initiatives in Mollahat, Bangladesh. The study suggests emphasizing community involvement, education, capacity building, tracking and assessing the success of efforts to mitigate and adapt to climate change, and policy advocacy to improve community resilience and successfully lessen the effects of climate change. These actions can support international initiatives to tackle climate change and create a more sustainable future for coming generations.

**Keywords:** Adaptation; Climate change; Resilience; Knowledge; Mitigation; Sustainability

### INTRODUCTION

Bangladesh is often listed as one of the most climate change vulnerable countries, despite the fact that the nation makes minimal contributions to the global greenhouse gas emissions which are primarily responsible for climate change (Anik & Khan, 2012). Developing and underdeveloped nations are becoming increasingly exposed to the consequences of climate change, and Bangladesh is particularly affected because of its deficiency in institutional, social, technological, and economic resources (Saha et al., 2017). Increasingly, one of the main causes of

natural disasters is climate change. The consequences of climate change are being felt globally in the form of occurrences like food scarcity, increasing sea levels, storms, droughts, heatwaves, bushfires, etc., according to the Intergovernmental Panel on Climate Change (IPCC) (Giupponi et al., 2019). Bangladesh's agriculture industry is already being impacted by climate change by ongoing droughts, floods, and windstorms (Thomas et al., 2007). Farmers, fishermen, owners of small businesses, and other communities residing in hoar areas—low-lying areas that are frequently flooded—are primarily affected by a wide range of climate variability as a result of global warming

and increased frequency of floods, particularly flash floods (Ahsan et al., 2010). Among the climate change-related experiences are new to the communities, and they are not included in literature or folklore. Climate change largely affects Dhaka in two ways: first, by increasing the frequency of flooding and drainage congestion; and second, by causing changes in seasonal patterns, such as shorter winters and longer, warmer summers, as well as altered patterns of precipitation. Increasing public awareness, providing training, and disseminating information to communities about how climate change affects their livelihoods are among the United Nations Framework Convention on Climate Change's provisions (Rabbani et al., 2011) It is an unprecedented task for humanity to project future scenarios in order to estimate the losses that climate change would cause to the environment, ecology, or society. Local administrations' inability to effectively handle the effects of climate change is another factor contributing to the vulnerability of the local population (Bicknell et al., 2012). Climate change is becoming a serious challenge in Bangladesh, causing damage to agriculture, disrupting people's daily lives and increasing the risk of environmental problems. However, many people still lack proper knowledge about climate change adaptation and mitigation, which reduces their ability to respond effectively to climate-related impacts (Saha et al., 2017). In addition, only a few studies have focused on community knowledge of climate change adaptation and mitigation and no such study has been conducted in Mollahat Upazila, Bagerhat. This survey's goal is to find out what Mollahat, Bagerhat residents know and do about mitigating and adapting to climate change. As climate change poses increasing threats to communities worldwide, it is crucial to assess the level of awareness and implementation of measures within specific regions. This survey seeks to evaluate the knowledge of climate change and its effects among the residents of Mollahat. Examining their readiness to deal with the effects and their involvement in efforts to mitigate climate change. Also identify gaps and propose strategies to enhance climate resilience in Mollahat, Bagerhat. By comprehensively examining the local context, the research aspires to contribute valuable insights for sustainable development and effective climate change response in the region.

## MATERIALS AND METHODS

### Study Design, Target Area, and Population

Mollahat Upazila area 187.88 sq km, located in between 22°48' and 22°59' north latitudes and in between 89°40' and 89°57' east longitudes. It is bounded by Kalia upazila on the north, Fakirhat and Chitalmari upazilas on the south. Population Total- 130878; male 65205, female 65673; Muslim 104335, Hindu 26302, Christian 89 and others 152. Union/ Village - a) Atjuri b) Udaypur c) Kulia d) Kotalia e) Gaola f) Gangni g) Chunkhola. Water bodies Main rivers: Madhumati, Nalua, Chitra and Atharbanki; Kendua Beel, Kotalia Beel and Kata Gang are notable. Mollahat Upazila

was the target area of the study. (Bangladesh Bureau of Statistics, n.d.).

### Source of Data

All of the databases used in this investigation were gathered from study area respondents. in order to calculate this project properly, two sorts of data have been used: primary data from a questionnaire survey and some secondary data to compute this project effectively.

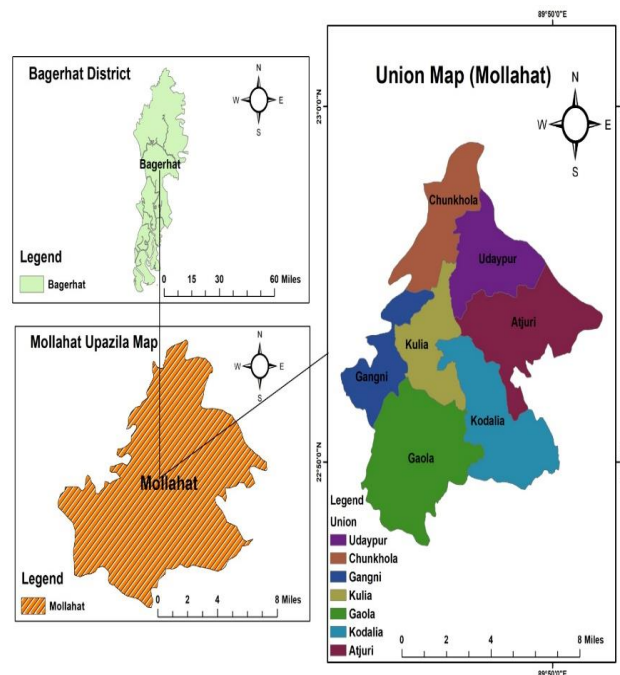


Figure 1: Map of Study Area

### Data Collection Procedure

A self-developed pre-tested partially structured questionnaire was used to collect data from the respondents. The original questionnaire was prepared in English and sent to experts of environmental sciences for getting their opinions and comments. According to their suggestions, the original questionnaire was finalized and translated to Bangla (mother tongue of Bangladesh) for easy understandability. The present authors checked the meaning of the Bangla version with the original English questionnaire. then questionnaire was finalized. The questionnaire consisted of three parts: (i) Personal details of the respondents (ii) Knowledge of climate change effect of study area's population. Before collecting data, discussed about the objectives of our study with all people of study area and took their written consent.

### Exclusion Criteria

The people who had taken any such screening tests before and any history of diagnosed mental illness were excluded from the study.

**Primary Data Collection**

Using a field survey, the original data came directly from people in the research area. The survey was done in each union at Mollahat upazila to get first-hand information for the report. For the collection of data regarding adaptation and mitigation knowledge assessment of Climate change effects among Mollahat Residence, field surveys were made in 200 respondents of each union in Mollahat upazila at Bangladesh. A structural questionnaire survey as purposively developed, pretested and updated with the necessary corrections. A semi-structured home management questionnaire, including their economic profile, family Composition and ecological descriptions has been applied. The final questionnaire was developed in logical sequences, so that the people can answer chronologically. I instantly observed the area of my study region in order to get knowledge and experience about the residents.

**Secondary Data Collection**

Most of the secondary data came from different places, like local government documents, newspaper articles and many online platforms to make and compute this project effectively.

**RESULT AND DISCUSSIONS**

**Demographic status of respondents**

Table 1. Demographic status of respondents

Characteristics	Ranges	Frequency	Percentages	Total
Union	Atjury	22	11.0	200
	Udaypur	42	21.0	
	Kulia	35	17.0	
	Kodialia	28	14.0	
	Gaola	29	14.0	
	Gangi	24	12.0	
	Chunkhola	20	10.0	
Gender	Male	113	56.5	
	Female	87	43.5	
Education	Illiterate	10	5	
	Primary	42	21	
	Secondary	80	40	
	Higher Secondary	49	24.5	
	Graduate	19	9.5	
Occupation	Service	57	28.5	
	Business	65	32.5	
	Housewife	45	22.5	
	Student	27	13.5	
	Other	6	3.0	
Monthly income	10000 - 15000	25	12.5	
	16000- 20000	36	18.0	
	21000 - 25000	36	18.0	
	26000 - 30000	34	17.0	
	31000 - 35000	31	15.5	
	36000 - 40000	22	11.0	
Type of family	Nuclear	116	58.0	
	Joint	84	42.0	
Number of family member	1-3	30	15.0	
	4-6	76	38.0	
	7-10	71	35.5	
	11-14	23	11.5	
Father's Education	Illiterate	16	8	
	Primary	59	29.5	
	Secondary	79	39.5	

Mother's Education	Higher secondary	33	16.5
	Graduate	13	6.5
	Illiterate	24	12.0
	Primary	72	36.0
	Secondary	77	38.5
Age group	Higher secondary	20	10.0
	Graduate	7	3.5
	15-20	25	12.5
	21-25	23	11.5
	26-30	49	24.5
	31-35	46	23.5
	36-40	39	19.0
	41-45	18	9

Source: Author's own calculation from field survey, 2024

**Respondents Understanding of Climate Change**

According to the pie chart, 25% of respondents acknowledge understanding about climate change very well, slightly higher proportion (28.50%) understand it well. However, a significant portion (33.50%) acknowledge understanding the concept but not to a very high degree. Meanwhile, 13% of respondents indicated they do not understand climate change. These results suggest a range of comprehension levels among respondents, with a notable portion expressing uncertainty or lack of understanding about the issue. This reflects such level of knowledge about climate change among the residents of rural areas (Berrang-Ford et al., 2010).

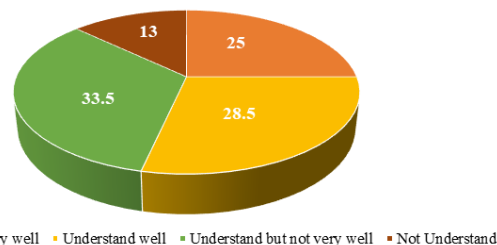
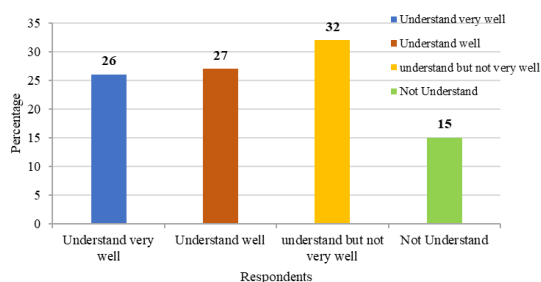


Figure 2: Respondents Understanding of Climate Change

**Respondents Understanding of Climate Change Effect**

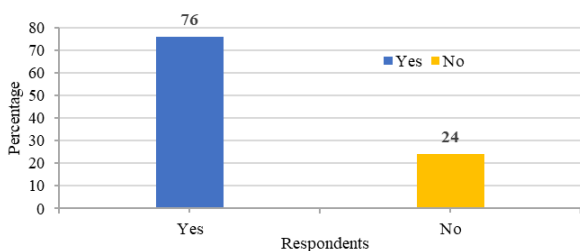
Due to their lack of knowledge, they directly and indirectly contribute to climate change (Dietz et al., 2020; Hasan et al., 2024; Karl et al., 2003). These studies highlight the varied degrees of awareness among respondents. The study depicts respondents' comprehension levels regarding the effects of climate change. Notably, a significant proportion (32%) acknowledges understanding the issue but not extensively. Roughly a quarter (26%) claim a strong understanding, while 27% express a good level of comprehension. However, 15% admit to lacking understanding entirely.



**Figure 3:** Respondents understanding of climate change effect

**Climate change effect is a real and pressing issue in Mollahat, Bangladesh**

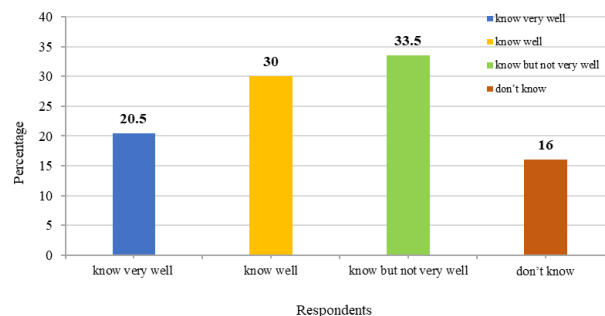
The survey results indicate a strong acknowledgment of climate change as a significant and urgent concern in Mollahat, Bangladesh, with 76% of respondents affirming its reality and pressing nature. However, 24% of respondents expressed skepticism or disbelief regarding the issue, suggesting a need for continued efforts to raise awareness and address misconceptions within the community. In this context, it's so difficult to prevent the effect without proper strategies (Cadez et al., 2018).



**Figure 4:** Climate change is a real and pressing issue

**Knowing level of adaptation to changing climate patterns**

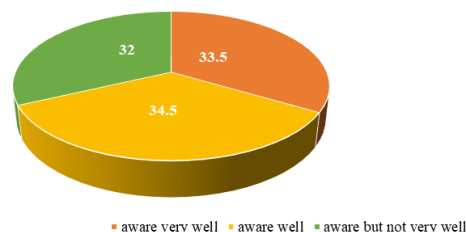
The following chart indicates that 20.5% of respondents knowing level of adaptation to changing climate patterns very well. Additionally, 30% of respondents stated they know it well. Furthermore, 33.5% of participants knowing level not very well. Finally, 16% of respondents admitted they don't at all. Previous research highlights the importance of adaptation about changing climate pattern (Boillat & Berkes, 2013; Crane et al., 2011; Lebel & Lebel, n.d.).



**Figure 5:** Knowing level of adaptation to changing climate patterns

**Awareness of the potential risks associated with climate change effect in the study area**

This pie chart reveals differing degrees of awareness regarding the potential risks linked to climate change effects in the study area. Approximately 33.5% of respondents are highly aware of these risks, while around 34.5% possess a good understanding. However, a notable portion, comprising 32% of respondents, acknowledge the existence of these risks but lack a comprehensive understanding. This finding resonates with studies that identify the potential risks associated with climate change effect (Calculli et al., 2021; Mihiretu et al., 2021).



**Figure 6:** Awareness of the potential risks associated with climate change effect

**Levels of seasonal pattern changed in the study area**

The bar chart depicts how climate change has influenced seasonal patterns in the study area. It shows that a substantial 46.50% of the population has experienced a significant change. This finding aligns with studies showing that seasonal pattern changed during climate change (DAS & ZHANG, 2021; Liu & Weng, 2008). Meanwhile, 10.50% have undergone a moderate shift, while 17.50% have seen less noticeable changes. Surprisingly, 10.50% have reported no change in seasonal patterns, indicating varied experiences across the study area.

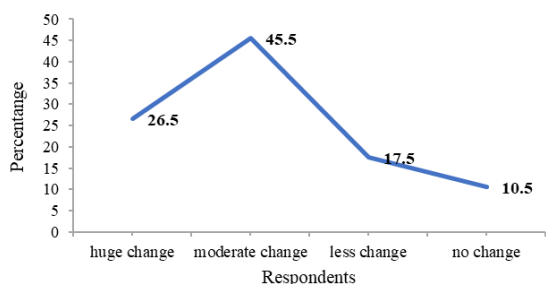


Figure 7: Seasonal pattern change

**Level of climate change affect in respondents’ daily life**

Studies have shown that climate change affects daily life in various ways, both directly and indirectly (Haque et al., 2012; Yu et al., 2013). The chart illustrates the impact of climate change on people's everyday experiences. It shows that 21% of respondents feel significantly affected by climate change, while 31.5% report feeling generally affected. Interestingly, 22.5% state that they are not significantly impacted, contrasting with the 15.5% who claim to be unaffected. Moreover, a notable 9.5% express uncertainty regarding the extent of climate change's influence on their daily lives.

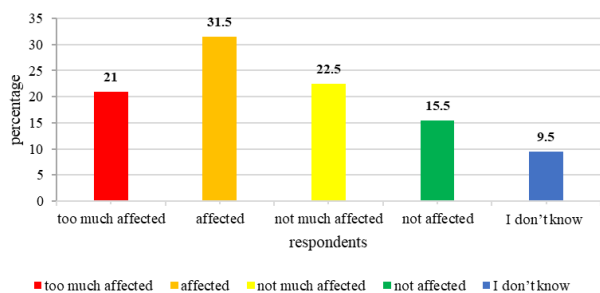


Figure 8: Level of climate change affect in respondents’ daily life

**Understanding level about the importance of reducing carbon emissions to mitigate climate change effects**

The bar chart portrays varying levels of comprehension among respondents. Notably, 27% individuals understand the significance very well, while 25% respondents grasp the concept well. Surprisingly, another 27% individuals do not understand the importance, highlighting a concerning gap in awareness. Additionally, 21% respondents acknowledge the concept but not to a significant degree, suggesting a nuanced understanding across the surveyed population. These findings are consistent with previous studies (Cordero et al., 2020; Whitmarsh et al., 2011).

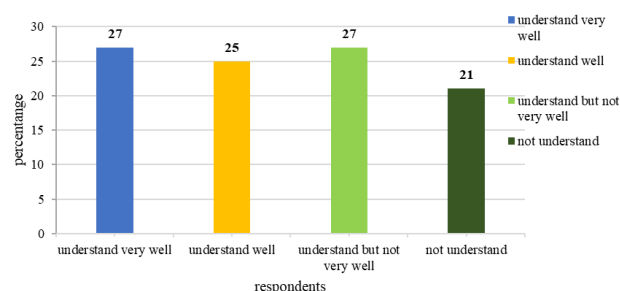


Figure 9: Understanding level about the Importance of reducing carbon emissions to mitigate climate change effects

**Respondents’ engagement in sustainable agricultural practices to mitigate climate change impacts**

The pie chart indicates that 26.50% actively engage in such practices, demonstrating a proactive approach to mitigate climate change effects in agriculture. Moreover, 15.50% are engaged, though perhaps less intensively. A significant portion, accounting for 32.00%, acknowledges the importance of sustainable practices but is not actively participating. Surprisingly, 15.00% of respondents reported no engagement, highlighting a potential gap in climate change adaptation efforts within the agricultural community. This level of engagement in sustainable agricultural practices to mitigate climate change consistent with findings in similar rural context (Mohsenipour et al., 2018).

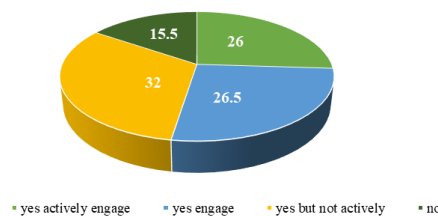


Figure 10: Respondents’ engagement in sustainable agricultural practices

**Amount of rainfall during the rainy season**

The charts show the varying levels of rainfall encountered by respondents. It demonstrates that a considerable 35% of respondents have faced extreme rainfall during the rainy season. Additionally, 48% have reported experiencing a medium amount of rainfall, while 17% have encountered low levels. These results shed light on the diverse experiences of respondents regarding rainfall intensity, crucial for understanding regional climatic patterns and their impacts. This study consistent with kind of similar finding. (DAS & ZHANG, 2021).

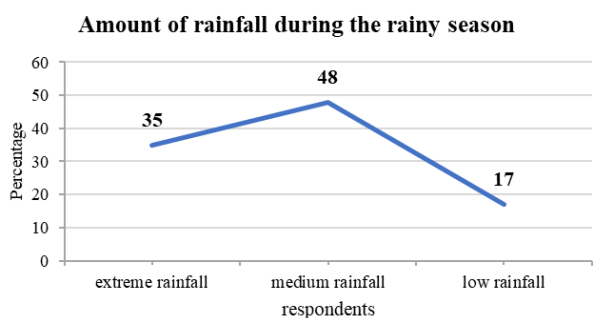


Figure 11: Amount of rainfall during the rainy season

**Respondents' insights on the continuous global temperature rise due to climate change**

The bar chart presents compelling insights into public perception. A striking 83.5% of respondents affirm the belief that global temperatures are indeed rising due to climate change. Contrarily, a notable 16.5% hold the belief that there is no such increase. These results underscore the prevalent acknowledgment of climate change's impact on global temperatures among the majority of respondents, despite a minority holding a contrary view (Howe et al., 2013; Leiserowitz, 2007; Li et al., 2011).

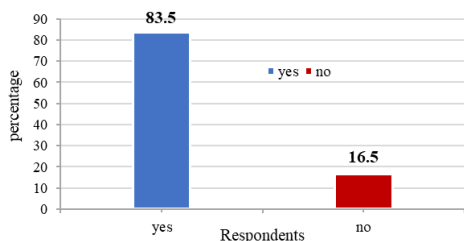


Figure 12: Respondents thinking in world temperature is increasing

**Levels of respondent's awareness on impacts of climate change on local agriculture and livelihoods in Mollahat**

The pie chart highlights the varying degrees of awareness among respondents. It reveals that a significant portion, 36.50%, are highly aware of the impacts of climate change on local agriculture and livelihoods. Additionally, 27.50% of respondents demonstrate a good level of awareness. However, a considerable proportion, 24.50%, acknowledges these impacts but not to a high degree. Surprisingly, 12.50% of respondents are not aware of the implications of climate change on local agriculture and livelihoods, indicating the need for further education and outreach initiatives with findings in similar context (Ali, 2023; Ibrahim et al., 2024).

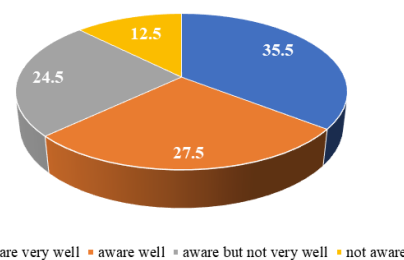


Figure 13: Respondent's awareness on impacts of climate change on local agriculture and livelihoods.

**Changing seasonal patterns affect agricultural practice**

The bar chart illustrates the varying degrees of influence on agricultural activities. Notably, 20% of respondents reported being significantly affected by changing seasonal patterns, while 27% experienced a noticeable impact. Surprisingly, 28.5% stated that they were not greatly affected, indicating resilience or adaptability in their practices. Conversely, 10.5% reported no discernible effect, suggesting localized stability or insulation from seasonal variations. Strikingly, 14% admitted uncertainty regarding the influence of changing seasonal patterns, highlighting the complexity and uncertainty surrounding this issue in agricultural practice. Moreover, this study consistent with similar finding about changing seasonal patterns affect in agricultural practice (Hansen, 2005; Sahn, n.d.).

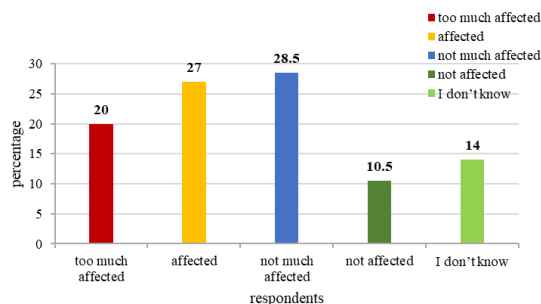
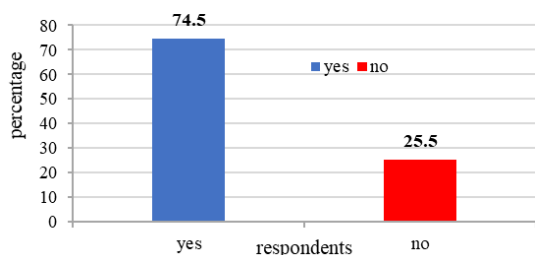


Figure 14: Changing seasonal patterns affect in agricultural practice

**Individual actions can significantly contribute to mitigating climate change**

The bar chart indicates 74.5% expressing belief in the significant impact of individual actions. Conversely, 26.5% remain skeptical about the efficacy of individual efforts in combating climate change. Previous research highlights the individual actions can significantly contribute to mitigating climate change (Fragnière, 2016; Ortega-Egea et al., 2014; Semenza et al., 2011).



**Figure 15:** Individual actions can significantly contribute to mitigating climate change

## CONCLUSIONS

The findings reveal a diverse range of perceptions and behaviors within the community, shedding light on areas of strength as well as areas requiring further attention and intervention. The survey indicates a varied understanding of climate change among respondents, with 25% claiming a strong comprehension, while 28.50% express a good level of understanding. However, a concerning portion, comprising 33.50%, acknowledges the concept but lacks a comprehensive understanding, while 13% admit to not understanding climate change at all. This highlights the need for targeted educational initiatives to bridge knowledge gaps within the community. Regarding awareness of climate change effects, the survey reveals a similar pattern, with 26% indicating a strong understanding and 27% expressing a good level of comprehension. However, 32% acknowledge the effects without a high degree of understanding, while 15% admit to lacking understanding entirely. Efforts should focus on providing accessible and accurate information to enhance community understanding of climate change impacts. The survey underscores the importance of diverse information sources in shaping community knowledge about climate change. While news media emerges as the primary source for 45.50% of respondents, social media also plays a significant role, with 29.50% relying on digital platforms for climate-related information. Community meetings and educational institutions also contribute to knowledge dissemination, emphasizing the need for multi-channel communication strategies. A majority of respondents (76%) acknowledge climate change as a real and pressing issue in Mollahat. However, 24% express skepticism or disbelief, indicating the persistence of misconceptions within the community. Additionally, while 62% believe their local community is well-prepared to handle climate change impacts, 38% hold the opposite view, suggesting a need for enhanced preparedness measures and community resilience initiatives. The survey reveals a mixed level of engagement in climate change adaptation and mitigation practices. While 57% of respondents report taking measures to adapt to climate change, 43% have not yet initiated such efforts, indicating a potential gap in community resilience. Similarly, while 64.5% have adopted eco-friendly practices, 34.5% have not, highlighting the need for broader participation in sustainability initiatives. The study

recommends that policymakers develop targeted climate education and capacity-building programs, while social workers and community organizations promote local adaptation practices to enhance community resilience against climate change impacts.

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## Authors Contribution

**Sanjida Binta Shafin Mishu:** Research design, conceptualization, Investigation, validation, Writing – original draft, Formal analysis. **Tusher Mohajan:** Research design, Data collection, conceptualization, statistical analysis. **Rakin Hasan:** Formal analysis, Writing – review & editing manuscript. **Md. Abir Hasan:** Validation, resources, review manuscript. **Prottoy Nandi:** Data Collection, resources, review manuscript. **Md. Farhan Hasan:** Data Collection, resources, review manuscript.

## Availability of data and materials

All data generated or analyzed during this study are available for sharing when the appropriate request is directed to the corresponding author.

## Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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