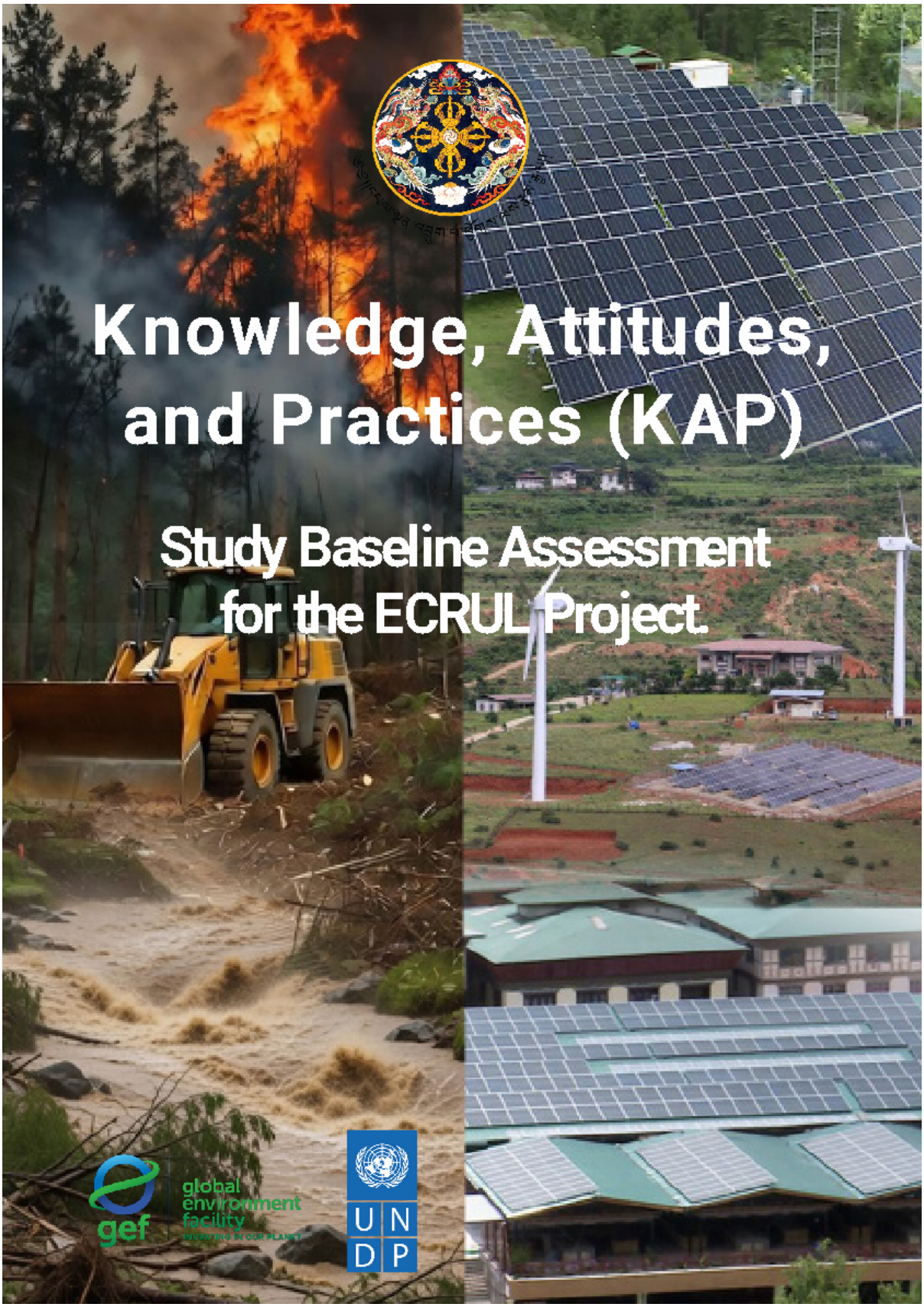

Knowledge, Attitudes, and Practices (KAP)

Study Baseline Assessment for the ECRUL Project

gef global environment facility

UNDP

THE KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) BASELINE ASSESSMENT OF ECRUL PROJECT

Department of Human Settlement, Ministry of Infrastructure and Transport

Submitted by: Bhutan A2Z Statistics, Economics, & Environmental Consultancy

ACCRONYMS

ECRUL	Enhancing Climate Resilience of the Urban Landscapes and Communities in Thimphu-Paro Region of Bhutan
GEF	Global Environment Facility
LDCF	Least Developed Countries Fund
KAP	Knowledge, Attitude, and Practice
DHS	Department of Human Settlement
MoIT	Ministry of Infrastructure and Transport
NbS	Nature-based Solutions
MEL	Monitoring, Evaluation, and Learning
CSO	Civil Society Organization
FGD	Focused Group Discussion
PMU	Project Management Unit
PSU	Primary Sampling Unit
SSU	Secondary Sampling Unit
TSU	Tertiary Sampling Unit
SK	Skip Interval
Wb	Base Weight
Adj.W	Adjusted Weight
SF	Sampling Fraction
LAP	Local Area Plan
KII	Key Information Interview
NSB	National Statistics Bureau
UNDP	United Nations Development Program
SCCF	Special Climate Change Fund
IFAD	International Fund for Agriculture Development
IUCN	International Union for Conservation of Nature
LGBT++ Individuals	Lesbian, Gay, Bisexual, and Transgender

EXECUTIVE SUMMARY

This report makes a comprehensive presentation of the findings on KAP (Knowledge, Attitude, and Practices) Study Baseline Assessment for ECRUL Project. The study was conducted between 29th January to 10th February, 2026 in the project landscapes of Thimphu and Paro. This KAP survey subjectively assessed the Knowledge, Attitudes, and Practices prevailing in the project landscapes. To augment the quantitative findings of this survey, qualitative aspects of the subject were considered to assess and track changes in awareness, perceptions, and practices around climate change, urban resilience, adoption of Nature-based Solutions (NbS), and adaptation strategies in line with the objectives of this study. Following are the specific objectives of this study:

- Assess current knowledge, attitudes, and behaviors of urban communities and institutions related to climate change and urban resilience;
- Identify perceptions regarding climate change causes and impacts on settlements;
- Establish baseline data to measure changes in adaptive capacity at individual, community, and institutional levels;
- Provide qualitative and quantitative baseline data toward measuring progress against the project's results framework; and
- Develop tool for Project Management Unit to record and measure knowledge, attitudes, and behaviors changes in communities.

KEY FINDINGS

Knowledge

- About 92% of respondents were aware of the term, 'Climate change,' as compared to 1.2 percent who were not at all aware of the same. By gender, about 51.6 percent of the females were aware of the climate change as against 40.2 percent males. Of the 9 climate-induced hazards witnessed over the years by the respondents, 'Global warming—melting snow in the mountains,' 'Changing weather patterns,' and 'Increase in air temperature' are the top three climate change-induced events.

- Of the total 10 aftermaths the respondents have witnessed over the years, 'Health hazard' (16.9%) tops the list of which 16.8 percent are females in Thimphu. This is followed by 'Damage to property' (5.3%), and 'Lack of portable water' (4.57%).

- 'Producing more harmful gases; Improper waste disposal by factories and households' (22.1%) and 'Deforestation' (5.4%) topped amongst the lists of causes for climate change. This indicates the existence of knowledge gap regarding the respondents' understanding of causes for climate change holistically.

- The survey revealed that 8 out of every 10 respondents have opined (agreed) that climate change is adaptive, as against 8.4 percent who disagreed. About 10.2 percent of the respondents did not know about it. Going by the third gender, about 0.05 percent of LGBT++ Individuals have agreed to the statement.

- A little more than 4 out of every 10 (43.2%) respondents have reported that they did not know about the solutions against the impacts of climate change as against about 20.5 percent of them who asserted that if collaboration of different tiers of the government (e.g. from local to national and international levels) is realized, that could be the solution to the impacts of climate change. This also indicates the major gap in knowledge regarding the solutions pertaining to the impacts of climate change.

- Respondents were specifically asked whether they were aware of the ECRUL Project. Only about 9.8 percent were aware of the same followed by the majority (70.8%) of them who were unaware of the project. About 19.4 percent did not know about it at all. To those who knew about the ECRUL Project, they were asked about the source of information on the same. About 86.3 percent of them have heard about the ECRUL Project through Facebook/Social media. About 3.4 percent of them have reported that they heard it for the first time through this survey.

Attitude

As regards to the attitude on the climate change and its impacts most were concerned about the same and its solutions such as conservation of natural resources and energy to prevent climate change issues and the respondents' readiness to do whatever they could to help preserve the

environment. Following are some of the pertinent findings on the attitude of respondents on climate change and its impacts:

- Around 25 percent females have strongly agreed to the statement, 'Complying with environmental laws can prevent the impact of climate change' as opposed to males (20%) could mitigate the impacts of climate change.

- Respondents were made to delve deeper into their attitude on climate change and its impacts. In the statement, 'Nature will take care of the climate change and it is needless to worry' a little more than 10 percent (Male=5.9%; Female=4.5%) have strongly agreed to the same. On the other hand, about 18.8 percent (Male=12.4%; Female 16.4%) of them strongly disagreed with the statement followed by 33.9 percent who disagreed the same.

- As regards to respondents' attitude towards climate resilient structures, close to three-quarters (73.6%) of them have agreed to the statement, 'Building climate-proof structures near the river basin is a solution to climate change.' However, on the contrary, close to 10 percent of the respondents did not agree to the same. About 17 percent of them have remained neutral.

- As for the respondents' attitude on encouraging and promotion of community participation to help prevent the impact of climate change, a little more than 9 out of every 10 (91.1%) of the respondents have agreed to the statement, 'Encouraging and

- A significant percentage (68.5%) of respondents have asserted that everyone needs to be responsible to address the impacts of climate change. More than 2 out of every ten (23.7%) respondents felt that the government is responsible for addressing climate change. A small proportion (3.3%) of the respondents feel that local people need to take responsibility for taking action against climate change. Interestingly, about 0.2 percent of the LGBT++ Individuals have asserted that everyone should be responsible for addressing the same.

- A huge majority (98.6%) were very interested in finding out more about climate change and rated the scale, 'Very important.' In the like manner, a little more than 9 out of every

10 (91.8%) respondents have agreed to the statement, 'I am hopeful that we could do something to adapt to climate change.'

- Upon being asked to rate the statement, 'I am willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth,' based on their level of agreement, about 94.5 percent of the respondents have agreed as opposed to 1.1 percent who disagreed. Upon disaggregated by gender, about 53.8 percent of female respondents have agreed that they were willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth as compared to 40.7 percent male respondents.

- The survey also sought to excavate the respondents' stand on mitigation of climate change issues via Nature-based Solutions. The statement, 'Increase reforestation to mitigate climate change issues' revealed 6 out of every 10 (60%) female respondents disagreeing the same augmented by male respondents with about 41.9 percent. On the other hand, about 48.6 percent of female respondents have agreed to the statement, 'Discourage building infrastructure near vulnerable areas.' About 38.1 percent of the male respondents too have agreed to the same statement.

Practices

- A little more than one-quarter (26.4%) of the respondents claimed to have taken actions till date to lessen the impact of climate change in their area or community as opposed to 4.4. percent. Around 3 percent were not sure if they had done the same. By gender, about 14.1 percent of female respondents in Thimphu claimed to have taken some actions as compared to 10.3 percent males. About 45.8 percent have followed 'Water management' and 30.2 percent of them who followed 'Waste management' and around 8 percent involved in reforestation (planting trees). This is closely followed by 'Carpooling' (7.3%). About 6.2 percent have turned off lights and water taps when not in use. Close to 5 percent have conserved energy and less than one percent (0.4%) have raised awareness on the issue of climate change.

- The statement, 'Do not have access to information about climate change' has been reported with a percentage share of 42.5 percent as one of the hindrances in taking any action to prevent or lessen the impact of climate change.

- Upon asking the respondents whether they feel safe with the current place of dwelling from climate-induced hazards, a little more than one-quarter (27.5%) of the respondents felt safe with the current location they dwell at from the climate-induced hazards. A little more than 4 out of every 10 (40.7%) respondents have reported that they do not know whether they are dwelling at a safe place from climate-induced hazards.
- The top three sources of information that made them learn about climate change and its impacts were from the combined sources such as 'National TV (e.g. BBS) and Social media' (56.6%), Social media alone (10.2%), and National TV (8.1%).

The Key Takeaways

- Gear all the programs under ECRUL sooner especially the demonstration and awareness program in the EAs identified by this study in the form of algorithm;
- To better identify the 'missing middle' of the Theory of Change of this project, conduct the midterm KAP survey right after implementation of some of the programs in the aforementioned EAs;
- Find out the plausible ways to coordinate amongst the RPs for realizing better output and outcome of the ECRUL Project;
- Conduct a thematic study from this report and datasets led by the PMU and update the indicators;
- Align the Sub Activities especially those related to mitigation, adaption, and resilience to the Pareto Analysis results and the EFA results;
- Information on climate change and its impacts needs to be disseminated well; and
- Finally, make the RPs and other relevant officials study this report thoroughly.

According to the Pareto Analysis, the most crucial attribute that fell within the 20% of the Pareto Chart is the attribute, 'Adaptation and resilience.' If the project aligns the plans and programs in line with the attribute, 'Adaptation and resilience' and its corresponding indicator items as enshrined in the main findings of this study, it will yield 80% of the benefits.

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CHAPTER ONE: INTRODUCTION

INTRODUCTION AND SIGNIFICANCE OF THE STUDY

The Knowledge, Attitude, & Practices (KAP) Baseline Assessment pertaining to the ECRUL project is initiated by the Department of Human Settlement (DHS), Ministry of Infrastructure and Transport (MoIT) and the UNDP, Bhutan in the project landscape districts viz. Thimphu and Paro. The project landscapes under the six-year project (Enhancing Climate Resilience of the Urban Landscapes and Communities in Thimphu-Paro Region of Bhutan) is funded by the Global Environment Facility (GEF) Least Developed Countries Fund (LDCF) co-financed by the Royal Government of Bhutan. The aforementioned project is jointly implemented by MoIT and UNDP, Bhutan. The project is aimed at strengthening the climate resilience of those two urban areas through the integration of NbS (Nature-based Solutions), resilient urban planning, and inclusive community-based adaptation. The project is expected to directly benefit 146,129 residents in those two cities of which about 51.4 percent are females. Hence, to rely on certain baseline facts and figures to serve as a tracking tool for ECRUL project's monitoring, evaluation, and learning (MEL) framework, a KAP Baseline Assessment entailed here is crucial.

Of late, Bhutan has been witnessing varying degrees of natural disasters mostly climate-induced. To cite a few glaring examples, the landscape of Bhutan had been impacted by and large with a range of climate hazards most notably floods, soil erosion, drying potable water sources, irrigation water sources, forest fires, and windstorms (Waiba & Dorji, 2024). Despite the fact that Bhutan enjoys the status of being carbon-negative, she frequently suffers from climate-induced hazards viz. landslides, flash floods, droughts, and heat waves. The most common climate-induced hazards are GLOFs (Glacial Lake Outburst Floods). A study by a plethora of authors (Syldon, Shrestha, Miyamoto, Tamakawa, & Nakamura, 2024) revealed that in the far future, the extreme cases of rainfall will increase by 50 to 60 percent specifically for the river basins with a 32 percentage increase. The aforementioned authors as well highlighted the interesting hydrological insight—mountain regions are sensitive to changes in environment and climate.

Bhutan is also plagued with extreme temperatures and shifting precipitation patterns fueling the abovementioned climate-induced hazards. Lhamo et al. (2023) found the generalized extreme value (GEV) of T=50-year return value indicating an increasing value of annual maximums across Bhutan. A study by Dorji (2024) on the 'Climate Change Projection for Bhutan' had reported annual new hottest temperatures since 2014 with the record high (warmest) year 2024. Dorji

(2024) as well has revealed an interesting fact that Bhutan witnessed the increase in both maximum and minimum temperatures especially in the northern and central regions. It has been found that the likely rise in temperatures ranged from 1.5°C to 5°C inching closer to the global target for limiting rise in global temperature below 1.5°C.

National Environmental Commission Secretariat (2014) had revealed beyond doubt in the study, 'Rapid Baseline Assessment of Local Preparedness and Responsiveness to Climate Induced Hazards,' a daunting fact about increased climate-induced multi-hazards. The study revealed that of the total multi-hazards witnessed over the years, windstorms (22%) followed by forest fires (21%), water scarcity (20%), landslides (15%), and flashfloods (12%) are some of the frequent events (National Environmental Commission Secretariat, 2014). However, the same study unfortunately revealed the increase in such events. It was further revealed that only 50.8 percent of the study participants had access to weather information and early warning systems. "Loss of vegetation tops the list with 82.2%, followed by loss of property (63.2%) and induced poverty (14.7%). The highest social impact produced was loss of capital (47.3%), followed by fear for investment in infrastructure (29.1%) and unemployment (21.1%)." This is corroborated by the study, 'Consequences of climate change impacts and incidence of extreme weather events in relation to crop production in Bhutan' that revealed the most common extreme weather events as 'untimely rain,' 'drought,' 'heavy rain,' and 'heat waves' (Chhogyel, Kumar, & Bajgai, 2020).

To aid to the aforementioned challenges faced by Bhutan, the urban sprawl especially in Thimphu and Paro had led to the demand for improved climate resilience for these two are the most populous districts of Bhutan challenged with inadequate resources and infrastructure. The urban sprawl in Thimphu had been skyrocketing between 1990 and 2018. Chhetri (2023) had computed 106.2 percentage growth in built-up areas in Thimphu city with a net growth of 4.63KM^2. The urban area witnessed a record high growth of 8.99KM^2 in 2018 as compared to just 4.36KM^2 in 1990. This has substantially aided to the straining of resources and infrastructure increasing the densification. Another study by Dorji et al. (2022) revealed that Thimphu city had the largest proportion of the area (65.9%) in 1990 under vegetation cover, which now is sprawled with concrete structures. The population growth had been skyrocketing in Thimphu from just 80K in 2006 to 149K in 2025 (Dorji et al., 2024). In a nutshell, Bhutan has become highly vulnerable to climate change and its impacts. Thimphu and Paro combined comprise 25 percent of the country's population representing 46 percent of total urban populace (Department of

Human Settlement, 2024). These two cities also represent contributors of over 40 percent of the country's GDP. According to the project document (Department of Human Settlement, 2024), with changes in extreme temperatures and precipitation patterns as result of climate change, the two cities are prone to urban flooding, landslides, and forest fires affecting economy, landscape, and populace. This dire situation had been augmented by inadequate and insufficient climate-proof infrastructure making these two aforementioned cities more susceptible to risks.

All the above facts and figures are interlinked with threat to Bhutan's socio-economic development especially in the sectors viz. agriculture, water security, and health. To this effect, this study is aimed at excavating the baseline facts and figures to address the above burning issues through nature-based solutions, resilient urban planning, and climate-proof infrastructure development. To realize these propositions, the ECRUL project is being implemented by DHS, MoIT in conjunction with UNDP along with the technical and financial support from GEF-LDCF. Hence, to contribute to the overall evaluation strategy for Years 3 and 6 or to contribute to the ECRUL project's MEL (monitoring, evaluation, and learning) framework strictly in line with indicator 11, a KAP survey 2026 to measure the long-term impact of the project and as well develop the communication strategies, stakeholder engagement plans, and participatory activities throughout the project cycle is crucial.

OBJECTIVES

The 'Theory of Change' of this project entails strengthening the management of climate risks and reducing the vulnerability of urban landscapes and communities to the impacts of climate change in the Thimphu-Paro region. In a nutshell, "the project seeks to address the impacts of fluvial (riverine) and pluvial (surface water) flooding, cyclonic events, and water stress on the residents of Thimphu and Paro" (Department of Human Settlement, 2024, p.2). The broad objective of this study is to assess and track changes in awareness, perceptions, and practices around climate change, urban resilience, adoption of NbS, and adaptation strategies via KAP Baseline Assessment. The specific objectives as enshrined in the ToR of this study are as follows:

1.1. Assess current knowledge, attitudes, and behaviors of urban communities and institutions related to climate change and urban resilience;

1.2. Identify perceptions regarding climate change causes and impacts on settlements;

1.3. Establish baseline data to measure changes in adaptive capacity at individual, community, and institutional levels;

1.4. Provide qualitative and quantitative baseline data toward measuring progress against the project's results framework; and

1.5. Develop tool for Project Management Unit to record and measure knowledge, attitudes, and behaviors changes in communities.

Study coverage and target groups

The study covered two project landscapes, urban areas of Thimphu and Paro. The overall purpose of this study was to generate information regarding the level of Knowledge, Attitude, and Practices (KAP) of urban communities and beneficiaries (indicator 12) in accordance with Project Results Framework (PRF). This KAP survey is intended to provide a critical evidence base for tracking progress, identifying behavioral changes, and informing adaptive management of the project. The target population or the study unit was mostly the urban householders of Paro and Thimphu. The study as well included various stakeholders at various levels. The study covered six major sections viz. 'Area information,' 'Demographic characteristics,' 'Knowledge,' 'Attitude,' 'Practices,' and 'Access to information' through a structured questionnaire. To augment the quantitative study, this study covered Key Informants, which were mostly the project stakeholders and Focused Group Participants. The duration of the study was for about 35 days and staggered across three months.

CHAPTER TWO| METHODOLOGY

Based on the nature of the study and line of enquiries or objectives, a mixed method (both qualitative and quantitative) is employed for this study. The quantitative part pertains to the conduct of a cross-sectional survey to sampled urban households covering the study domains/project landscapes (Thimphu and Paro). The qualitative part includes the KIIs and FGDs with relevant stakeholders (youth, women, local governments, CSOs, Responsible Parties, technical agencies in Thimphu and Paro) of the ECRUL project.

2.1. Sample size determination, Sampling plans and computation of statistical weights

a. Sampling frame

The latest household lists (EAs in Thimphu and Paro) of the National Statistics Bureau (NSB) have been employed as a sampling frame for sampling the respondents belonging to abovementioned study domains or project landscapes.

b. Sample size determination

Based on the aforementioned sampling frame, a sample size for proportion technique was used to determine the representative sample size for the proposed study. The sample size is computed using the following formulae, which is a confidence interval approach or the sample size determination technique for proportion:

(i) $n = \frac{\left(Z_{\alpha/2}\right)^2 pq}{\varepsilon^2}$ *, where n = sample size for proportion,* $Z_{\alpha/2}$ *= 1.96 @ 95% confidence level, p = q=0.5 (proportion of picking 50-50 right answer) and* $\varepsilon^2 = \pm 5\%$ *confidence interval/margin of error. Finite Population Correction (fpc):* $n_1 = \frac{n}{\left(1+\frac{n-1}{N}\right)}$ *, where* n_1 *is the new sample size and N = Total households in blocks.* The **fpc** is to minimize the width of the confidence interval so as not to misguide the probability of lying the true answers in that wide margin of error. After adjusting for fpc the sample size tantamount to 379 urban households. Ultimately, for the generation of reports by project areas, the sample size is computed to 760 urban households.

Table 1: Sampling Plan and computation of statistical weights

Primray Strata	*Sub-strata/LA Name*	*Households*	*PPSWOR*	*Disp. Allocation*	*SF*	*Wbase*	*SK*
Thimphu	Dechecholing	1,372	37	40	0.029	34.30	686.00
	Taba	2,409	65	60	0.025	40.15	803.00
	HejoSamtelingZIlukha	2,343	64	60	0.026	39.05	781.00
	Lower & Upper Motithang	3,142	85	80	0.025	39.28	785.50
	Core & Changzamtok	6,209	168	180	0.029	34.49	689.89
	Yanchenphu, Changbangdu, & Lungtenphu	5,932	161	160	0.027	37.08	741.50
Paro	Semtokha, Babesa, & Khasadrabchu Town	3,844	104	100	0.026	38.44	768.80
	LAP 1,2, & 3	1,339	36	40	0.030	33.48	669.50
	LAP 4,5,6,&,7	1,354	37	40	0.030	33.85	677.00
	Total	**27,944**	**758**	**760**	**0.027**	**36.77**	735.37

PSU=Primary Sampling Unit; LA=Local Area; LAC in Map=Local Area Code in Map; HHs=Households; PPSWOR=Prob. Proportional to Size without Replacement; Disproportionate Allocation=PPS with Adjustment; SF=Sampling fraction; Wb=Base weight; and SK=Skip interval for sampling SSUs.

c. Sampling method

Based on the nature of study, a multi-stage sampling method was employed for sampling the respondents under study domains. Precisely, in this study a stratified two-stage sampling design was adopted. The two project sites formed primary strata and the Local Areas under respective project sites grouped based on the proximity of geographical location formed sub-strata. The details of the sampling procedures are illustrated as follows:

(i) Selection of the PSU (Primary Sampling Unit): The EAs falling under each stratum was considered as PSUs. The selection of final PSUs was carried out using Probability Proportional to Size Without Replacement (PPSWOR) method of sampling with the number of urban households as size of variable.

However, the underrepresented households were adjusted using the Disproportionate Allocation Method.

(ii) The SSU (Secondary Sampling Unit): The SSUs are those urban households in each EA (PSU), which were selected using Circular Systematic Sampling (CSS) method of sampling; and

(iii) The elements/Tertiary Sampling Units (TSUs)/Ultimate Sampling Units (USUs), which are the urban household heads falling under each SSU. The TSU/USU is selected for the interview in the field using the rule of thumb of skipping 3 or 5 households for randomization.

d. Weights determination

To represent the entire household populations in each stratum, the probability weight (refer table 1) was determined as follows:

If N_h = total population belonging to the corresponding item in a stratum '$_h$' and n_h = sampled item corresponding to stratum '$_h$' then n_h/N_h is called sampling fraction and the inverse of the same, N_h/n_h is called base weight.

2.2. Selection of Households (SSUs) in Enumeration Areas (EAs)

The SSUs have been selected using the circular systematic sampling (CSS) method as depicted in table 2. The skip interval generated in table 1 was the basis for the selection. The random number has been generated in excel, which later augmented with the skip interval and selected the EAs.

Table 2: Selected Secondary Sampling Units (SSUs)

Sub-strata/Local Area	Local Area Code in Map	Enumeration Area (EAs)	2024 Updated Households	Household heads to be interviewed
Dechencholing I	I	EA-1	36	20
Dechencholing III a	3a	EA-23	56	20
Sub-total			**92**	**40**
Taba I a	5a	Pamtsho -I	33	20
Taba I c	5c	Jungsina 01	92	20
Taba II c	6c	Taba Lam - 1, 16,27, 33, 35	184	20
Sub-total			**309**	**60**

Sub-strata/Local Area	Local Area Code in Map	Enumeration Area (EAs)	2024 Updated Households	Household heads to be interviewed
Changzamtok I a	22b	Hebi Lam and Changzamtok Lhakhang area	46	20
Changzamtok II a	23a	Labor Camp Area	29	20
Changzamtok III a	24a	Building no. 25 to building no. 27	41	20
Changzamtok III c	24c	RBP Residence Building above Chundu Sawmill	60	20
Changzamtok IV a	25a	Above DHE Office	53	20
Sub-total			**449**	**180**
Yangchenphu	26	Water tank and Local Governance Area	24	20
Changbangdu I	27	Community police office area	30	20
Changbangdu	28	EA-4	44	20
Lungtenphu I a	29a	Wangtchu Lam 2	30	20
Lungtenphu I b	29b	Bhutan Eden Travels area	36	20
Lungtenphu I c	29c	Changrigphel LSS area	56	20
Lungtenphu I e	29e	Dodo Shoe Product Area	58	20

Sub-strata/Local Area	Local Area Code in Map	Enumeration Area (EAs)	2024 Updated Households	Household heads to be interviewed
Lungtenphu Ie	29e	K Norkhel Enterprise area	25	20
Sub-total			**303**	**160**
Semtokha a	31a	Workshop area including Augta & Kuenga Engineering workshop	48	20
Semtokha a	31a	Residential area below express way & above wangchu	79	20
Semtokha c	31c	Dantak Canteen and Residential area	42	20
Babesa I a	32a	EA-6	43	20
Babesa I Ba	32ba	Bapi Lam 14 area 1	36	20
Sub-total			**248**	**100**
LA 1		Hotel Lhading Area	42	20
LA 2		Geptey behind town III	32	20
Sub-total			**74**	**40**
LA 4		Cremation ground and dzong area	63	20
LA 6		Tshering Lhams shop & Imtrat Khangkhu Area	34	20
Sub-total			**97**	**40**
Grand-total			**1,836**	**760**

The convenient sampling was employed to select the respondents who are stakeholders of the ECRUL project in Thimphu and Paro for KII/FGD. The list provided by the PMU were used as the respondents for the KII. The FGDs were mostly conducted amongst the youth and women.

2.3. Study Instrument and Data Collection:

2.3.1. Study instrument: A well structured questionnaire is designed strictly based on the objectives of the ToR of this study and finalized in conjunction with the PMU. The data collection was carried out using CAPI (android devices) whereby the interface is designed using google forms.

2.3.2. Interviewing method: The self-administered or one-to-one guided oral interview were conducted for those respondents under project areas (Thimphu & Paro) with a structured and standardized questionnaire. For the educated respondents, self-administered interview or partially orally (by the interviewer) and partially by self-reading and self-answering (by the respondent) was conducted with clarification of doubts by the enumerators. On the contrary, those who cannot read or write a one-to-one guided interview were conducted. The main respondents were the head of the urban households.

2.3.3. Interviewers/Surveyors: Based on the agreed sample size after finalization of the simulation exercise with PMU, university graduates comprising 75% females and 25% males were inducted as surveyors. They were trained with the survey instruments and a pre-test was conducted in Thimphu before actually embarking onto the field works. A field supervisor each was deployed with the respective survey team. The lead consultant monitored the overall field works.

2.3.4. Focused Group Discussion (FGD) and Key Informant Interviews (KIIs)

Various stakeholders of the ECRUL project in Thimphu and Paro were identified for KII to compile juxtaposing opinions. The list of those stakeholders provided by the PMU were selected for KII and made to respond online. As for the FGD participants, youth were asked to answer the key questions online.

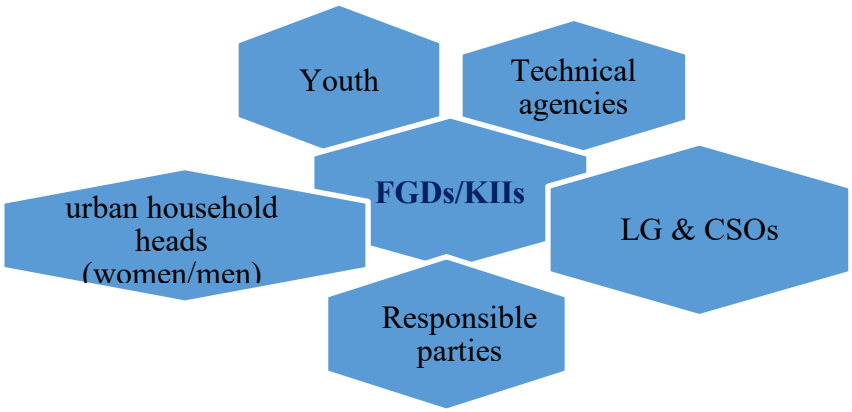


Figure 1: Targeted KII/FGD participants

2.4. Quality Control Process

The flow diagram below depicts the quality control process in a nutshell spanning from sampling to report writing.

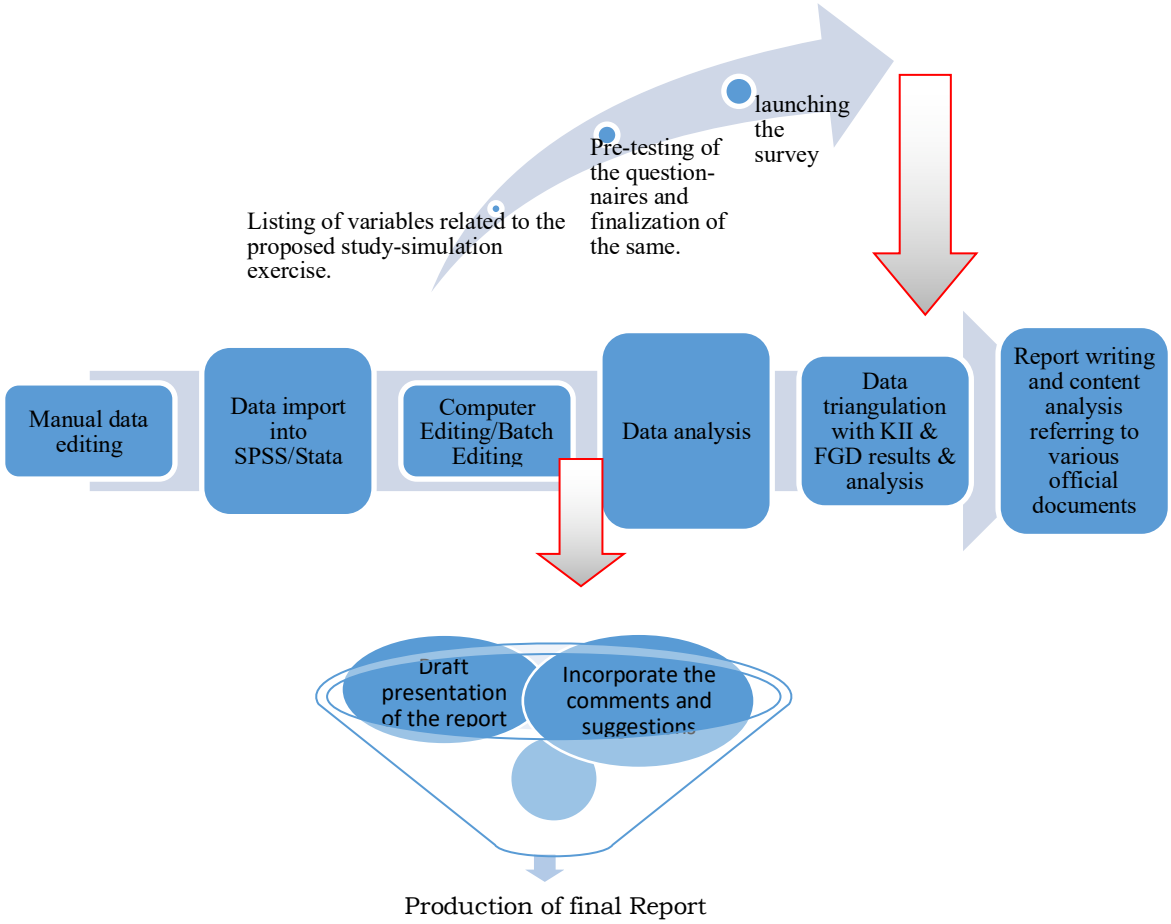


Figure 2: Quality control process of the study

2.5. Data Analysis and Reporting

The well processed and cleansed data using ***SPSS 22*** was analyzed. To fulfill all the objectives and particular indicators of the ECRUL project, the data were analyzed specifically. Since, most of the variables under consideration for the KAP survey used different scales such as 5-point Likert scale, binary scale, codes, ratio scale, etc, the reliability test was conducted using Cronbach's Alpha. The figure below illustrates the entire data analysis process.

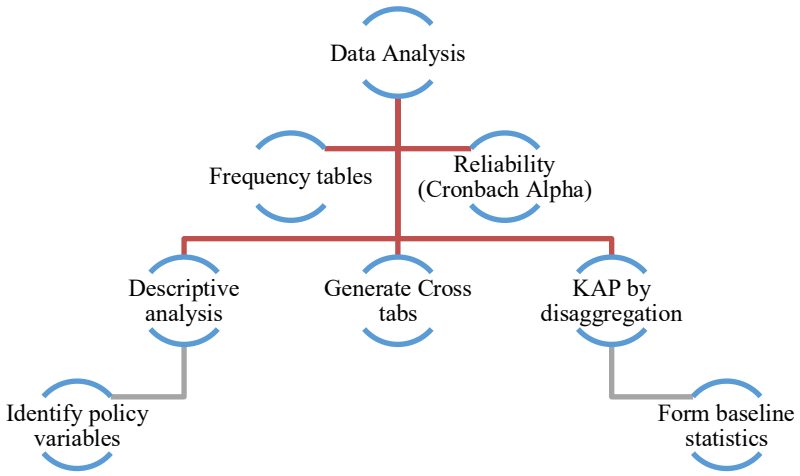


Figure 3: Data analysis process

CHAPTER 4| MAIN FINDINGS

This chapter presents the main findings of the study. It is sub-divided into six sections viz. 'Geographical characteristics,' 'Socio-demographic characteristics,' 'Knowledge,' 'Attitude,' 'Practices,' and 'Access to information.' The findings are segregated by gender and study landscape. The word, 'survey' and 'study' are used interchangeably in this report. All the results analyzed and presented in this report are weighted. The total absolute figures might vary a bit since SPSS rounds off the numbers automatically. It is also due to skip patterns and non-response to the particular questions.

4.1. Geographical characteristics

The study covered two project landscapes of Thimphu and Paro. Based on the sample size determination technique deemed suitable for this study, a study covered a representative sample of 760 urban households across these two project landscapes. The study enjoyed zero (0%) non-response rate aiding to the precision of the estimation. About 90.4 percent of the respondents were covered in Thimphu as against 9.6 percent in Paro. The survey covered the sampled households located at three different tiers viz. Low-lying area (45.2%), Steep incline (37.1%), and Near river (17.7%). However, these three locations were determined by the surveyors based on their inductive inference and did not use any geometrics. Upon being asked the duration of the respondents' stay in their current location, close to half (48.8%) of them reported to have stayed between 1-5 years followed by 'more than 5 years' (23.7%), 'Less than a year' (21.9%), and about 5.6 percent who stayed all their life.

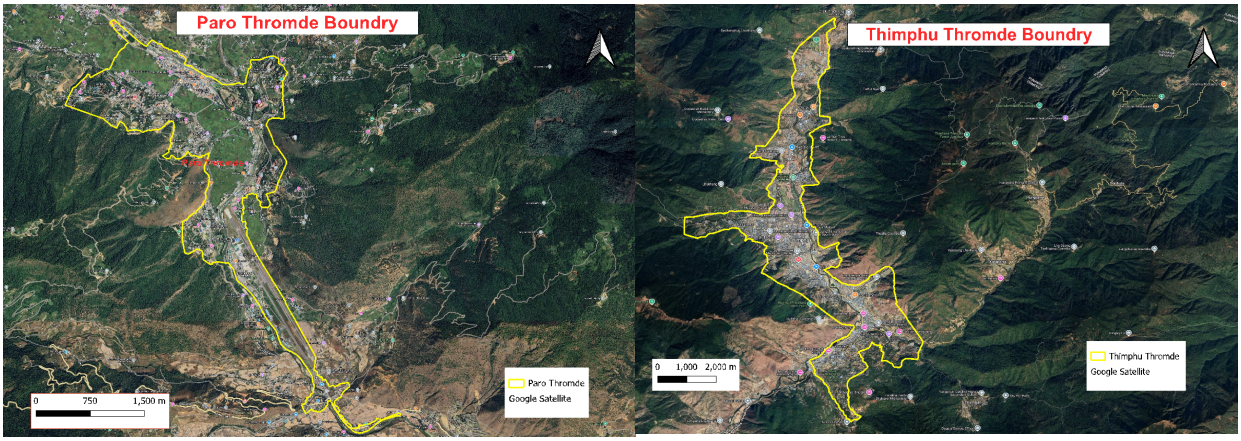


Figure 4: Enumeration Areas (EAs), NSB 2026

4.2. General Characteristics

This sub-section presents the general characteristics of the respondents comprising socio-demographic characteristics, economic characteristics, and educational characteristics. This sub-section as well presents the personal characteristics such as third gender and the condition of disability. Table 3 depicts the general profile of the respondents.

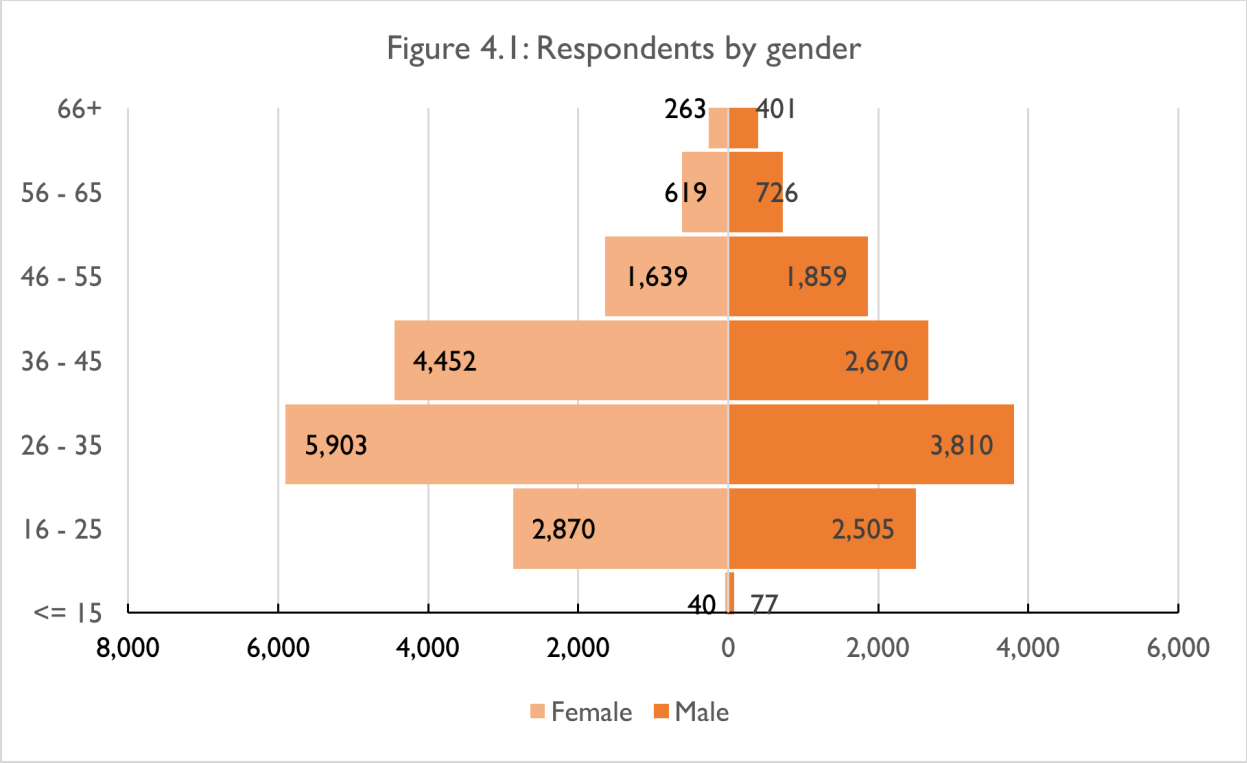
Table 3: Profile of the respondents

Characteristics		*Frequency*	*Percentage (N=27,945)*
Age	<= 15	117	0.40%
	16 - 25	5,449	19.50%
	26 - 35	9,713	34.80%
	35+	12,628	65.00%
Gender	Female	15,825	56.60%
	Male	12,046	43.20%
	LGBT++ Individuals	72	0.20%
Marital status	Divorced	1,928	6.90%
	Living together	887	3.20%
	Married	14,870	53.20%
	Never married	8,333	29.80%
	Separated	149	0.50%
	Widowed	1,777	6.40%
Mother tongue	Dzongkha	11,087	39.70%
	Khengkha	2,849	10.20%
	Lhotsamkha	5,672	20.30%
	Tshanglakha	23,912	85.60%
	Others	793	2.80%
Religion	Buddhist	24,563	87.90%
	Christian	794	2.80%
	Hindu	2,587	9.30%
Person With Disabilities	Differently abled	431	1.50%
	Don't want to say	324	1.20%
	No disabilities	27,189	97.30%

Table 3 continuation

Education	College & above	6,535	23.40%
	Higher secondary school	9,668	34.60%
	Lower secondary school	1,590	5.70%
	Middle secondary school	4,630	16.60%
	NFE/Shedra/Monastic	577	2.10%
	No education	3,358	12.00%
	Primary school	1,586	5.70%
Occupation	Govt. employee	4,921	17.60%
	Businessman/woman	4,801	17.20%
	Homemakers	4,718	16.90%
	Pvt. employee	4,706	16.80%
	Student	2,586	9.30%
	Unemployed	1,297	4.60%
	Corp. Employee	1,131	4.00%
	Others	3,784	13.50%

The survey covered about 98 percent straights (56.6% females & 43.1% males) against 0.2 percent LGBT++ Individuals. The highest proportion (65%) of the respondents fell in the age bracket of 26-35 years old with less than one percent (0.4%) of them less or equal to15 years old.



More than half (53.2%) of the respondents were married and close to 3 out of 10 were never married followed by divorcees (6.9%) and widows (6.4%). More than three-quarters (85.6%) spoke Tshanglakha with about 39.7 percent Dzongkha. A little more than 2 out of 10 respondents spoke Lhotshamkha. About 87.9 percent of the respondents followed Buddhist faith followed by close to 10 percent Hindus and 2.8 percent Christians. Less than one percent of the respondents reported that they are disabled followed by 1.3 percent who reported having a condition such as partially disabled against 1.2 percent who did not want to report the existence of such conditions. The majority of the respondents had undergone some form of education as against 12 percent with no education. An almost equal proportion of civil servants and businessmen/women were the respondents of this survey followed by homemakers (16.9%) and private employees (16.8%).

4.3. Socio-economic Characteristics

Table 4 presents the monthly income and expenditure of respondents. The mean income and expenditure of the household is Nu. 30,182.7 and Nu. 21,787.7 respectively. About 50 percent of the total household populace earns Nu. 20,000 a month (Median=Nu. 20,000). In a similar vein, the median expenditure of the households is Nu. 20,000 a month. The cohort of

households between the monthly income of Nu. 5,001-25,000 seem to be spending more than what they earn (-15.5%) followed by the income range of Nu. 25,001-45,000.

Table 4: Monthly income and expenditure of respondents

Nu.	*Income*	*Expenditure*	*Difference*
<= 5,000	33.9%	25.5%	8.3%
5,001 – 25,000	25.3%	40.8%	-15.5%
25,001 – 45,000	20.5%	24.5%	-4.0%
45,001 – 65,000	11.7%	6.9%	4.9%
65,001 – 85,000	4.6%	1.3%	3.3%
85,001 – 105,000	1.2%	0.5%	0.6%
105,001+	2.9%	0.5%	2.4%
Total	100.0%	100.0%	-

The survey also sought to learn the communication facilities owned by the households. A little more than 6 out of every 10 households (61.7%) surveyed owned a TV and Cellular phone with an intranet as illustrated in table 5. The next two highest communication facilities owned are 'TV; Cellular phone; Cellular phone with intranet' (14.6%) and 'Cellular phone with intranet' (9.4%). However, the modal value of 9 (9th item) are TV and 'Cellular phone with intranet.'

Table 5: Communication facilities owned by the respondents

Communication facilities	*Frequency*	*Percent*
Cellular phone	191	0.70%
Cellular phone with intranet	2,636	9.40%
Cellular phone with intranet; Print media subscription	74	0.30%
Cellular phone; Cellular phone with intranet	722	2.60%
Cellular phone; Print media subscription	37	0.10%
Friends	38	0.10%
TV	448	1.60%
TV; Cellular phone	737	2.60%
TV; Cellular phone with intranet	17,237	61.70%
TV; Cellular phone with intranet; Print media subscription	886	3.20%
TV; Cellular phone with intranet; Radio	176	0.60%
TV; Cellular phone with intranet; Radio; Print media subscription	38	0.10%
TV; Cellular phone; Cellular phone with intranet	4,068	14.60%
TV; Cellular phone; Cellular phone with intranet; Print media subscription	220	0.80%
TV; Cellular phone; Cellular phone with intranet; Radio	142	0.50%
TV; Cellular phone; Cellular phone with intranet; Radio; Print media subscription	76	0.30%
TV; Cellular phone; Print media subscription	111	0.40%
TV; Cellular phone; Radio	34	0.10%
TV; Radio	73	0.30%
Total	27,944	100.00%

The respondents were asked to pigeonhole two most often used media in the past one month. Figure 5 shows 'TV and phone' (34%) and 'Smart phone' (28.5%) as the two most often

used media in the past month by the respondents. Going by the top fives, 'Social media and tv' (15.4%), 'Smart phone' (28.5%), and 'Facebook and TikTok (10.7%) augment the sum.

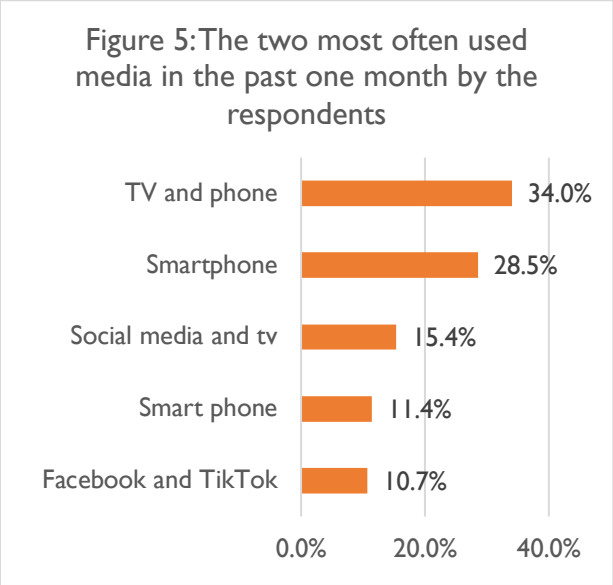


Figure 5: The two most often used media in the past one month by the respondents

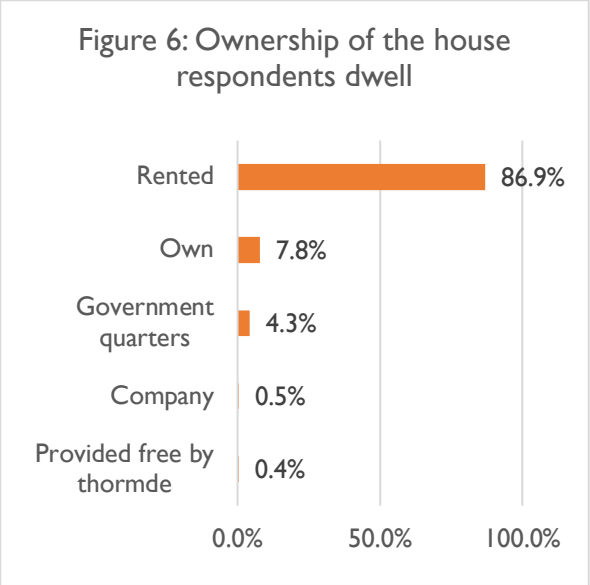


Figure 6: Ownership of the house respondents dwell

Figure 6 shows the ownership of the household respondents live in. Close to 9 out of every ten (86.9%) of the respondents live in a rented house as opposed to the 7.8 percent who own the house they live in. About 4.3 percent of the respondents lived in government quarters followed by housing provided by the company the respondents work.

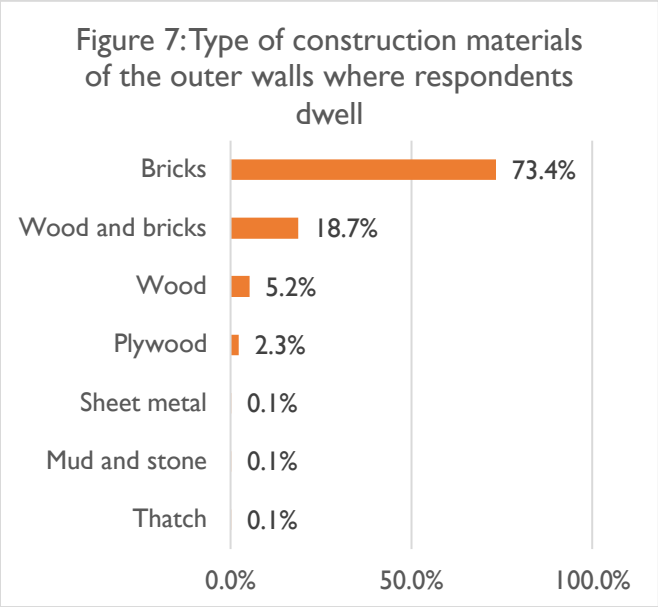


Figure 7: Type of construction materials of the outer walls where respondents dwell

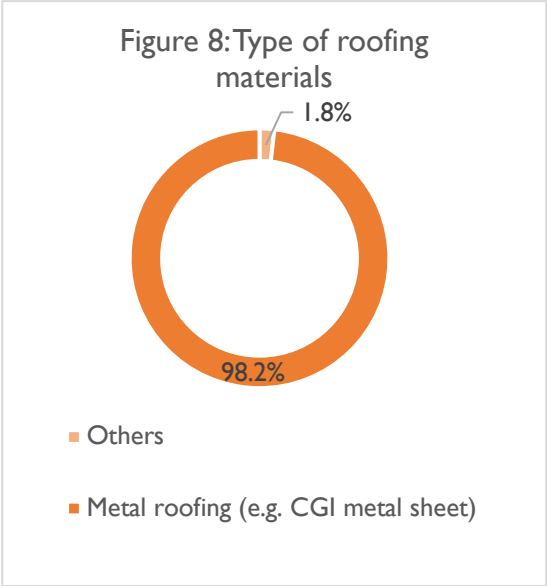
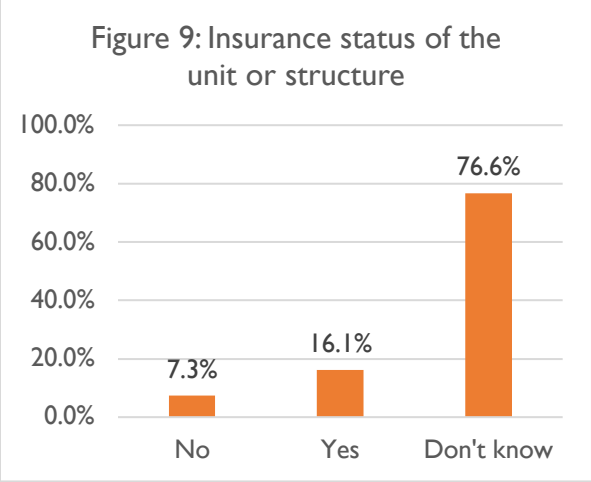
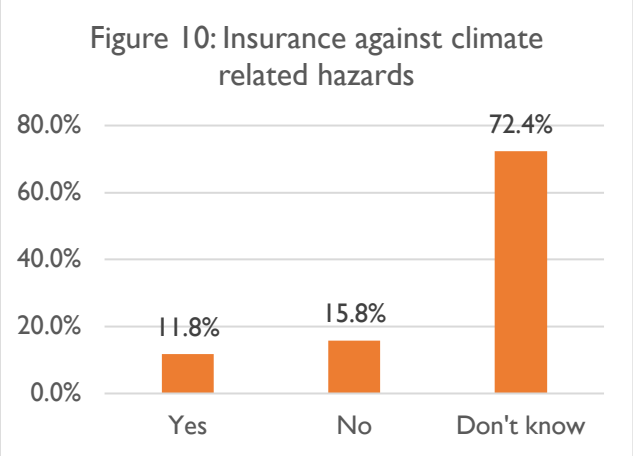


Figure 8: Type of roofing materials

The survey also sought to check the type of construction materials of the outer walls of the respondents indirectly to check the resilience of the structure against any anticipated climate-induced hazards. About 73.4 percent of the structure was made of bricks walls followed by 18.7

percent 'Wood and bricks' as shown in figure 7. Similarly, figure 8 shows a pie of roofing materials. A glaring 98.2 percent of the structure covered by this survey comprised 'Metal roofing.'





Upon being asked whether the unit or the building the respondent dwelt is insured, a little more than three-quarters (76.6%) of them did not know about the same (figure 9). In a similar manner, figure 10 shows whether the structure was insured against climate related hazards. Around 73 percent of the respondents were oblivious of the insurance of the unit or building they dwell against the climate related hazards.

4.4. Knowledge

This section presents the residents' knowhow on climate change and its impacts. Respondents were asked 10 specific questions to subjectively test their level of knowledge on climate change and its detrimental impacts. The variables under consideration were also aimed at unfolding the level of respondents' knowhow on the adaptive capacity and resilience. However, this study solely presents the descriptive analysis of those variables and does not establish any causality or comparative analysis. To check for the robustness of scales employed in measuring those 69 items with 3 and 5-point Likert scale, the Cronbach's Alpha value is computed. Cronbach's Alpha value of 0.800 indicates the robustness of scales (reliability) used in this study that has surpassed the threshold limit of 0.6 (Nunnaly, 1987). The Cronbach's Alpha based on standardized items (0.797) as well show a very good internal consistency (covariance) of the items. This aforementioned value particularly shows that despite several unequal scales (different metrics such as 'strongly agree to strongly disagree' and 'Yes, No, 'Not sure') used in this study, the reliability is quite high after standardization.

Table 6: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.800	0.797	69

4.4.1. Awareness on climate change

The respondents were made to rate their awareness on climate change with three levels of scales namely 'Awareness,' 'Not at all aware,' and 'Not aware' as illustrated in table 7. A little more than 9 out of every ten (92%) were aware of the term, 'Climate change.' By gender, 51.6 percent of the females are aware of the climate change as against 40.2 percent males. In Thimphu, about 52 percent of the females are aware of climate change as against 39.9 percent males. About 0.3 percent of the LGBT++ Individuals were also aware of the term, 'Climate change.' Close to half (47.5%) of the female respondents in Paro are aware of the climate change, which is less by 4.5 percentage points as compared to Thimphu. A little more than 4 out of every ten (42.5%) male respondents in Paro had reported that they were aware of the climate change.

Table 7: Awareness on the term, 'Climate change'

Area	Level of awareness	Female	Male	LGBT++ Individuals	Total
Paro	Aware	47.50%	42.50%	-	90.00%
	Not at all aware	1.20%	-	-	1.20%
	Not aware	3.70%	5.00%	-	8.70%
	Total	52.50%	47.50%	-	100%
Thimphu	Aware	52.00%	39.90%	0.30%	92.20%
	Not at all aware	0.60%	0.60%	-	1.20%
	Not aware	4.40%	2.10%	-	6.50%
	Total	57.10%	42.60%	0.30%	100%
Both	Aware	51.60%	40.20%	0.30%	92.00%
	Not at all aware	0.60%	0.60%	-	1.20%
	Not aware	4.30%	2.40%	-	6.70%
	Total	56.60%	43.10%	0.30%	100%

Following the question on the level of awareness, respondents were asked whether they had noticed or encountered the events related to climate change during their stay in the current place of dwelling over the years. Table 8 shows that amongst the 9 climate-induced hazards witnessed over the years by the respondents at their current location or community, the highest mean is secured by the event, 'Global warming' ($\underline{X}$=4.15; $\int$ =0.66) followed by 'Changing weather patterns' ($\underline{X}$=4.11; $\int$ =0.65), 'Increase in air temperature' ($\underline{X}$=4.07; $\int$ =0.67), and 'Wild fires' ($\underline{X}$=3.83; $\int$ =1.16). The modal value of 4 indicates the most common response of the choice, 'Agree' respondents have checked. The highest modal value corresponds to the item, 'Wild fires.' The statements or items that secured lowest means was 'Frequent landslides (both wet and dry)' ($\underline{X}$=2.93; $\int$ =1.17). Smaller std. deviations across all the items indicate that the variability is small and most of the data are clustered near the means whereby we can bank on the average or mean well for drawing certain conclusions from this study.

Table 8: Climate change events witnessed over the years [5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Strongly disagree]

Events	*Valid N*	*Mean*	*Mode*	*Std. Deviation*
Global warming (e.g melting snow in the mountains)	27,945	4.15	4	0.66
Changing weather patterns (erratic rainfall & hotter period)	27,873	4.11	4	0.65
Increase in air temperature	27,830	4.07	4	0.67
Wild fires	27,655	3.83	5	1.16
Poor air quality	27,833	3.75	4	1.01
Windstorm	27,732	3.56	4	1.05
Stronger and more frequent floods	27,904	3.29	4	1.21
Increased use of chemicals for agriculture	27,839	2.95	3	1.09
Frequent landslides (both wet and dry)	27,872	2.93	2	1.17

The following sub-section analyzed the events of climate change, which respondents either noticed or encountered in the community ever since they started living there. Figure 11 depicts the noticing of global warming via melting of snow over the years. Following the top box method (combining like terms), about 89.5 percent of the respondents have noticed global warming over the years. This variable is solely based on the 'melting of snow in the mountains' the respondents have witnessed over the years. On the contrary, about 2.2 percent of them have disagreed with the statement. Also about 8.3 percent of them have checked the category, 'Don't know.' Going by the gender, a little more than half (51.3%) of female respondents have agreed to have noticed the global warming ever since they lived in the present area or community as compared to 38 percent male respondents with a stark difference of 13.3 percentage points. Quite interestingly, on the contrary, about 0.2 percent of the LGBT++ Individuals has agreed with the statement. In a similar vein, about 86.9 percent of the respondents have noticed an increase in air temperature over the years in their community with less than 2 percent of them negating the statement. A little more than10 percent of the respondents have checked the category, 'Don't know' (Figure 12).

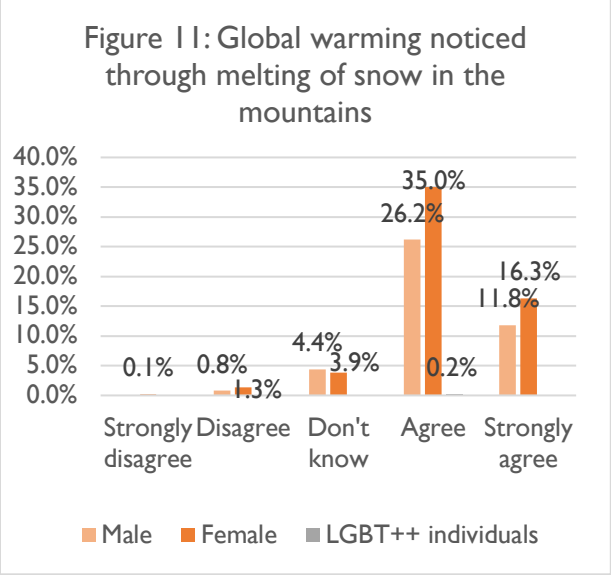


Figure 11: Global warming noticed through melting of snow in the mountains

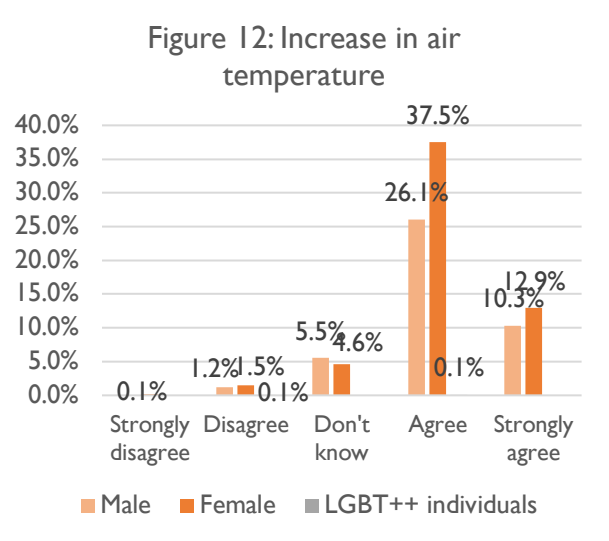
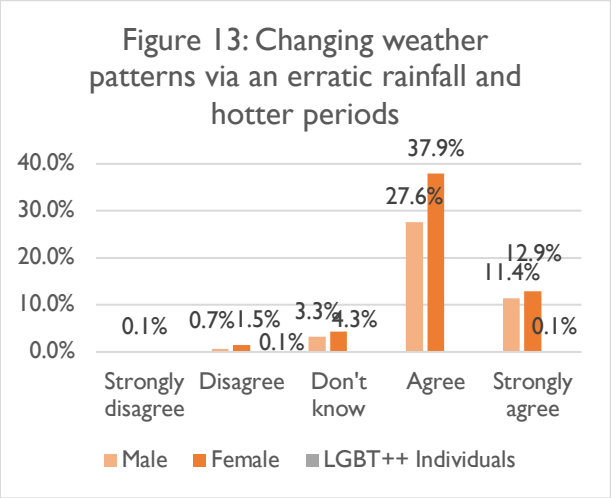


Figure 12: Increase in air temperature

Figure 13 revealed that about 89.6 percent of the respondents agreed having noticed the change in weather patterns in their community. To narrow down and be specific with the perspectives on changing weather patterns of the respondents, two parameters were used viz. 'erratic rainfall' and 'hotter period.' In the like manner, table 14 revealed about 71.3 percent of the respondents having agreed upon noticing the increased use of chemicals for agriculture as

opposed to a little more than 14.5 percent who did not agree to the statement (Figure 14). A close to 14 percent have remained neutral to the statement.



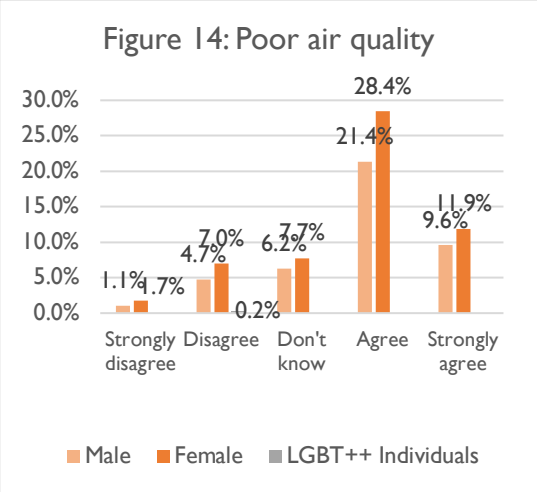
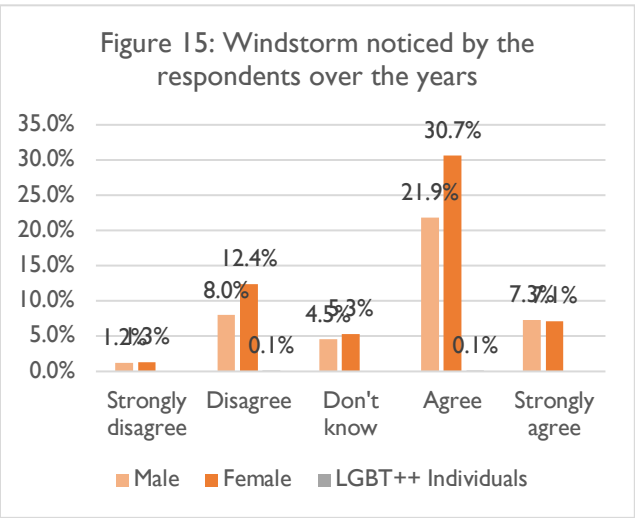


Figure 15 on the other hand depicts the windstorm noticed by the respondents over the years. More than two-thirds (69.1%) have reported to have noticed windstorms over the years in their community. Here too, close to 10 percent have remained neutral to the statement. Close to a quarter (22.9%) of the respondents have disagreed that they noticed any of such events. To subjectively assess the knowledge gap of the respondents, a particular option, 'forest fire/wildfire' was made to choose. About 69.1 percent of the respondents have reported to have noticed the 'Wild fires' over the years in their community (Figure 16). On the other hand, about 22.1 percent of the respondents disagreed with the notice of the same followed by about 97.7 percent of them who were oblivious of the wild fires. Since only about 4 percent of the wildfires is considered as climate-induced hazards as against the remaining 96 percent, which are mostly caused by humans out of their careless and unauthorized activities (Speck, O & Speck, T, 2024), this particular finding indicated a sizable knowledge gap amongst the respondents as regards to the climate-induced hazards events they reported as have noticed over the years.



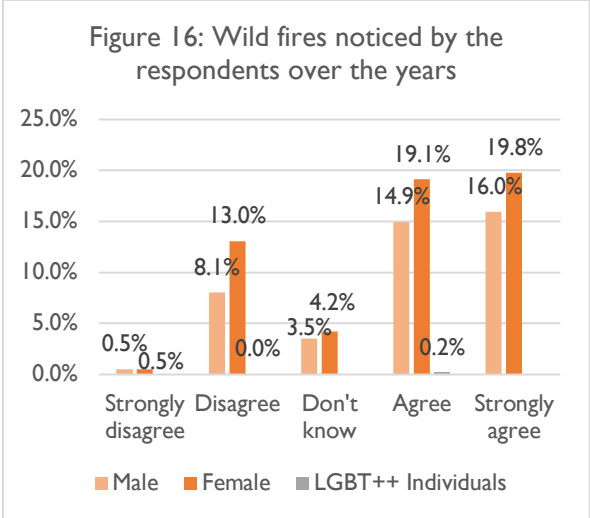


Table 9 presents the aftermaths of the climate change impacts noticed or encountered by the respondents over the years. The top three aftermaths the respondents have reported are 'Health hazard' (50.7%), 'Damage to property' (17.1%) and 'Lack of portable water' (13.7%). Interestingly, only about 0.1 percent of the females in Thimphu alone reported 'Anxiety' as an aftermath of the events they noticed over the years. Another effect the respondent mentioned is the 'Loss of income' (6.6%) as a result of climate change-induced events. About 11 percent of the respondents have reported having no effects on their community. Less than one percent of the respondents have reported the aftermath of the climate-induced event they noticed as 'Devastating psychological impact especially for women and children.' Going by the gender, more female respondents (56.6%) have noticed the events as compared to males (43.2%), which makes a stark difference of 13.2 percentage points. This may be due to more proportion of female respondents covered by this study out of sheer probability. In a similar vein, about 0.2 percent of the LGBT++ Individuals reported health hazard and lack of portable water as an aftermath of the climate change-induced events they noticed or encountered over the past years in their community.

Table 9: Aftermaths of the climate change impacts noticed by the respondents over the years

Effects/Gender/Landscapes	*Paro*		*Thimphu*			*Both*
	Female	*Male*	*Female*	*Male*	*LGBT++ Individuals*	*Total*
Anxiety	-	-	0.10%	-	-	0.10%
Damage to property	2.70%	3.70%	4.50%	6.10%	-	17.10%

Devastating psychological impact especially women and children	0.10%	-	0.10%	-	-	0.20%
Health hazard	0.10%	0.20%	29.10%	21.10%	0.10%	50.70%
Lack of portable water	0.50%	-	7.00%	6.10%	0.10%	13.70%
Loss in agricultural production	0.00%	-	0.30%	0.30%	-	0.50%
Loss of income	1.40%	0.60%	3.00%	1.60%	-	6.60%
No effects	0.10%	-	7.40%	3.40%	-	11.00%
Total	5.00%	4.60%	51.60%	38.60%	0.20%	100.00%

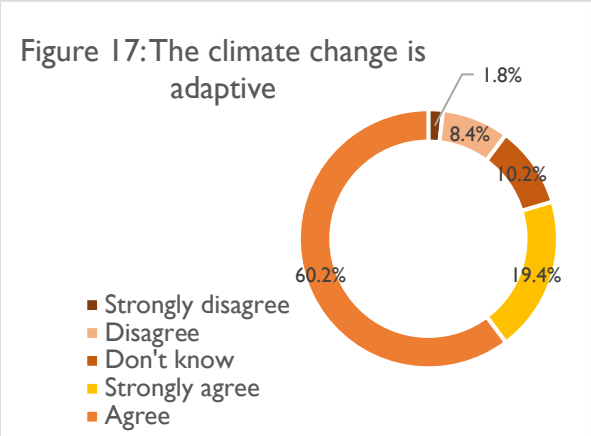
The survey also sought to learn the level of knowhow of the respondents on the main causes of climate change. A specific question was asked as to what mainly causes climate change according to them with 7 checklists including an open-ended column, 'Others.' Table 10 presents the detailed scenario of the causes of climate change reported by the respondents. 'Producing more harmful gases (e.g. carbondioxide, methane, etc); Improper waste disposal by factories and households' (66.4%) tops the list followed by 'Deforestation' (16.3%). About 5.3 percent of the respondents have asserted that Climate change occurs upon displeasing local deities. About less than one percent has even asserted that climate change occurs due to heavy rainfall. This is an excerpt from the open-ended column, 'Others.' Similarly, about 2.5 percent have asserted that none of those 11 checklists are the causes of climate change. A close to one percent of them have reported either 'Don't know' or 'No idea.' About 4.6 percent of the respondents proclaimed the cause of climate change as 'Improper waste disposal by factories and households.'

Table 10: Causes of climate change according to the respondents

Effects/Gender/Landscapes	*Paro*		*Thimphu*			*Both*
	Female	*Male*	*Female*	*Male*	*LGBT++ Individuals*	*Total*
Carelessness of people	-	-	0.20%	-	-	0.20%
Climate change is natural	1.00%	0.90%	1.20%	0.10%	-	3.30%
Climate change occurs upon displeasing local deities	1.40%	-	3.20%	0.80%	-	5.30%
Deforestation	0.70%	0.30%	10.20%	4.90%	0.10%	16.30%
Don't know	-	-	0.30%	0.10%	-	0.40%
Electricity generation; Climate change is natural	0.10%	-	-	0.10%	-	0.30%

Heavy rainfall	0.10%	0.10%	-	-	-	0.20%
Improper waste disposals by factories and households; Electricity generation	1.20%	1.20%	1.40%	0.90%	-	4.60%
No idea	-	-	0.50%	-	-	0.50%
None of the above	0.50%	0.50%	1.00%	0.50%	-	2.50%
Producing more harmful gases (e.g. carbondioxide, methane, etc);Improper waste disposals by factories and households	0.80%	1.40%	33.90%	30.20%	0.10%	66.40%
Total	5.80%	4.40%	51.90%	37.70%	0.20%	100.00%

Figure 17 shows the direct opinion of the respondents on the adaptability of climate change. 6 out of every 10 respondents have opined ("Agree") that climate change is adaptive followed by close to 20 percent who opined ("Strongly agree") that climate change is adaptive. About 8.4 percent of them disagreed with the statement followed by close to 2 percent, 'Strongly disagree.' About 10.2 percent of the respondents have reported the category, 'Don't know.'



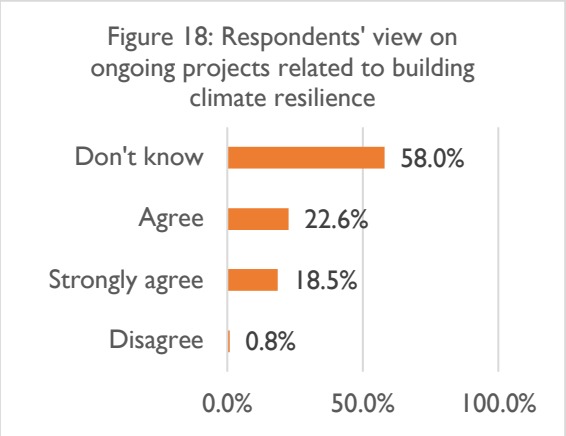


Table 11 illustrates the statement, 'Climate change is adaptive' segregated by project landscape and gender. On a 5-point Likert scale (Strongly agree to strongly disagree), upon disaggregated by project landscapes, about 2.4 percent of females in Paro have strongly agreed to the statement, 'The climate change is adaptive' followed by 1.8 percent of males. On the contrary, an equal proportion (0.1%) of them have checked the categories, 'Disagree' and 'Strongly disagree' respectively. As compared to Paro, about 8.5 percent of females in Thimphu have agreed to the abovementioned statement. Amongst the third gender, an insignificant proportion (0.2%) of the LGBT++ Individuals have agreed to the statement.

Table 11: The climate change is adaptive

Effects/Gender/Landscapes		*Agree*	*Disagree*	*Don't know*	*Strongly agree*	*Strongly disagree*	*Total*
Paro	Female	2.4%	0.1%	-	2.4%	0.1%	5.1%
	Male	2.5%	-	0.2%	1.8%	-	4.6%
Thimphu	Female	29.9%	5.0%	6.9%	8.5%	1.3%	51.6%
	Male	25.2%	3.2%	3.1%	6.7%	0.4%	38.5%
	LGBT++ Individuals	0.2%	-	-	-	-	0.2%
	Total	60.2%	8.4%	10.2%	19.4%	1.8%	100.0%

Table 12 illustrates the solutions pertaining to the impacts of climate change. A little more than 4 out of every 10 respondents (43%) have reported that they don't know about solutions against the impacts of climate change. However, a little more than 2 out of every 10 (21.9%) of them responded that if collaboration of different tiers of the government (e.g. from local to national and international levels) is implemented, it could be the solution to combat the impacts of climate change. Around 10.7 percent have reported that the solution could be both 'Ecosystem-based adaptation (EbA)' and 'Collaboration of different tiers of the government.' Sum 9.5 percent of the respondents have reported that 'Value local knowledge and strengthen local organizations and planning processes' could be the possible solution to combat the impacts of climate change. About 8.5 percent have reported just 'Ecosystem-based adaptation (EbA)' as a solution to combat impacts of climate change. Similarly, less than 5 percent have suggested both 'Ecosystem-based adaptation (EbA);Adoption of participatory approaches' as the solution for the same.

Table 12: Respondents' awareness on climate change impact solutions

Solutions	*Paro*		*Thimphu*			*Both*
	Female	*Male*	*Female*	*Male*	*LGBT++ Individuals*	
Adoption of participatory approaches	0.10%	0.20%	1.30%	0.60%	-	2.50%
Collaboration of different tiers of the government (e.g. from local to national and international levels)	1.60%	1.50%	8.80%	6.70%	0.10%	21.90%
Don't know	1.90%	1.80%	23.40%	12.40%	-	43.00%

Ecosystem-based adaptation (EbA)	0.50%	0.10%	3.20%	4.00%	-	8.50%
Ecosystem-based adaptation (EbA);Adoption of participatory approaches	0.10%	0.10%	1.40%	2.00%	-	3.90%
Ecosystem-based adaptation (EbA);Collaboration of different tiers of the government (e.g. from local to national and international)	0.10%	0.10%	5.00%	5.20%	-	10.70%
Value local knowledge and strengthen local organizations and planning processes	0.20%	0.30%	4.00%	4.30%	0.10%	9.60%
Total	4.60%	4.20%	47.00%	35.20%	0.20%	100.00%

As a part of subjectively evaluating the level of their awareness on the climate change related terms, the respondents were asked to check 10 items as illustrated in table 13. The top three terms the respondents are aware of are 'Urban agriculture' ($\underline{X}$ =3.21; $\hat{}$=1.43) 'Parks/National parks' ($\underline{X}$ =2.73; $\hat{}$=0.65), 'Green-belt Zone' ($\underline{X}$ =2.28; $\hat{}$=0.92), and 'Urban forests' ($\underline{X}$ =2.27; $\hat{}$=0.93).

Table 13: Respondents' awareness on the climate change related terms

Terms	*Valid N*	*Mean*	*Mode*	*Std. Deviation*
Urban agriculture	27,945	3.21	1	1.43
Parks/National parks	27,945	2.73	1	1.38
Urban landscape design/planning	27,945	2.40	1	1.38
Green-belt Zone	27,945	2.28	4	1.27
Urban Green Infrastructure/Nature-based urban resilience	27,945	2.28	1	1.35
Urban forests	27,945	2.27	1	1.20
Climate change-induced stresses	27,945	2.17	3	0.93
Wildlife corridors	27,945	2.11	3	0.91
Socio-ecological resilience	27,945	2.11	3	0.93
Natural capital	27,945	1.73	3	0.65

Figure 19 displays the respondents' awareness on the ECRUL Project. Only about 9.8 percent are aware of the existence of the ECRUL Project as against a huge proportion (70.8%) of them who blatantly reported that they were not aware. A close to 20 percent have checked the category of answer, 'Don't know.' Upon asking the source of information on ECRUL Project,

about 86.3 percent of the respondents reported to have learned through Facebook/Social media followed by an equal proportion (3.4%) of them who have learned from friends and this particular survey team.

Figure 19: Respondents' awareness on ECRUL Project

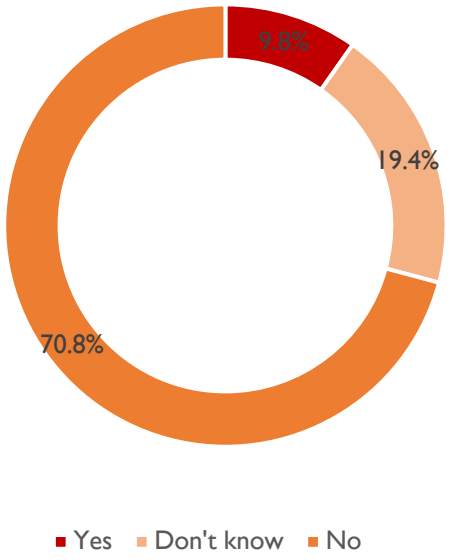
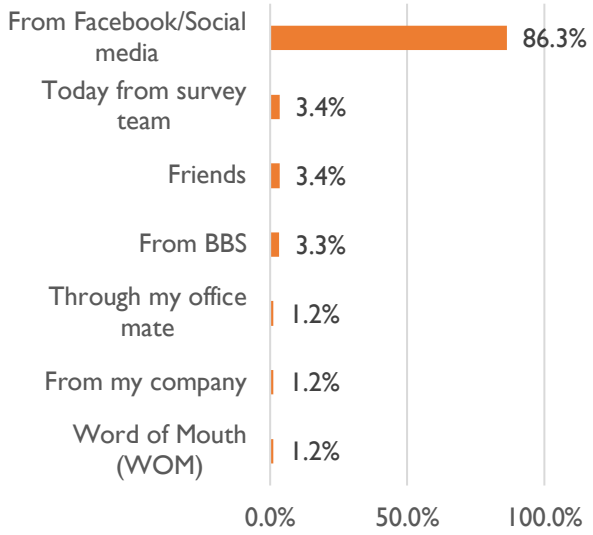


Figure 20: Source of information on ECRUL Project



4.5 Attitude

This section presents the findings related to the attitude of the respondents on climate change, mitigation, and adaptation. There were 18 items or statements made to rate based on 5-point Likert scale (5 being strongly agree to 1 being Strongly disagree). The respondents were also asked to rate based on their level of importance the statements related to the impact of climate change in their community. A Cronbach's Alpha value of 0.7 for 18 items has revealed the high reliability of the scale involved in gauging the ratings of the respondents on those statements describing their attitude. Table 14 illustrates the mean rating of top 5 statements on the attitude of respondents. The highest mean is secured by the statement, 'I am concerned about climate change and its impacts to the community' ($\underline{X} = 4.55;\ \sigma = 0.59$) with modal value of 5 (Strongly agree) followed by the statement, 'Conserve natural resources and energy to prevent climate change issues' ($\underline{X} = 4.39;\ \sigma = 0.72$), and 'I as an individual am ready to do whatever I can to help to preserve the environment'($\underline{X} = 4.39;\ \sigma = 0.97$). Another two statements that secured highest means are respectively, 'Complying with environmental laws can prevent the

impact of climate change'$\left(\underline{X} = 4.34;\ \sigma = 0.71\right)$ and 'Discourage building of infrastructure near vulnerable areas'$(\underline{X} = 4.29;\ \sigma = 0.67)$.

Table 14: Mean rating of Top 5 statements on attitude of respondents [5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Strongly disagree]

Item	*Valid N*	*Mean*	*Mode*	*Std. Deviation*
I am concerned about climate change and its impacts to the community	27,945	4.55	5	0.59
Conserve natural resources and energy to prevent climate change issues	27,945	4.39	4	0.72
I as an individual am ready to do whatever I can to help to preserve the environment	27,945	4.39	4	0.97
Complying with environmental laws can prevent the impact of climate change	27,945	4.34	4	0.71
Discourage building of infrastructure near vulnerable areas	27,945	4.29	4	0.67

4.5.1. Attitude towards mitigation and adaptation for climate change-induced hazards

The survey sought to check the level of mitigation and adaptation of climate change-induced impacts through a couple of statements. An effective climate action requires a balanced approach of both mitigation and adaptation. Following are some of the statements presented in graphs by gender. Figure 21 depicts the compliance with environmental laws to prevent the impact of climate change. Close to 3 out of every 10 (24.8%) females have strongly agreed to the statement, 'Complying with environmental laws can prevent the impact of climate change' as opposed to males (2 out of every 10). This mainly indicates the mitigation of the impacts of climate-induced impacts. Similarly, figure 22 as well shows how concerned respondents are with climate change and its impacts. 'Upon asked to rate the statement, 'I am concerned about climate change and its impacts to the community,' about 33.7 percent of the females have strongly agreed to the statement as against 25.2 percent of the men.

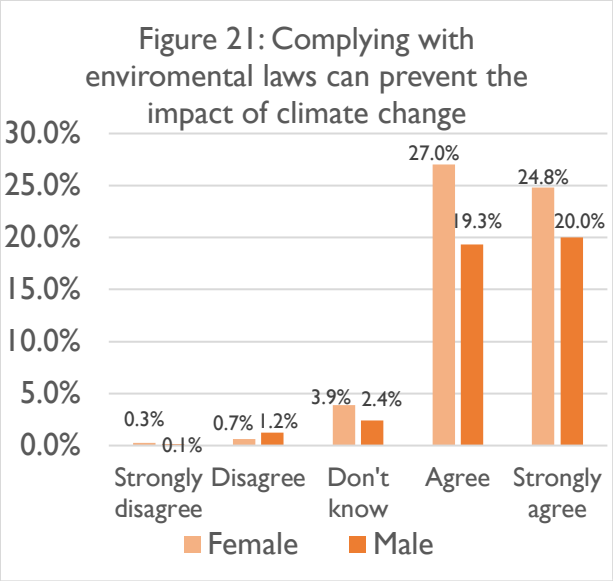


Figure 21: Complying with enviromental laws can prevent the impact of climate change

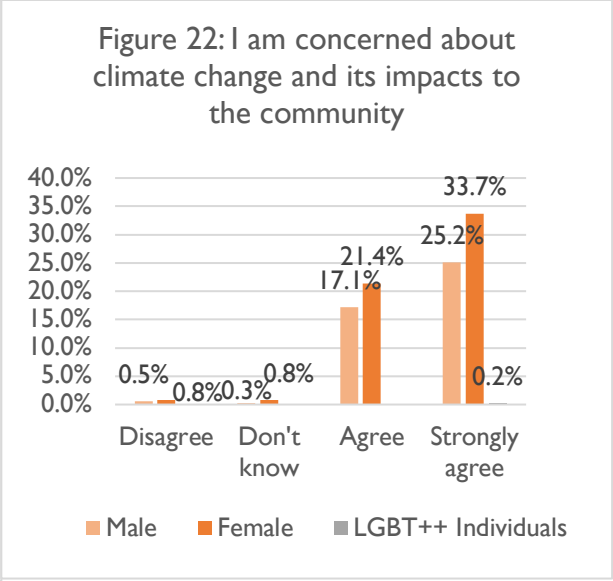
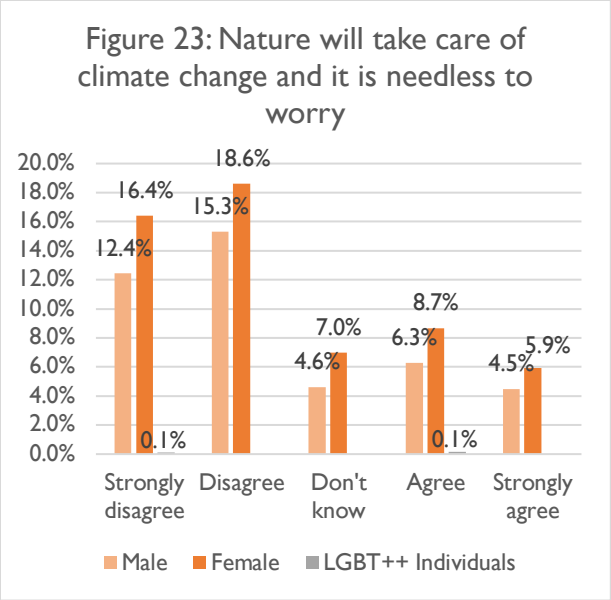


Figure 22: I am concerned about climate change and its impacts to the community

Further, respondents were asked to delve deeper into their attitude on climate change and its impacts. Figure 23 depicts the overall attitude of the respondents. The statement, 'Nature will take care of the climate change and it is needless to worry' had been made to rate. A little more than 10 percent (Male=5.9%; Female=4.5%) have strongly agreed to the statement. On the other hand, about 18.8 percent (Male=12.4%; Female 16.4%) of them strongly disagreed with the statement followed by 33.9 percent who disagreed the same. By the same token, the statement, 'Living for today is more important than worrying about the effects of climate change in the years to come' had been catered to the respondents to rate with their level of agreement. Figure 24 revealed that a little more than 2 out of every 10 respondents (Male =9.4%; Female=14.6%) strongly disagreed with the statement, 'Living for today is more important than worrying about the effects of climate change in the years to come.' On the contrary, 29.8 percent of the respondents have agreed to the statement (Male=14.4%; Female=15.4%). Around 12 percent have chosen the category, 'Don't know' (Male=3.9%; Female=7.8%).



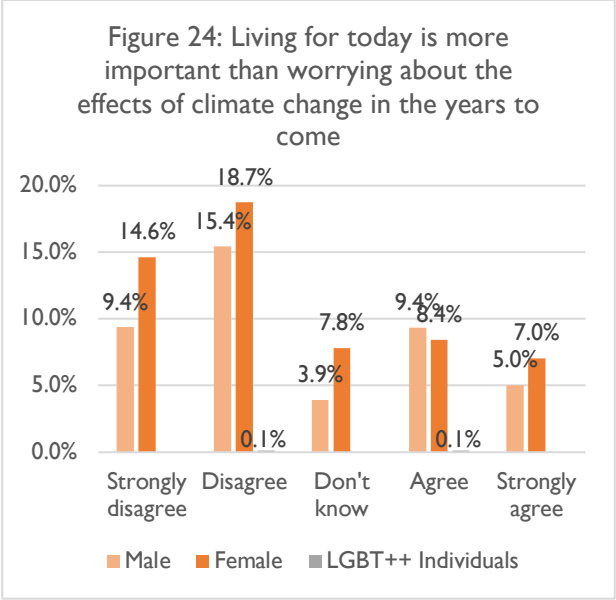
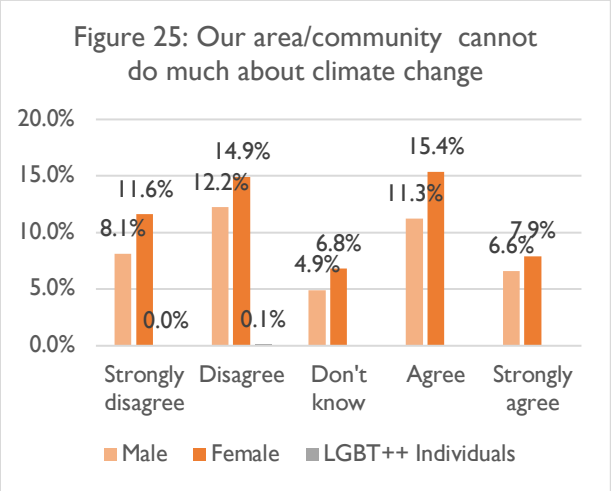
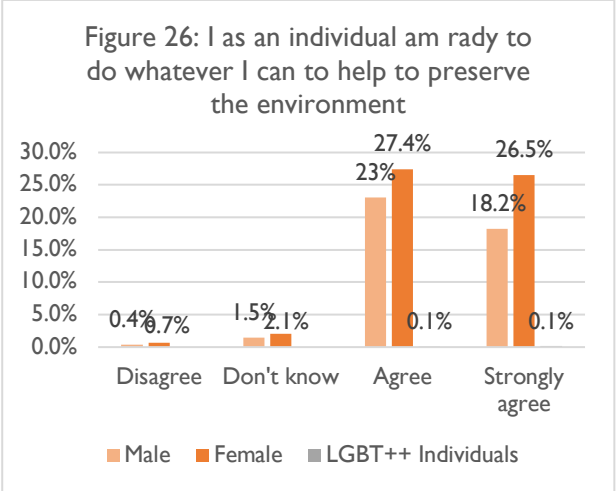


Figure 25 portrays the personal attitude of the respondents and about 41.2 percent (Male=17.9%; Female=23.3%) of the respondents have reported that their area/community cannot do much about climate change. Around 12 percent of the respondents have rated the category, 'Don't know.' Figure 26.1 indicates the attitude of respondents on the preservation of the environment. About 95.2 percent (Female=53.9%); Male=41.2%) of the respondents have reported that they are ready to do whatever to help preserve the environment as against a little more than one percent (1.1%) who disagreed.





Respondents' attitude towards climate resilient structures is depicted in figure 27. Close to three-quarters (73.6%) of them have agreed to the statement, 'Building climate-proof structures near the river basin is a solution to climate change.' This question was intended just to check one of the mitigations for climate resilience as to whether the respondents would agree

upon. However, on the contrary, close to 1o percent of the respondents did not agree to the same. About 17 percent of them have remained neutral. The majority of respondents (91%) have opined disaster management plans in line with the right technology for adaptation can help prevent the impact of climate change. Nonetheless 1.6 percent of the respondents have disagreed with the aforementioned statement. About 6 percent of them have remained neutral (Don't know).

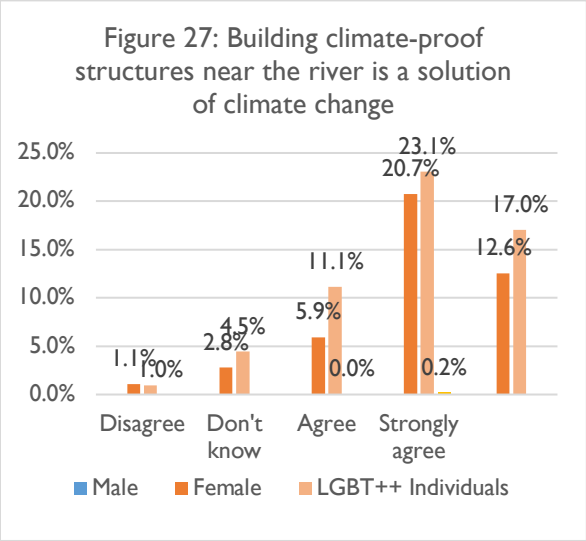


Figure 27: Building climate-proof structures near the river is a solution of climate change

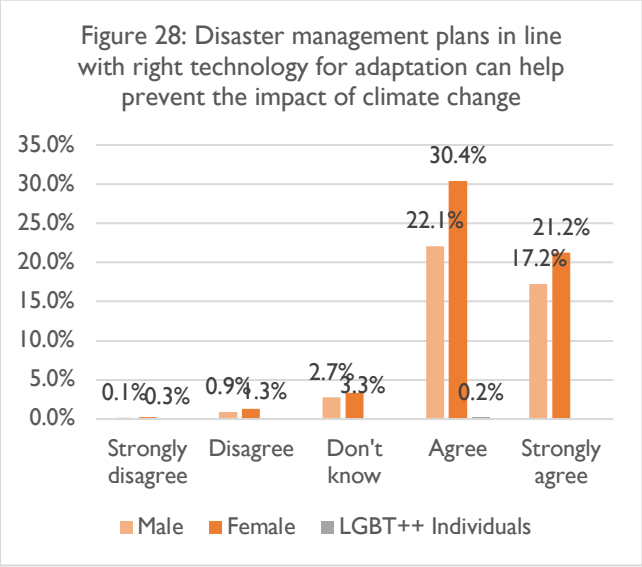
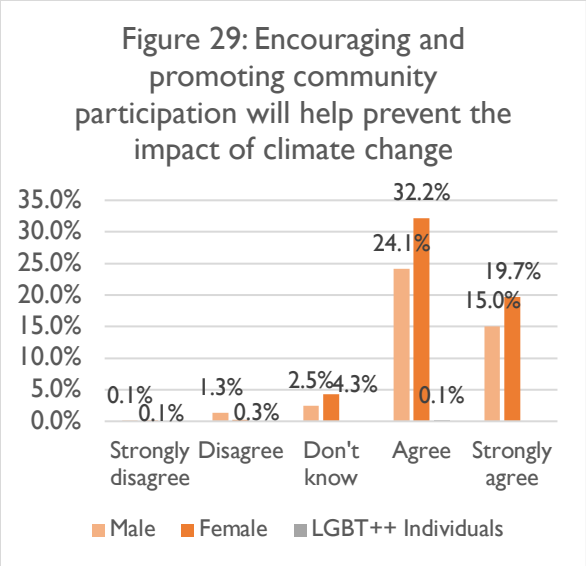
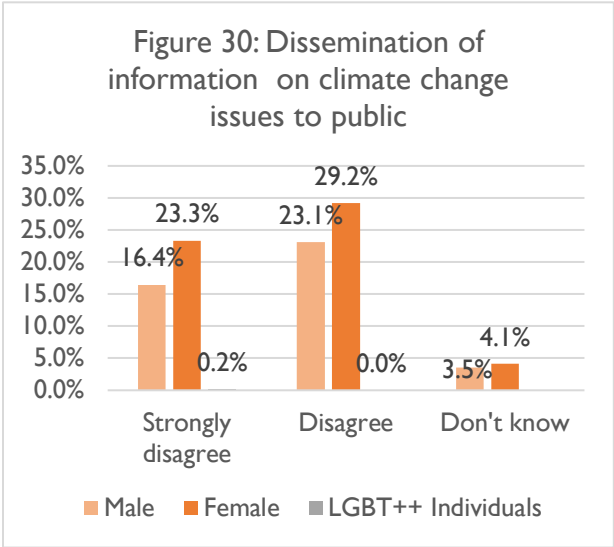


Figure 28: Disaster management plans in line with right technology for adaptation can help prevent the impact of climate change

Figure 29 depicts the respondents' attitude on encouraging and promotion of community participation to help prevent the impact of climate change. A little more than 9 out of every 10 (91.1%) of the respondents have agreed to the statement, 'Encouraging and promoting community participation will help prevent the impact of climate change.' Surprisingly, 92.3 percent of the respondents have disagreed with the statement, 'Dissemination of information on climate change issues to the public needs to be increased' followed by the remaining percentage (7.7%) who have remained neutral as depicted in figure 30.





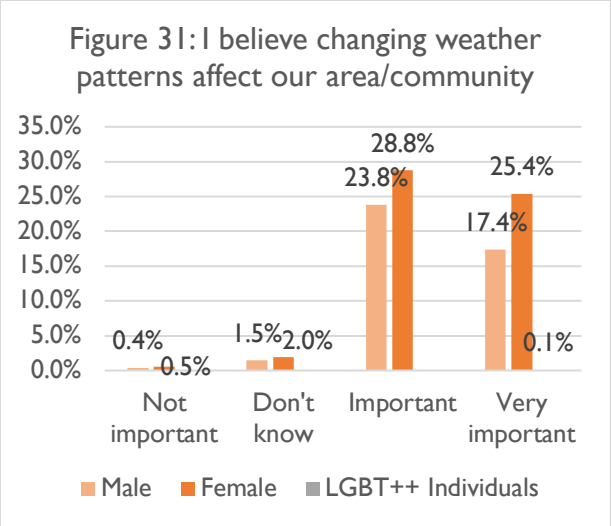
4.5.2 Effects of climate change felt by the respondents

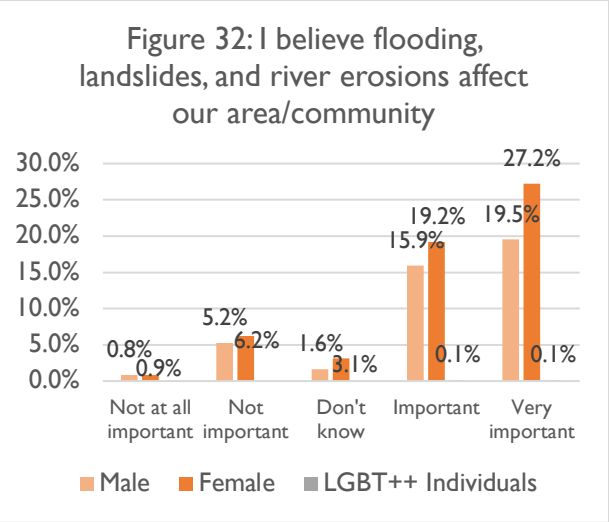
This sub-section highlights the respondents' importance level on the effects of climate change in the area/community they live in. Respondents were made to rate the level of importance for seven items as in table 15. The highest mean is secured by the item,'I believe changing weather patterns affects our area/community' ($\underline{X}$=4.63; $\hat{\sigma}$=0.51) followed by the statement, 'I believe the stronger and more frequent windstorms affects our area/community' ($\underline{X}$=4.41; $\hat{\sigma}$=0.83) and 'I believe increased temperature affects our area/community'($\underline{X}$=4.38; $\hat{\sigma}$=0.60). The modal values are 5 (Very important) and 4 (Important) indicating the maximum responses to these two scales. The two lowest items secured a respective mean of 3.95 and 3.67 corresponding to the items, 'Increased vector borne/water borne diseases affecting our area/community' and 'Frequent forest fires affect the air quality of our area/community' respectively.

Table 15: Perception of level of importance on the climate change related events 95=Very important;4=Important;3=Don't know;2=Not important;1=Not at all important)

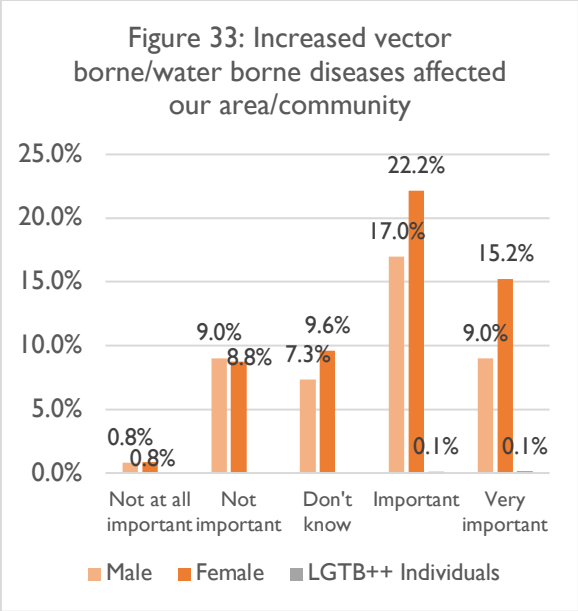
Item	*Valid N*	*Mean*	*Mode*	*Std. Deviation*
I believe changing weather patterns affects our area/community	27,945	4.63	5	0.51
I believe the stronger and more frequent windstorms affects our area/community	27,945	4.41	5	0.83
I believe increased temperature affects our area/community	27,945	4.38	4	0.6
I believe flooding, landslides, and river erosions affect our area/community	27,945	4.23	4	0.77
An individual should learn more about climate change	27,945	4.14	5	1.05
Increased vector borne/water borne diseases affected our area/community	27,945	3.95	4	1.03
Frequent forest fires affect the air quality of our area/community	27,945	3.67	4	1.08

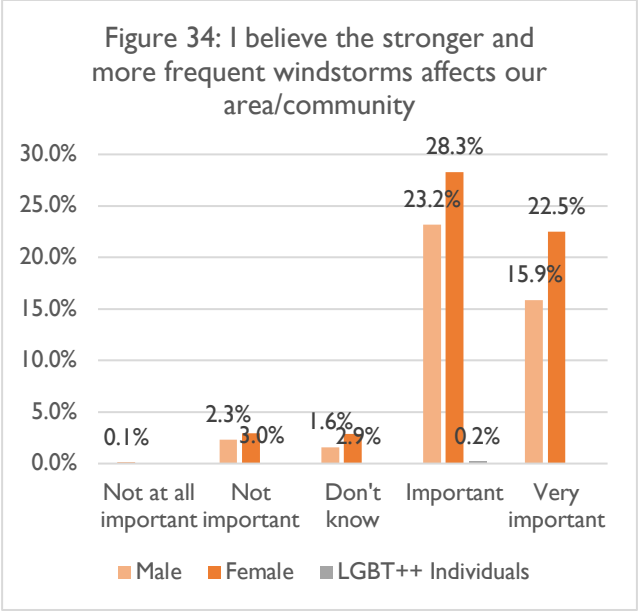
Figure 31 portrays the importance level rated by respondents against the statement, 'I believe changing weather patterns affect our area/community' by gender. About 45.9 percent of females have agreed to the statement as very important as opposed to 8.9 percent of them rating 'Not important.' Asked whether they feel important to the statement, 'I believe flooding, landslides, and river erosions affect our area/community,' about 27.2 percent of females have rated it as very important to the same as opposed to 7.1 percent. About 19.5 percent of males have rated the same statement as opposed to 6 percent who rated it as not important (figure 32).





The survey also rated the respondents on the situation (importance) of vector borne/water borne diseases that affected their community. Based on figure 33, close to two-thirds (63.4%) have reported the statement, 'Increased vector borne/water borne diseases affected our area/community' as important. Going by gender, 37.4 percent of females rated it as important as compared to 26 percent males. A very insignificant percentage (0.02%) of third gender has rated the statement as important. Figure 34 on a similar note explains the severity of the windstorms. The majority (89.9%) of the respondents have felt important with the statement, 'I believe the stronger and more frequent windstorms affect our area/community.' A little less than 5 percent have chosen the category, 'Don't know' indicating they neither feel the statement important nor not important. A total of 5.4 percent of the respondents have rated the statement as not important.





To address the impact of climate change, respondents were asked to choose various responsible parties. Table 16 revealed that a significant percentage (68.5%) of respondents have asserted that everyone needs to be responsible to address the impacts of climate change.

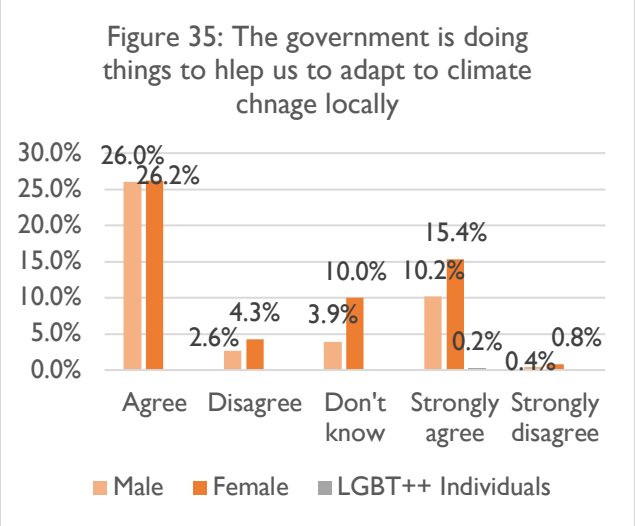
Table 16: Parties responsible for addressing climate change issues in respondents' area/community

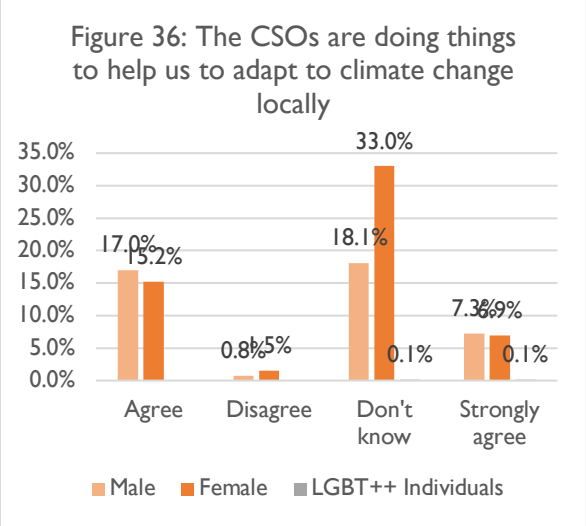
Responsible parties	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	
Businesses/industry	-	-	0.70%	0.30%	-	0.90%
Don't know	0.20%	-	1.10%	0.70%	-	2.00%
Everyone	1.60%	1.90%	29.30%	35.40%	0.20%	68.40%
Government	1.90%	3.00%	6.00%	12.80%	-	23.70%
House owner	-	-	-	0.30%	-	0.30%
Local government	0.20%	0.00%	0.40%	0.60%	-	1.20%
Local people	0.60%	0.10%	1.00%	1.60%	-	3.30%
Whoever is causing the issue should be responsible to address	-	-	0.10%	-	-	0.10%
Total	4.60%	5.10%	38.50%	51.60%	0.20%	100.00%

More than 2 out of every ten (23.7%) respondents felt that the government is responsible for addressing climate change. A small proportion (3.3%) of the respondents feel that local people

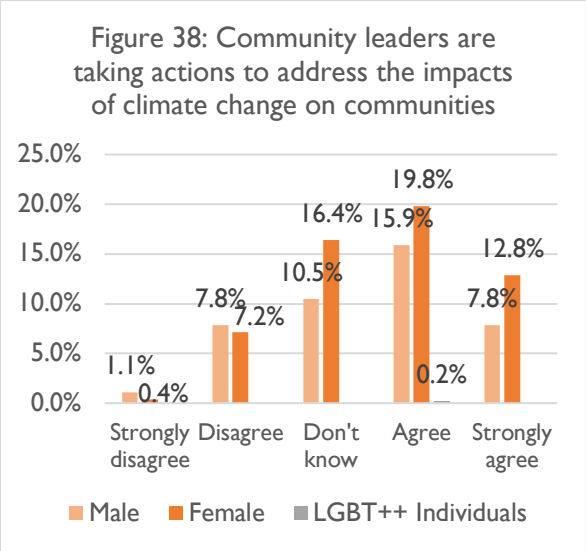
need to take responsibility for taking action against climate change. Interestingly, about 0.2 percent of the LGBT++ Individuals have asserted that everyone should be responsible for addressing the same. Similarly, about 2 percent of respondents have chosen the neutral position (Don't know).

Upon being asked to rate the statement, 'The government is doing things to help us to adapt to climate change locally,' a significant portion of respondents (77.8%) have agreed to the same followed by around 14 percent who reported, 'Don't know.' About 8.1 percent of the respondents have disagreed with the statement as compared to more than three-quarters of agreement as illustrated in figure 35. On the other hand, figure 36 shows the CSO's intervention to adapt to climate change locally. Quite a significant portion of respondents (51.1%) have checked the category, 'Don't know.' This is followed by 2.3 percent who did not agree with the statement, 'The CSO is doing things to help us to adapt to climate change locally.' On the positive note, about 46.5 percent have agreed that the CSO has done things to help them adapt to climate change locally.





When asked whether the community leaders were taking actions to address the impacts of climate change in the communities, more than half (56.5%) of the respondents agreed with the existence of such actions. However, quite a sizable proportion (26.9%) of them did not know about it as shown in figure 38. Similarly, figure 39 shows the community members' actions to address the impacts of climate change in the communities. Close to two-thirds (62.5%) of the respondents reported to have taken actions to combat the impacts of climate change in their communities. About 27.6 percent of them have checked the category, 'Don't know.'



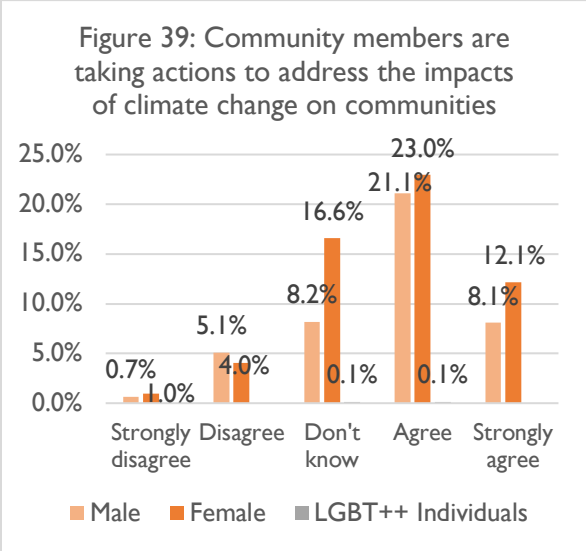
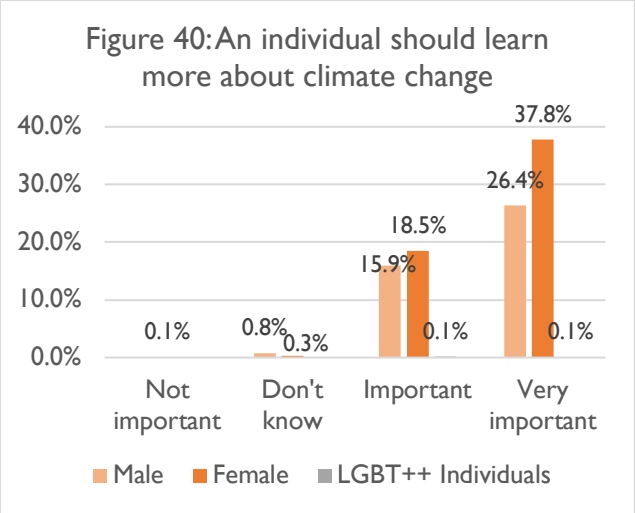


Figure 40 reveals that a huge majority (98.6%) are very interested in finding out more about climate change and rated the statement, 'An individual should learn more about climate change.' In the like manner, figure 41 revealed that a little more than 9 out of every 10 (91.8%) respondents have agreed to the statement, 'I am hopeful that we could do something to adapt to climate change.'



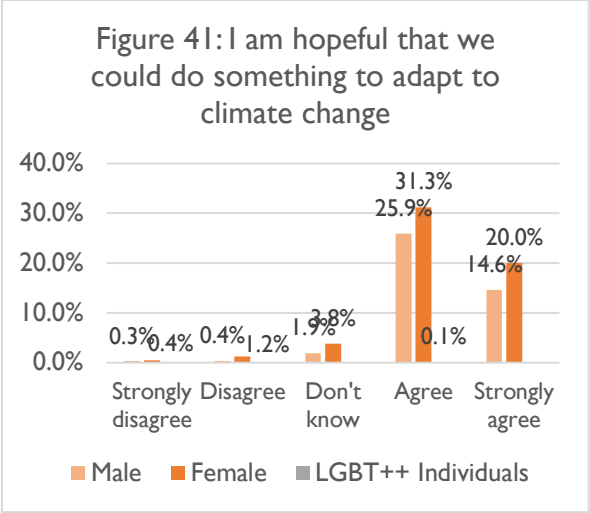
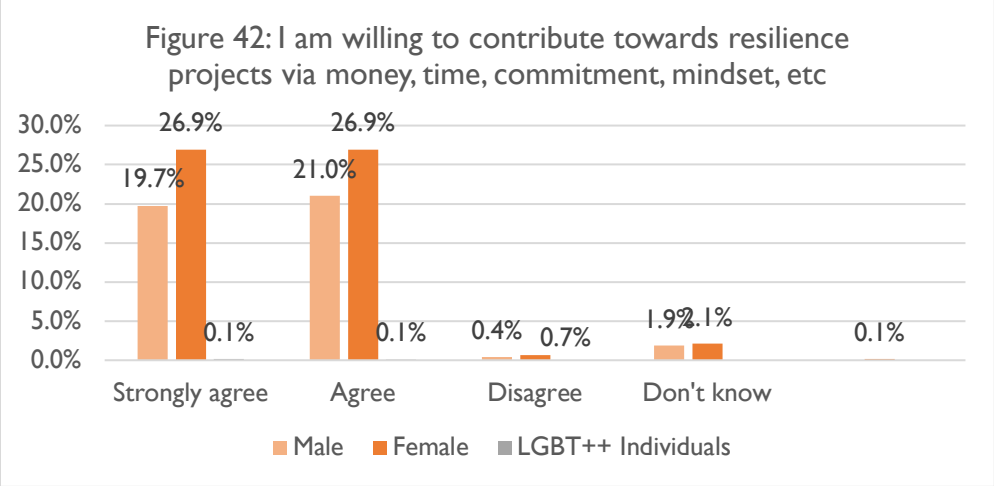


Figure 42 reveals one of the pertinent attitudes of respondents in terms of their willingness to contribute towards resilience projects via money, time, commitment, mindset, and the rest. Upon being asked to rate the statement, 'I am willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth,' based on their level of agreement, about 94.5 percent of the respondents have agreed as opposed to 1.1 percent who disagreed. Upon disaggregated by gender, about 53.8 percent of female respondents have agreed that they are willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth as compared to 40.7 percent male respondents.



4.5.2 Attitude on NbS (Nature-based Solutions)

This sub-section presents some of the statements rated for Nature-based Solutions to climate change. Figure 43 revealed that 6 out of every 10 (60%) female respondents have disagreed that an increased reforestation would mitigate climate change issues. This is also augmented by male

respondents with about 41.9 percent of them strongly disagreeing with the statement, ' Increase reforestation to mitigate climate change issues.' On the other hand, about 48.6 percent of female respondents have agreed to the statement, 'Discourage building infrastructure near vulnerable areas.' About 38.1 percent of the male respondents too have agreed to the same statement as depicted in figure 44.

Figure 43: Increase reforestration to mitigate climate change issues

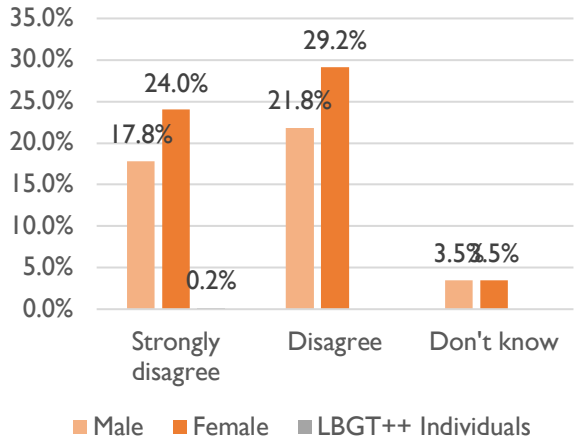
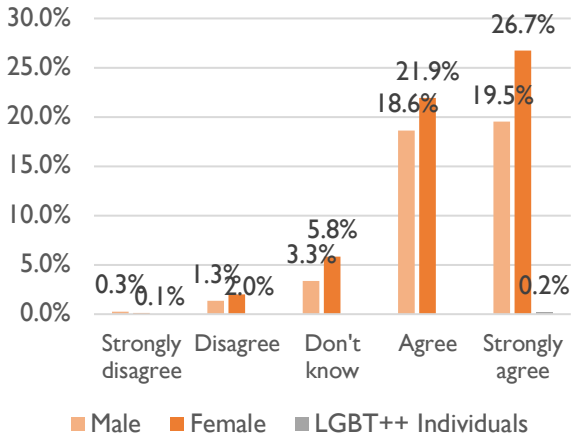
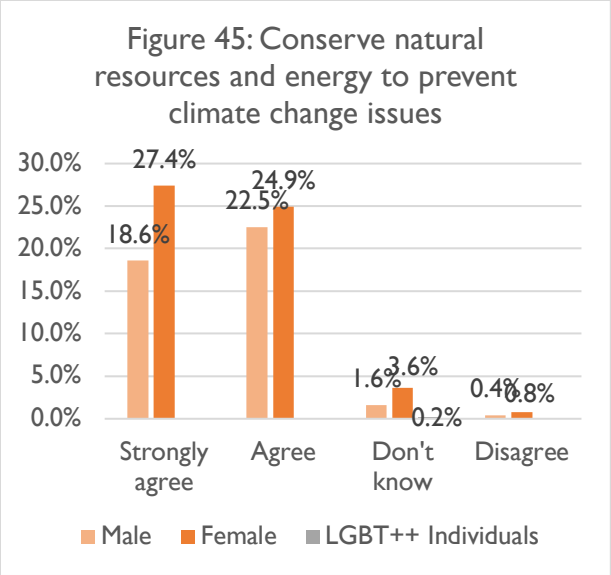
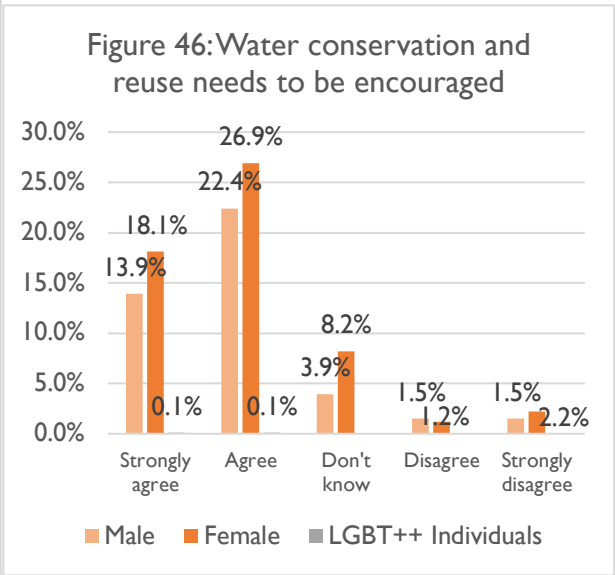


Figure 44: Discourage building of infrastructure near vulnerable areas



About 93.4 percent of the respondents have agreed that it is crucial to preserve natural resources and energy to prevent climate change issues as shown in figure 45. Very little (5.2%) of them have remained neutral to the statement, 'Conserve natural resources and energy to prevent climate change issues.' In a similar vein, figure 46 revealed that about 81.5 percent of the respondents agreed to the statement, 'Water conservations and reuse needs to be encouraged.' On the other hand, 6.4 percent of the respondents strongly disagreed with the above statement with a little more than 1 out of every 10 (12.1%) respondents having chosen, 'Don't know.'





4.6. Practices

This section deals with the prevailing practices to combat climate change related issues by the residents of the project landscapes. About 16 pertinent questions were asked to assess the prevailing practices in terms of both resilience and adaptation followed by the sources of information on climate change and its impacts. Table 17 presents the respondents' or community's actions till date to lessen the impact of climate change by landscapes and gender. A 3-point scale, 'Yes', 'No', and 'Not sure' had been used to gauge the question, 'Have you or the community taken any actions till date to lessen the impact of climate change in your area/community?' More than three-quarters (79.1%) of the respondents have checked the category, 'Yes' as opposed to 13.1 percent 'No.' Around 7.8 percent have checked the category, 'Not sure.' By gender, about 42.3 percent of female respondents in Thimphu have checked the category, 'Yes' as compared to 30.8 percent males. Likewise, almost an equal proportion of male (2.9%) and female (2,8%) respondents in Paro have checked 'Yes.' Going by both the landscapes, about 45.1 percent female respondents have checked the category, 'Yes' as compared to 33.7 percent males.

Table 17: Respondents/community's actions till date to lessen the impact of climate change

Landscape/Gender		*Yes*	*No*	*Not sure*	*Total*
Paro	Male	2.9%	0.4%	1.3%	4.6%
	Female	2.8%	1.5%	0.8%	5.1%
Thimphu	Male	30.8%	5.2%	2.5%	38.5%
	Female	42.3%	6.1%	3.1%	51.5%
	LGBT++ Individuals	0.2%	0.0%	0.0%	0.2%
Both	Total	79.1%	13.1%	7.8%	100.0%

Figure 47 pertains to the category, 'Yes' checked in table 17 above. Amongst those who have taken actions to lessen or prevent the impacts of climate change in the community they live in, about 45.8 percent have followed 'Water management.' This is followed by 30.2 percent of them who followed 'Waste management' and around 8 percent who involved in reforestation (planning trees) vis-à-vis turned off lights and water taps when not in use. This is closely followed by 'Carpooling' (7.3%). About 6.2 percent have turned off lights and water taps when not in use. Close to 5 percent have conserved energy and less than one percent (0.4%) have raised awareness on the issue of climate change.

Figure 47: Actions taken by repondents to lessen or prevent the impacts of climate change in the community

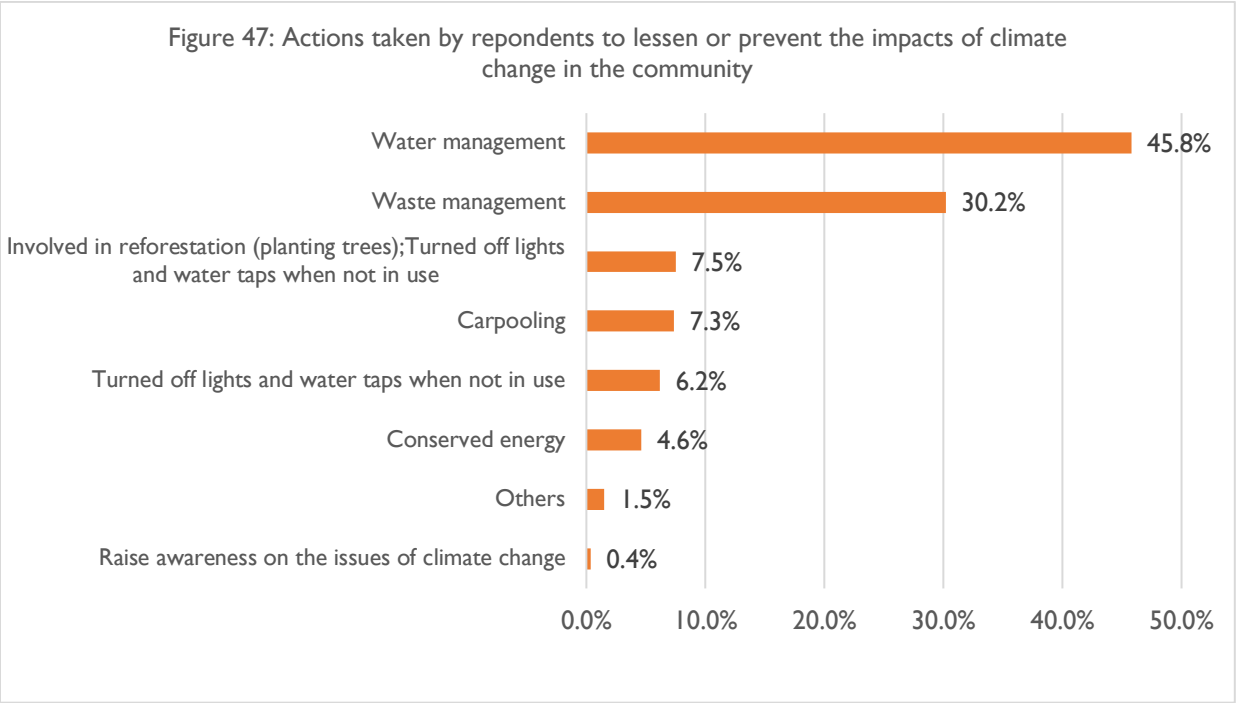


Table 18 illustrates the hindrances in taking any action to prevent or lessen the impact of climate change by project landscapes and gender. The respondents were made to choose multiple items with an open column, 'Others (specify).' The top variable the respondents have chosen is 'Do not have access to information about climate change' with a percentage share of 42.5 percent. This response is closely followed by the variable, 'Do not know what exact action to be taken' (40.3%). Around 14 percent have reported that nobody bothered about climate change in their community. About 0.2 percent of the respondents were partially disabled and have reported their incapacity for above activities.

Table 18: Hindrances in taking any action to prevent or lessen the impact of climate change

Hindrances	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	*Total*
Do not have access to information about climate change	2.30%	2.70%	16.60%	20.80%	0.10%	42.50%
Don not know what exact action to be taken	2.70%	2.30%	15.90%	19.30%	0.10%	40.30%
Everyone is busy	-	-	0.50%	2.00%	-	1.60%
Others	-	0.10%	0.30%	1.40%	-	1.90%
Nobody bothers about climate change in our area/community	0.40%	0.80%	5.50%	6.80%	-	13.60%
Partially disabled	-	-	-	0.20%	-	0.20%
Total	5.40%	5.90%	38.70%	49.70%	0.20%	100.00%

Respondents were further delved with a question on their readiness to overcome climate-induced hazards. Table 19 presents the respondents' immediate action if they came across any one of the climate-induced hazards. A close to half (48.1%) of them have reported that they would follow the advice of the community leaders and other relevant authorities via media. Upon disaggregated by gender, almost an equal proportion (Female=7.8%; Male=8.2%) of them have reported the same. Interestingly, about 34.9 percent of the respondents reported that they won't know what action needs to be taken in such events. By gender, almost twice the female respondents (7.9%) have reported their incapacity to handle such events as compared to males (3.7%). On the other hand, close to 5 percent of them have checked the variable, 'None of such

events can affect me or my community due to our *apriori* knowledge on how to respond to those events.' Going by the project landscape, almost an equal proportion of male (1.5%) and female (1.7%) respondents in Paro have responded to one of the immediate actions they would take in times of sudden climate-induced hazards confronted with as compared to males (13%) and female (17.1%) in Thimphu.

Table 19: Respondents' immediate action if came across any one of the climate-induced hazards

Landscapes/Gender/Immediate action	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	*Total*
Be hopeless and cry	-	-	-	0.10%	-	0.10%
Call emergency	-	-	0.10%	0.30%	-	0.40%
Not sure	-	-	0.00%	0.50%	-	0.50%
Don't know what step to take in such events	0.20%	-	10.90%	23.80%	-	35.00%
Follow my parents	-	-	0.10%	-	-	0.10%
Follow the advice of the community leaders and other relevant authorities via media	2.70%	2.70%	21.90%	20.60%	0.20%	48.30%
None of such events can affect me or my community due to our apriori knowledge on how to respond to those events	1.10%	1.80%	1.10%	0.50%	-	4.40%
Run away	-	-	1.10%	2.00%	-	3.10%
Wait for help from government	-	-	-	0.10%	-	0.10%
We are sensitized on the steps we need to follow by the concerned authorities	0.50%	0.10%	0.90%	0.50%	-	2.00%
We are trained in disaster management	0.00%	0.20%	0.30%	0.10%	-	0.60%
We strictly follow existing early warning systems	-	0.10%	1.30%	1.30%	-	2.70%
We strictly follow existing early warning systems	-	0.10%	1.30%	1.40%	-	2.80%
Total	4.50%	5.00%	38.90%	51.40%	0.10%	100.00%

The survey also sought to explore the type of fuel used by the respondents for daily cooking. The combination of 'LPG gas; Induction cooktop; Rice cooker; Curry cooker' tops the other type of fuel used for daily cooking with a percentage share of 31.8 percent. This is followed by a little more than 2 out of every 10 (21.4%) respondents who used the combination of 'LPG gas; Induction cooktop; Rice cooker; Curry cooker.' This is followed by 16.3 percent of the category of respondents who used only LPG gas and Rice cooker. About 21.4 percent have reported to have used the combination of 'LPG gas; Rice cooker; Curry cooker.'

Table 20: Type of fuel used by the respondents for daily cooking

Fuel	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	
Kerosene; Induction cooktop; Rice cooker; Curry cooker	0.00%	0.30%	1.70%	2.80%	0.10%	4.90%
LPG gas	0.40%	0.30%	0.70%	0.90%	-	2.30%
LPG gas; Fuelwood; Induction cooktop	0.90%	0.80%	0.60%	0.60%	-	2.80%
LPG gas; Induction cooktop; Rice cooker	0.10%	0.20%	13.50%	18.00%	-	31.80%
LPG gas; Induction cooktop; Rice cooker; Curry cooker	2.40%	2.20%	7.00%	9.80%	-	21.40%
LPG gas; Rice cooker	-	0.10%	6.90%	9.30%	-	16.30%
LPG gas; Rice cooker; Curry cooker	0.30%	0.50%	3.70%	4.60%	-	9.20%
Rice cooker	-	-	0.10%	0.10%	-	0.20%
LPG gas; Rice cooker; Curry cooker	0.30%	0.70%	4.50%	5.40%	0.10%	10.90%
Total	4.50%	5.10%	38.70%	51.40%	0.20%	100.00%

Table 21 illustrates interesting facts about the concerned agencies' actions noticed by the respondents against combating the impact of climate change. A little more than half (50.2%) of the respondents have reported that they did not notice concerned agencies carrying out any actions to combat the impacts of climate change. Around 18.5 percent of the respondents have noticed the concerned agencies conducting an awareness campaign in their area or community. One of the actions the respondents' community noticed of the concerned agencies was providing

support to the agriculture sector to improve crop performance (16.4%). About 7.7 percent have noticed an Early Warning Systems for floods and health-related impacts installed. A very insignificant proportion (0.2%) of the respondents reported that the concerned agencies helped to disseminate information about climate change in their community.

Table 21: Actions noticed by the respondents that have been carried out by the concerned agencies to combat the impact of climate change

Action taken	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	
Conducted awareness campaigns in the area/community	2.00%	2.10%	5.80%	8.30%	0.20%	18.50%
Do not take take action in this area to combat the impact of climate change	-	-	-	0.30%	-	0.30%
Disseminated news	-	-	0.50%	-	-	0.50%
Help to disseminate information about climate change	-	-	-	0.20%	-	0.20%
Don't know	0.10%	0.30%	1.00%	0.60%	-	2.00%
Enforced building code	0.30%	0.10%	1.20%	1.30%	-	2.90%
Granted *kidu*	-	-	-	0.20%	-	0.20%
Rebuilding of roads	-	-	-	0.20%	-	0.20%
Improving drains and waste management vehicles	-	-	0.30%	0.70%	-	1.10%
Installed an Early Warning Systems for floods and health-related impacts	-	-	3.60%	4.10%	-	7.70%
Didn't noticed	-	-	21.40%	28.80%	-	50.20%
Provided support to agriculture sector to improve crop performance	3.90%	2.50%	6.30%	3.60%	-	16.40%
Total	6.30%	5.00%	40.10%	48.30%	0.20%	100.00%

Table 22 presents the water shortages experienced by the respondents over the past one year. The frequency of shortage is reported between 1-2 days (37.2%) closely followed by 30.2 percent who reported no shortages whatsoever. About 16.6 percent experienced the shortages between 3-5 days followed by less than a week (7.3%). Close to 7 percent have experienced shortages for more than a week. In the similar manner, less than one percent has experienced about half a day. A very insignificant portion (0.1%) could not remember.

Table 22: Water shortages experienced by the respondents over the past one year

Periods	*Paro*		*Thimphu*			*Both*
	Male	*Female*	*Male*	*Female*	*LGBT++ Individuals*	
Between 1-2 days	1.40%	1.80%	13.70%	20.30%	-	37.20%
Between 3-5 days	0.40%	0.40%	5.90%	9.80%	0.10%	16.60%
Can't remember	-	-	0.10%	-	-	0.10%
Exactly one week	-	0.10%	0.70%	0.60%	-	1.30%
Half day mostly	-	-	-	0.10%	-	0.10%
Half days out of 1 day	-	-	-	0.10%	-	0.10%
Less than a week	0.40%	0.20%	3.50%	3.20%	-	7.30%
More than a week	0.40%	0.20%	3.30%	3.00%	-	6.90%
None of the above	2.00%	2.30%	11.30%	14.50%	0.10%	30.20%
Total	4.60%	5.10%	38.50%	51.60%	0.20%	100.00%

Respondents were also asked about the portable water supply with a reference period of three months. Over the past three months, the majority (83.5%) of them have reported to have experienced the shortage of portable water supply for the whole day (Table 23) followed by an equal proportion (6.1%) of them experiencing between 5-7 hours a day and 'Half a day.' Only a very insignificant proportion (0.4%) of them did not experience such a situation. Table 23 also revealed that male and female respondents in Thimphu (2.8%) and Paro (1.3%) have experienced between 5-7 hours of portable water supply shortage per day over the three months.

Table 23: Hours of portable water supply per day received by the respondents

Frequency of shortage/Landscape/Gender	*Paro*		*Thimphu*		*Both*
	Male	*Female*	*Male*	*Female*	*Total*
Whole day	2.8%	3.3%	32.0%	45.5%	83.5%
Between 5-7 hours a day	0.7%	0.6%	2.5%	2.3%	6.1%
Half a day	1.1%	0.7%	1.9%	2.4%	6.1%
Less than 2 hours a day	0.0%	0.5%	1.7%	1.3%	3.5%
None	-	-	0.3%	0.1%	0.4%
Time to time	-	-	0.1%	0.1%	0.3%
More than 4 days	-	-	0.1%	0.0%	0.1%
Total	4.6%	5.1%	38.6%	51.7%	100.0%

Table 24 has revealed the heating requirements during the cold season and its frequency. The frequency of heating system requirements was gauged by four categories viz. 'At least 5 hours a day', 'More than 5 hours a day', 'Off and on', 'Throughout the season.' A quite significant proportion (98.6%) of the respondents have reported to have used the heating system during the cold season. More than 1 out of every 10 (16%) of the respondents have reported to have used the heating system off and on. A close to 9 percent of them have reported to have used the heating system throughout the season. A close to 5 percent of them have reported to have used the heating system at least 5 hours a day. Around 4 percent have reported to have used the heating system for more than 5 hours a day.

Table 24: Heating system requirements during the cold season and its frequency

Frequency	*Gender*	*Cannot say*	*No*	*Yes*	*Total*
At least 5 hours a day	Male	-	-	2.5%	3%
	Female	-	-	2.3%	2%
	Total	-	-	4.9%	5%
More than 5 hours a day	Male	-	-	1.3%	1%
	Female	-	-	2.2%	2%
	Total	-	-	3.5%	4%
Off and on	Male	-	0.1%	7.5%	8%
	Female	0.04%	-	8.4%	8%
	Total	0.04%	0.1%	16.0%	16%
Throughout the season	Male	-	-	2.8%	3%
	Female	-	-	5.7%	6%
	Total	-	-	8.5%	9%
Total	Male	-	0.3%	14.2%	15%
	Female	0.04%	0.3%	18.7%	19%
	Total	0.13%	0.89%	98.6%	100%

On the other hand, respondents were as well inquired whether they used a cooling system during the warm season. Figure 48 shows that more than half (59.7%) of the respondents have checked the category, 'Yes' meaning requiring the cooling system during the warm season. By gender, about 33 percent of female respondents have reported to have required cooling systems during the warm season by 6.3 percentage points as compared to males (26.7%). In terms of

frequency of the requirement of cooling system, figure 49 revealed about 26.8 percent of the respondents have reported to have required them off and on. Less than one percent have reported that they do not use or require the cooling system during the warm season.

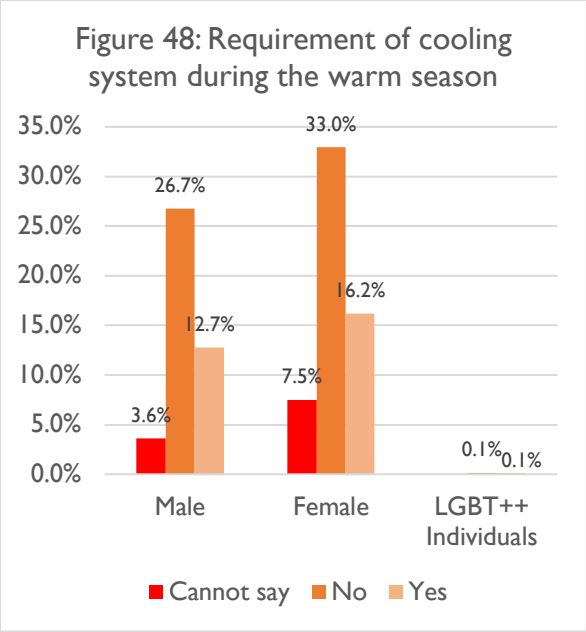


Figure 48: Requirement of cooling system during the warm season

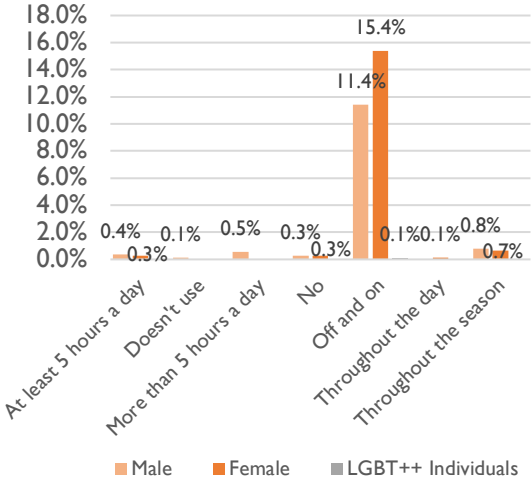


Figure 49: Requirement of cooling system by frequency

Table 25 presents the urban setup in the two project landscapes in terms of the existence of some climate adaptation and resilience setups. The item, 'Overall, we can bear the heat in this area' had secured the highest mean of 3.94 with a std. deviation of 0.86. This is closely followed by the item, 'Have urban forest cover to protect us from heat during warm season' ($\underline{X}$=3.92; σ=1.05). On the contrary, upon being made to rate on a 5-point Likert scale, the statement, 'We have lots of drainage issues here' secured the third highest mean of 3.52 with a std. deviation of 1.24. The lowest mean was secured by the item, 'Our area has lots of wetlands' ($\underline{X}$=2.25; σ=1.11).

Table 25: Urban setup in the two project landscapes [5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Strongly disagree]

Items	*Valid*	*Mean*	*Mode*	*Std. Deviation*
Overall, we can bear heat in this area	27,945	3.94	4	0.86
Have urban forest cover to protect us from heat during warm season	27,945	3.92	4	1.05
We have lots of drainage issues here	27,945	3.52	4	1.24
Overall, this urban setup is fine	27,945	3.19	4	1.15
There are enough parks or vegetation covers to combat heat in our area	27,945	2.94	2	1.2
Our area has lots of dusts that were added over the years by river erosion and other flashfloods	27,945	2.54	1	1.56
Our area has lots of wetlands	27,945	2.25	2	1.11

The respondents were asked whether they feel safe with the current place of dwelling from climate-induced hazards. Figure 50 revealed that a little more than one-quarter (27.5%) of the respondents felt safe with the current location they dwell at from the climate-induced hazards. A little more than 4 out of every 10 (40.7%) respondents have reported that they do not know whether they are dwelling at a safe place from climate-induced hazards. On a similar note, figure 51 depicts the level of adaptability of the community respondents dwell at the current location from climate-induced hazards. About 33.3 percent of the respondents have reported that they are not sure whether they are adaptive to the climate-induced hazards. However, a little more than one-quarter (25.3%) of the respondents have reported that they are ready to respond to the climate-induced hazards as opposed to 20.7 percent who are not ready. On the contrary, a little more than 5 percent of the respondents are completely ready to face any climate-induced hazards in their area or community as compared to 15.3 percent of them who are not at all ready.

Figure 50: Overall opinion of the respondents as to whether they feel safe with the current place of living from climate-induced hazards

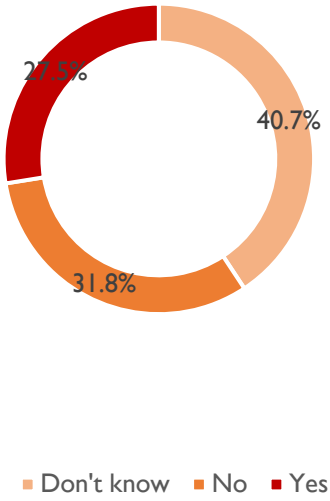


Figure 51: The level of adaptibility of community respondents dwelling at the current location from climate-induced hazards

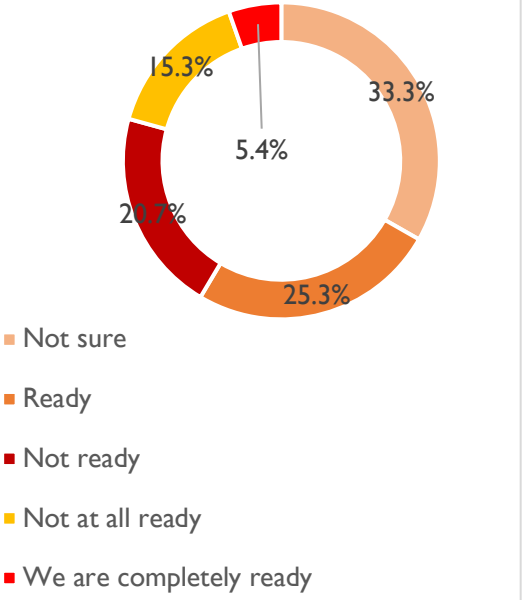


Figure 52 depicts one of the most important prevailing practices in the project landscapes. Asked whether the respondents have attended any consultative meetings or school lessons on climate change, around 36 percent of them have reported, 'Yes' as against a huge percentage of 'No' (63.1%). Less than 2 percent of them have checked the category, 'Don't know.'

Figure 52: Respondents' attendance of consultation meeting or school lesson on climate change

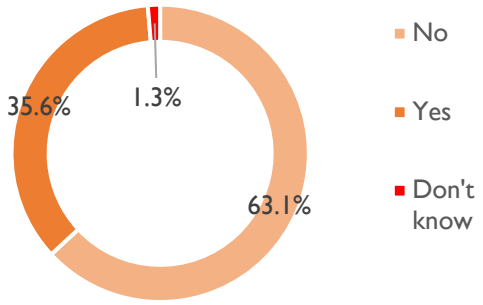


Table 26 is closely related with figure 52 above. Those respondents who have either attended the consultative meetings or school lessons on climate change and its impacts were

asked about the organizer of the same. More than three-quarters (76.8%) of the respondents have reported that they learned about climate change and its impacts in schools. This is followed by the Local Government (7.3%) and the Department of Disaster Management (6.2%). Interestingly, about four percent of the respondents have attended from multiple organizers like 'Local Government, UNDP, Local , School, Department of Disaster Management, and hospital. The UNDP alone secured 2.2 percentage share as the organizer. A close to 2 percent of the organizers were from the Desung organization.

Table 26: Organizer of consultative meetings or school lesson on climate change

Organizer	*Male*	*Female*	*LGBT++ Individuals*	*Total*
College	-	0.9%	-	0.9%
Department of Disaster Management	5.9%	3.7%	0.4%	10.0%
Desuung organisation	2.4%	0.8%	-	3.1%
Don't know	0.8%	-	-	0.8%
Local Government	6.2%	5.6%	-	11.8%
Local Government; UNDP; Local NGOs; School; Department of Disaster Management; hospital	4.9%	1.6%	-	6.5%
School	31.0%	31.0%	0.4%	62.5%
RBA/Police	0.4%	0.4%	-	0.8%
UNDP	2.0%	1.6%	-	3.6%
Total	53.7%	45.5%	0.8%	100.0%

To further delve into the respondents' attendance on the climate change and its impacts' lesson, they were further asked the time period of their attendance, which was their last attendance. This is illustrated in table 27. Around 43 percent of them could not remember their last attendance. However, on the contrary, about 1.4 percent of them have just attended the same in the last week prior to the date of interview followed by 1.8 percent of them who reported 'a month ago.' A little more than one-quarter (26.7%) of them have reported to have attended the lesson or campaign one year ago. Around 14 percent have reported to have attended some 6 months ago. The remaining proportion of the respondents have attended such consultative meetings more than 5 years ago.

Table 27: Last consultative meeting attended on climate change

Last attendance period	*Frequency*	*Percent*
Cannot remember	4,361	42.9%
An year ago	2,708	26.7%
Six months ago	1,383	13.6%
5-8 years ago	583	5.7%
2-4 years ago	478	4.7%
10-15 years ago	280	2.8%
One month ago	181	1.8%
Last week	144	1.4%
During my past school and college days	38	0.4%
Total	10,156	100.0%

On the front of the respondents' access to information on climate change and its impacts, a multiple option was presented before them for the choice as depicted in table 28.

Table 28: Respondents' access to information on climate change and its impacts

	Paro		*Thimphu*			*Both*
Sources of Information	*Male*	*Female*	*Male*	*Female*	*LGBT++ Individuals*	
Children	-	-	-	0.2%	-	0.2%
National Radio	0.2%	0.1%	0.8%	0.4%	-	1.5%
National TV (e.g. BBS)	2.9%	2.6%	0.9%	1.6%	-	8.1%
National TV (e.g. BBS);Social media	1.0%	1.4%	20.5%	33.6%	0.1%	56.7%
No information on climate change is disseminated usually	-	-	3.7%	2.9%	-	6.6%
National TV (e.g. BBS);Social media; Print media; Conference, meeting and parents, teachers, public meetings; school lesson	-	-	3.7%	2.5%	-	6.2%
National TV (e.g. BBS);Social media; Word of mouth	-	-	3.3%	4.3%	-	7.6%
No idea	-	-	0.1%	0.5%	-	0.7%
Print media	-	0.1%	0.7%	0.6%	-	1.4%
Social media	-	0.7%	4.3%	4.8%	-	10.3%
Friends and families	-	-	0.5%	0.2%	-	0.8%
Total	4.6%	5.1%	38.6%	51.6%	0.1%	100.0%

The respondents have learned about the climate change and its impacts from a combined source such as 'National TV (e.g. BBS) and Social media' (56.6%), Social media alone (10.2%), and National TV (8.1%). The 'National TV (e.g. BBS), Social media, Word of mouth' comprise 7.6% of the percentage share as illustrated in table 28. The lowest source of information on climate change and its impacts is children with 0.2 percentage share.

4.7. Empirical Analysis

This section deals with some of the variables that needed more attention to be used as policy variables. A huge number of indicator items or the latent variables were used to define knowledge, attitude, and practices. To check whether these indicator items pegged with Likert type of scales can actually be the metrics or the enough characteristics to sum up in a single definition such as knowledge, attitude, and practices, an EFA (Exploratory Factor Analysis) is carried out in this section. This is usually attained by regrouping variables through reduction of dimension using EFA. Factor Analysis in general is nothing but a multivariate statistical approach used to reduce a large number of variables into small sets of variables or factors mainly to avoid those which are related to each other and duplicate one another. According to Yong and Pearce (2013), FA reduces variables to summarize data so that relationships and patterns can be easily interpreted and understood. Prior to carrying out EFA, all the 69 items were tested for reliability via Cronbach's Alpha to check the patterns of correlation or internal consistency amongst them. The Cronbach's Alpha value stands at 0.8 indicating the robustness of scales employed in measuring those 69 indicator items vis-à-vis is well above the threshold limit of 0.6 (Nunnally, 1978). To testify whether the respondent data captured through this survey is suitable for carrying out EFA, some statistical criteria are computed as illustrated in table 29. KMO and Bartlett's Test. According to Hair, Black, Babin, Anderson, and Tatham (1998) KMO of value over 0.5 is considered as suitable for carrying out EFA. Table 29 revealed that KMO value stands at 0.84, which has surpassed the threshold of 0.5 making this survey data as suitable for conducting EFA. Further, Bartlett's Test of Sphericity tests whether the data is appropriate for EFA. Here, the significant value ($\chi^2 = 609122.539; p = 0.000$)indicates the appropriateness of the data for EFA.

Table 29: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.84
Bartlett's Test of Sphericity	Approx. Chi-Square	609122.539
	df	2415
	Sig.	0.000

Table 30 on the other hand confirms the number of factor extraction. According to (Hair, Black, Babin, Anderson, & Tatham, 1998). The explained variance can vary between 50-60% normally for the humanity studies. The explained variance in this study is 57.2% as shown in table 30. It shows how much of the total variability in your data has been captured by each factor or component.

Table 30: Total Variance Explained

Factor	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*			*Rotation Sums of Squared Loadings*[a]
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*	*Total*
1	8.000	11.429	11.429	7.483	10.69	10.69	5.091
2	5.399	7.713	19.141	4.934	7.049	17.738	4.433
3	3.976	5.679	24.821	3.39	4.843	22.581	5.016
4	3.064	4.378	29.198	2.509	3.585	26.166	3.291
5	2.794	3.991	33.189	2.25	3.215	29.381	3.997
6	2.428	3.468	36.658	1.891	2.701	32.082	3.497
7	1.744	2.492	39.15	1.185	1.693	33.775	2.001
8	1.514	2.163	41.313	0.969	1.384	35.159	1.815
9	1.492	2.131	43.444	0.929	1.328	36.486	2.487
10	1.41	2.014	45.459	0.895	1.279	37.765	3.266
11	1.352	1.931	47.389	0.778	1.112	38.877	2.569
12	1.245	1.779	49.169	0.702	1.002	39.879	2.87
13	1.227	1.753	50.922	0.64	0.914	40.793	1.601
14	1.169	1.67	52.591	0.605	0.864	41.657	1.589
15	1.102	1.575	54.166	0.522	0.746	42.402	2.529
16	1.078	1.539	55.705	0.5	0.714	43.116	1.412
17	1.062	1.517	57.222	0.479	0.685	43.801	1.71

Extraction Method: Principal Axis Factoring.

[a] When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 53 illustrates the Scree Test. We can see from the Scree plot that there are 17 factors whose eigenvalue is one and above. The number of points above the point of inflection is the number of factors to be retained which tantamount to 17 factors meaning the data should be analyzed for 17 factors.

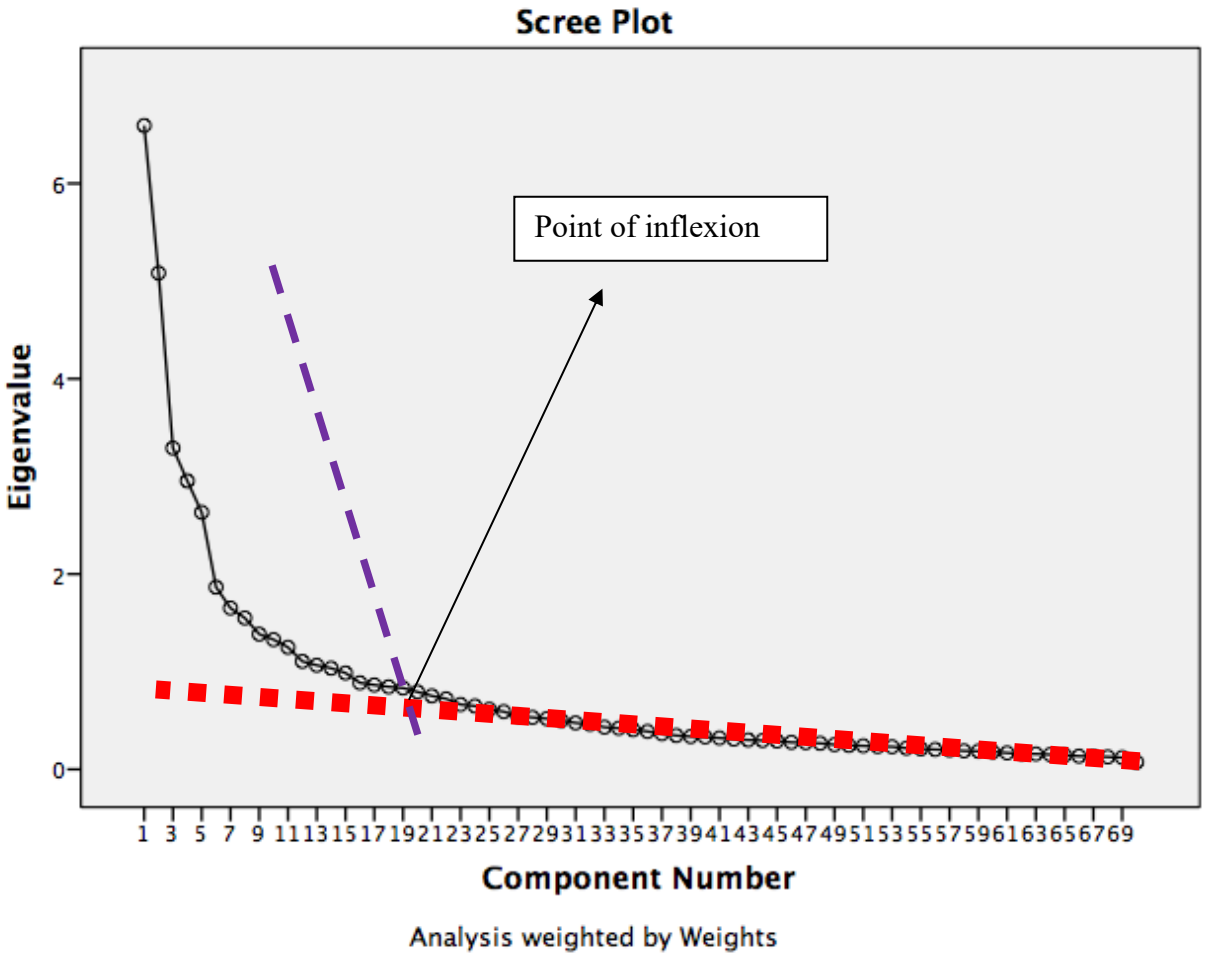


Figure 53: Scree plot

Table 31 illustrates the reduction of dimension of the indicator variables or factors. The Rotated Component Matrix regrouped 69 indicator variables to 31. From this 8 factors are leveled as 'Events noticed in the area or community,' 'Adaptation and resilience,' 'Green urban planning,' 'Mitigation, adaptation, and resilience of climate change-induced hazards,' and 'Action of national and local leaders,' 'Negative attitude towards climate change,' 'Perceived importance on climate change-induced hazards,' 'Helps from government and UNDP.'

The factor loadings are the correlation coefficient between the indicator variables and the aforementioned 8 factors. Rotated component matrix is a result of rotation of factors, which is done to maximize high item loadings and minimize low item loadings producing more interpretable and simplified factor solutions (Thompson, 2004). The factor loadings of those variables ranged from 0.51 to 0.78, which is above the suggested limit value of 0.30 (Hair et al., 1998). The Cronbach's alpha for 8 factors varied from 0.66 to 0.83 indicating high internal consistency within each factor and is well above the lower threshold of 0.50 (Nunnally, 1978).

Table 31: Rotated Component Matrix[a]

	Component									Cronbach's Alpha
Indicator variables/factors	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
KNOWLEDGE										
Events noticed in the area/community										
Stronger and more frequent floods									.638	.736
Frequent landslides (Both wet and dry)									.798	
Adaptation and resilience										
Every individual can do something to adapt to climate change					.669					
Climate change can affect the quality of life for both present and future generations					.630					.705
Human activity is responsible for climate change					.650					
Urban NbS										
Urban Green Infrastructure design/Nature-based urban resilience				.505						
Socio-ecological resilience				.522						
Urban agriculture				.601						
Green-belt Zone				.597						.733
Urban landscape design or planning				.574						
Climate change-induced stresses				.520						
Urban forest				.719						
Wildlife corridors				.523						

Indicator variables/factors	*Component*									*Cronbach's Alpha*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
ATTITUDE										
Mitigation, adaptation, and resilience of climate change-induced hazards										
Disaster management plans in line with right technology for adaptation can help prevent the impact of climate change	0.579									
Encouraging and promoting community participation will help prevent the impact of climate change	0.588									
Discourage building of infrastructure near vulnerable areas	0.577									0.71
Conserve natural resources and energy to prevent climate change issues	0.631									
Water conservation and reuse needs to be encouraged	0.543									
Action of national and local leaders										
Community leaders are taking actions to address the impacts of climate change on communities						0.617				
National level government leaders are taking actions to address the impacts of climate change on communities						0.641				0.757
Community members are taking actions to address the impacts of climate change on communities						0.627				
Negative attitude towards climate change										
Living for today is more important than worrying about the effects of climate change in the years to come		0.78								
Nature will take care of the climate change and it is needless to worry		0.792								0.832
Our area or community cannot do much about climate change		0.671								

Indicator variables/factors	Component 1	2	3	4	5	6	7	8	9	Cronbach's Alpha
ATTITUDE CONTD.										
Perceived importance on climate change-induced hazards										
I believe the stronger and more frequent windstorm effects our area or community			.738							
I believe increased temperature affects our area or community			.567							
I believe flooding, landslides, and river erosions affect our area or community			.667							.779
Increased vector borne/water borne diseases affected our area/community			.661							
Frequent forest fires affect the air quality of our area/community			.692							
PRACTICES										
Helps from Govt. and CSOs										
The government is doing things to help us to adapt to climate change locally								.711		.662
The CSOs are doing things to help us to adapt to climate change locally								.740		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 23 iterations.

CHAPTER 5| QUALITATIVE FINDINGS

This chapter deals with the analysis of qualitative findings from the Key Informant Interviews (KIIs) with the stakeholders of ECRUL project and the FGDs with youth and women.

5.1. Results of KII

This sub-section deals with the Key Informant Interview results. All the stakeholders of ECRUL Project were asked 8 pertinent questions along with one open column for any other comments online. There were 17 responses to the online KII across 13 different organizations (CST, Department of Employment and Entrepreneurship, Department of Livestock, NCWCS, MoIT, PMU,DHS, Thimphu Thromde, WWF Bhutan, Thimphu Dzongkhag, Department of Water, MoIT, WWF-Bhutan, Don't want to report, Ministry of Finance, Department of Forests and Park Services, MoENR). About 47.1 percent of the stakeholder respondents were females as against 52.9 percent males with their ages ranging from 25 to 56 years. All the responses are reported here ad verbum. Following are the responses by the stakeholders based on the respective questions:

5.1.1. The term 'climate resilience'

The stakeholders were asked their understanding of the term, 'climate resilience.' Following ad verbum responses are reported here based on coding and thematic analysis:

"Climate resilience is the resilience of the landscape and the communities to adapt to the changing patterns of the climatic conditions over the time. Climate resilience can be in the form of infrastructure integrity (which can resist or adapt to the change), landscape dynamics (which can remain unaffected or adapt quickly to the changing climatic conditions) and social capital of the communities (diverse livelihoods, institutional mechanism in place and social fabric to resist/fight the impact of climate vagaries)." (Male, 41 years old);

"Climate resilient refers to the ability to anticipate, prepare for, adapt to or recover from the impacts of the climate-related hazards and changes. It is how climate risk considerations are considered into decision-making to ensure sustainability, safety and long-term socio-economic stability." (Female, 31 years old);
"Able to absorb climate change shock." (Male, 46 years old);
"Capacity of communities/infrastructure to withstand or recover from climate related risks." (Female, 43 years old);
"Climate resilience is the ability of people, communities, and systems to prepare for, withstand, adapt to, and recover from climate-related shocks like floods, droughts, or heatwaves, while continuing to function and develop without long-term harm." (Female, 45 years old);
"Infrastructures or Cities being able to withstand and respond to the events induced by the climate Change." (Female, 41 years old);
"being able to withstand negative impacts due to climate induced disasters." (Male, 32 years old);"Ability of cities to overcome climate induced hazards." (Female, 32 years old);
"understanding the environment, preserving it and preventing from environmental disaster." (Female, 41 years old); and
"Capacity of communities/infrastructure to withstand or recover from climate related risks." (Female, 43 years old).

From the thematic analysis of the above results, the common code is the 'resilience', which is an a priori categorization based on the questions. Most of the participants have reported and understood at the same time the term, resilience as the ability or capacity of the communities and existing infrastructure at the place of their dwelling to withstand climate change-induced disasters.

5.1.2. Discussion on 'climate resilience'

Stakeholders were also asked to discuss any one of the urban resilience they knew spanning from economic resilience to social resilience, ecological resilience, and infrastructure resilience. Following are some of the pertinent discussions reported by the stakeholders:

- Infrastructure resilience:

"Urban infrastructure resilience refers to the ability of city systems such as roads, buildings, water supply, drainage, energy, and transport to withstand, adapt to, and quickly recover from climate and disaster risks, ensuring that essential services continue to function during and after shocks like floods, heatwaves, or earthquakes." (Female, 45 years old); and

"Integrating climate-resilient and low-emission principles into housing, surface transport and urban infrastructure such as energy-efficient buildings and promotion of electric mobility." (Male, 32 years old);

- Economic resilience:

"Economic resilience: good financial mechanisms and policies in place to adapt to the changing climatic conditions. For example excellent business continuity plan of the government in the event of climate - induced disaster. Is there enough institutional and financial arrangement to face such challenges, good financial mechanisms in place in the form of insurance schemes for households and businesses and finally diverse investments (not only hydro power but also in solar, wind etc." (Male, 41 years old);

- Social resilience:

"social resilience; ability of the society to withstand climate induced disasters." (Female, 37 years old).

5.1.3. Benefits of climate resilient development

This interview question particularly sought to extract the urban landscape design, green infrastructure design or the urban green infrastructure (UGI) planning such as parks, wildlife corridors, urban forests, and national parks. The climate resilience development is seen as bearer of many positive side effects such as economic stability, avoided future recovery costs, making the communities more livable, and improvement of public health.

"Climate-resilient development, when integrated into urban landscape and green infrastructure design, delivers multiple co-benefits. It reduces climate risks by managing floods, heat, and landslides through parks, wetlands, urban forests, and green corridors that absorb water and cool cities. At the same time, it improves public health and livability by enhancing air quality, providing recreational spaces, and reducing urban heat stress. Urban Green Infrastructure (UGI) also supports biodiversity by creating wildlife habitats and ecological corridors, strengthens food and water security, and lowers long-term infrastructure and maintenance costs by complementing or replacing hard engineering solutions. Overall, it enables cities to

grow in a way that is safer, more inclusive, environmentally sustainable, and economically efficient in the face of climate change." (Female, 45 years old);

"Economic stability & growth - reduced long term costs associated with climate disasters. Improved well being of people and environment - Cleaner air quality, improved water supply and sanitation services, improved urban environment, sustainable use of resources." (Female, 43 years old);

"As per world bank, for each dollar invested in climate resilient infrastructure there is a 4 dollars return in investment. By investing in proper climate resilient urban designs it assures proper planning integrating the climate factors. By incorporating best practice- nature-based solutions into infrastructure designs and by building it, the infrastructure mimics nature in absorbing water, acting as coolant and providing other ecosystems services in the locality and the landscape as a whole." (Male, 41 years old);

"1." Investing US$1 in disaster risk reduction and resilience can generate an average return of $4 to $15 in avoided future recovery costs- World Bank". 2. Make cities more livable." (Female, 32 years old);

5.1.4. Key challenges for the ECRUL Project sector

This question was aimed at letting the stakeholders unfold the actual bottleneck in implementing the ECRUL Project. Moral hazard on the parts of the key stakeholders and the level they shirk their responsibilities, which is likely to put a big dent to the theory of change of the project. Upon asked the key challenges for the ECRUL Project, following responses were unfolded:

"One key challenge for the ECRUL (Enhancing the Climate Resilience of Urban Landscapes and Communities) Project in the urban resilience sector is the limited capacity and readiness of existing urban infrastructure and institutional systems to integrate and implement climate-resilient planning and nature-based solutions. Current infrastructure in Thimphu and Paro was largely designed for historical climate patterns and is not adequately climate-proofed to handle more frequent and intense flooding, landslides, water scarcity, and other climate hazards, making these cities vulnerable to climate shocks. Addressing this requires not just physical upgrades (e.g., stormwater systems, watershed management), but also strengthening inter-agency coordination, climate risk data systems, urban planning practices, and technical skills across urban planners, engineers, and local government staff all of which take sustained capacity building, harmonized mandates and policies, and resources to operationalize effectively." (Female, 45 years old);

"Capacity constraints at the local level." (Female, 43 years old);

"Coordination issues." (Male, 46 years old);

"There is a lack of capacity in the RPs to comprehend NbS and climate resilience approaches thus leading to poor development of drawings/designs and policy interventions. There is lack of qualified engineers (civil, architect, urban planners) who have background in urban resilience planning and designing. there are barely 5 (needs fact check)." (Male, 41 years old);

"While the plans are well designed to meet the project and site requirements, implementation may be challenging due to staff turnover of the implementing agencies and potential gaps in understanding among contractors or private-sector implementers." (Female, 41 years old);

"Limited land to integrate NbS in Urban Spaces. Dzongkhag and Thromdes." (Female, 32 years old);

"Lack of Capacity to Design Climate Resilient Infrastructure and Nature based solutions." (Female, 37 years old);

"Lack of high skilled labors and builders. limited knowledge on high quality infrastructure products and state of the art techniques in the construction field. The central agencies are responsible for upskilling the workforce along with the supervisors." (Male, 32 years old); and

"One of the key challenges for the ECRUL Project, particularly in the urban development and human settlement sector, is institutional coordination across multiple agencies with overlapping mandates. Responsibilities related to urban planning, housing, transport, climate resilience and environmental management are distributed among several agencies, including DHS, local governments, sector ministries and regulatory authorities. Addressing this challenge requires strengthened inter-agency coordination mechanisms, clear role delineation and improved data-sharing arrangements to ensure coherent and effective implementation of ECRUL objectives." (Female, 31 years old).

Capacity constraints and coordination issues are some of the key challenges for the ECRUL Project. Many participants have asserted that severe lack of qualified personnel at the front of urban development and human settlement sector have put a big dent in the smooth execution of the project objectives.

5.1.5. Measures to improve laws and regulations related to climate risk-informed development approach in Bhutan

This specific question was asked to excavate the impediments in implementing climate risk-informed development approaches. The stakeholders reported the followings:

"To improve laws and regulations for a climate risk-informed development approach in Bhutan, the government can integrate climate resilience and nature-based solutions into urban planning, infrastructure, and sectoral policies, establish clear standards and guidelines for risk assessments, enforce compliance through monitoring and incentives, and strengthen coordination across ministries, local governments, and agencies. Updating legal frameworks to explicitly account for climate hazards and long-term sustainability will ensure development projects are safer, adaptive, and aligned with Bhutan's climate and environmental goals." (Female, 51 years old);

"Mainstreaming of climate risks." (Male, 46 years old);

"We support lots of projects related to climate resilience but due to severe corruption in the construction sector overlooked by responsible agencies come up with sub-standard quality that aids to the impact of climate change-induced events." (Female, 48 years);

"Corruption is the main cause." (Male, 38 years);

"Too many duplication of programs on climate change amongst CSOs. Everybody is pushing one's agenda. It would be nice if the erstwhile NECS would coordinate everything and make the program strong." (Male, 49 years);

"Can't share specific recommendations but there needs to be policy dialogues and RCSC should support capacity development program best is short, medium or longterm." (Male, 41 years old);

"Rather than simply protecting individual boundaries, focus on how each can complement and support the other (this is for the implementing agencies and policy making agencies)." (Female, 41 years old);

"Inter agency framework and Strategy." (Female, 32 years old);

"Currently there are limited laws and regulations related to climate risk informed development in Bhutan. The stakeholders at the local level has little or no knowledge at all. There must be regulations well circulated to take informed decisions on investments to take climate related issues into account.

inter agency coordination meetings and discussions should be held nationwide to ensure comprehensive development of regulations and guidelines." (Male, 32 years old);

"We have enough laws and regulations. However, people are difficult to deal with." (Male, 54 years); and

"Update existing laws and regulations governing urban development, infrastructure, housing and natural resource management to explicitly incorporate climate risk assessments and adaptation measures." (Female, 31 years old).

According to the participants, corruption has surfaced as one of the most detrimental barriers that need to update existing laws and regulations concerning climate risk-informed development in Bhutan. Time and again, the synergy amongst the agencies and the lack of seriousness amongst the stakeholders have been asserted by the participants. Some participants observed that a nodal agencies like the erstwhile NECS (National Environmental Commission Secretariat) needs to take the lead to avoid all the aforementioned issues related to the climate risk-informed development approaches in Bhutan.

5.1.6. Gaps that hinders implementing NbS (Nature-based Solutions) in urban areas based on the Bhutanese context

This question was targeted in fetching the gaps that hinders implementing NbS in light of the research limitations, data deficiencies, challenges in accessing and implementing existing knowledge. The lack of localized research, data deficiencies, limited knowledge or expertise of urban developers, and inaccurate information are the crucial gaps reported by the participants that hindered implementing NbS.

"In the Bhutanese urban context, several gaps hinder the effective implementation of Nature-based Solutions (NbS). Firstly, research limitations mean there is insufficient local evidence on the effectiveness, cost-benefit, and long-term impacts of NbS in Bhutanese cities, making it difficult to design context-specific interventions. Secondly, data deficiencies such as incomplete urban climate risk maps, limited biodiversity inventories, and scarce hydrological and soil data restrict planning and prioritization of green infrastructure like urban forests, parks, and wildlife corridors. Thirdly, there are challenges in accessing and applying existing knowledge, including limited technical guidelines, fragmented information across agencies, and a lack of training among urban planners, engineers, and local authorities. Together, these gaps slow the

mainstreaming of NbS into urban development, limiting the potential for cities to become climate-resilient, biodiverse, and livable." (Female, 51 years old);

"Urban developers have limited knowledge and expertise on NbS intervention." (Male, 46 years old);

"Lack of knowledge, capacity and resources. Therefore, there is very low buy-in for implementation of NbS." (Male, 44 Years);

"Lack of comprehensive, localized research and reliable data on urban ecosystems. Without adequate baseline studies and context-specific evidence, agencies struggle to design NbS that are tailored to Bhutan's unique urban landscapes." (Male, 34 years);

"Gaps in research, limited local data, and restricted access to knowledge and technical capacity hinder the effective implementation of Nature-based Solutions in Bhutanese urban areas. Additionally, a lack of clear ownership and community engagement often prevents these solutions from being adopted as sustainable options" (Female, 36 years);

"Limited research and evidence base on Nature-based Solutions (NbS). Inadequate capacity among technical professionals to effectively integrate NbS into planning and infrastructure design." (Female, 32 years old); and

"There is a research and knowledge limitation, as few locally generated studies exist on urban NbS, climate-resilient landscape design or the socio-economic benefits of green infrastructure, limiting evidence-based decision-making." (Female, 31 years old).

5.1.7. Effective ways to reach people or communities with information on climate change

This question pertains to people's access to information. The stakeholders were asked if they have any suggestions regarding the most effective ways to reach people or communities with information on climate change. The stakeholders have opined the followings:

"Community workshops and participatory forums engaging local residents in discussions, mapping climate risks, and codesigning solutions helps people understand and act. School and youth programs integrating climate education into curricula and extracurricular activities builds awareness from a young age." (Female, 45);

"Use trusted local leaders and local language to disseminate information." (Female, 43 years old);

"1. Innovating advertisements and advocacy materials v/s traditional TV/Radio-based Q&A and boring ads. 2. Use of digital platforms to educate different age-groups and profiles of the society." (Male, 41 years old);

"Most effective would be the traditional channels (radio, community meetings) with visual, participatory, and digital tools to make climate change information relatable, actionable, and trusted." (Male, 56 years);

"There must be frequent awareness programs to the LG level. During the budget proposals, the climate component must be set as criteria for receiving the funds." (Female, 37);

"Through community-based awareness programs that combine local storytelling, traditional knowledge, and scientific insights, making the message culturally relevant and easier to understand." (Male, 34 years);

"Short video clips that should be broadcasted nationwide, nationwide entertainment programs that promotes climate change effects." (Male, 32); and

"Engage local leaders, religious institutions and community groups to disseminate information through meetings, workshops and village-level consultations, leveraging trust and local networks.

Utilize radio, television, social media and local newspapers to provide climate information, practical adaptation tips, and updates on policy initiatives in accessible language. Establish local climate-smart or nature-based demonstration sites that allow communities to see adaptation measures in action." (Female, 31).

The results indicate the serious lack of information sharing mechanism. Most of the participants have urged that the local leaders, religious institutions, and community members needed to be engaged in terms of disseminating information on climate change. Similar concerns were expressed by the participants that a participatory forum engaging local leaders through community workshops along with school and youth programs need to be in place.

5.1.8. Agency actually responsible to mitigate climate change-induced hazards

The stakeholders were asked for their opinion on who actually is responsible to mitigate climate change-induced hazards. The majority of the participants have opined that it is the responsibility of all the individuals living in the community to mitigate climate change-induced hazards. They have further highlighted that the Department of Climate Change and Environment as the sole responsible agencies to take a lead.

"Mitigating climate change induced hazards is a shared responsibility: governments lead through policies, regulations, and resilient infrastructure planning; local authorities and communities implement adaptation measures and maintain ecosystems; the private sector adopts sustainable practices; and international partners provide technical and financial support. Effective mitigation requires coordination among all these actors to reduce risks and enhance resilience." (Female, 45);

"Department of Climate Change and Environment is solely responsible." (Male, 49 years);

"Department of Climate Change and Environment; Department of Disaster Management." (Female, 51 years);

"It is the responsibility of all at all levels." (Male, 44 years);

"All individuals" (Male, 34 years);

"Everyone." (Male, 32; Female, 47; Female, 43).

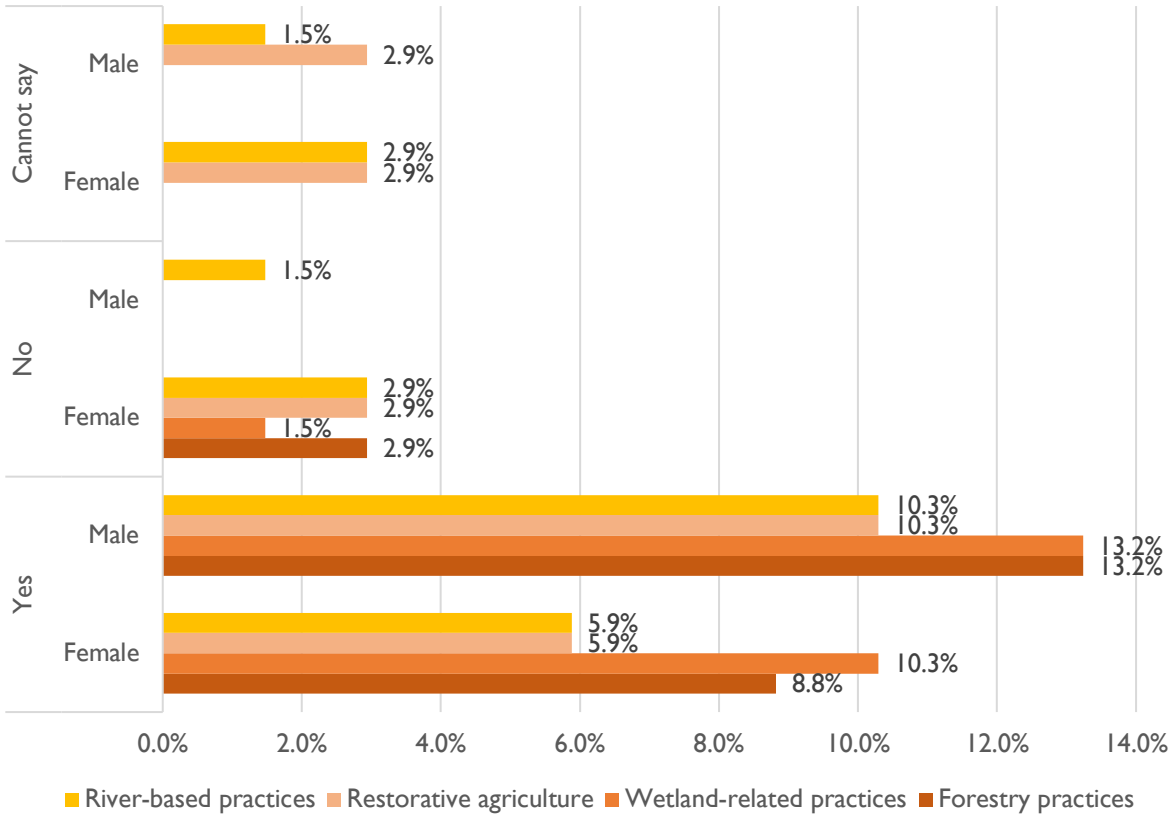
"The government to provides plans and resources at national level and citizens to play active individual level role." (Male, 41); and

"It lies with governments, communities, private sector actors, and international partners working collectively to integrate climate risk reduction into policies, planning, and everyday practices." (Male, 34 years)'

5.1.9. Nature-based Solutions to climate change

The stakeholders were indirectly tested whether they are familiar with some of the NbS to climate change. As illustrated in figure 5.1, Male respondents are more familiar with the NbS than females with a respective percentage share of 47.1 percent and 30.9 percent with a stark difference of 16.2 percentage points. As far as 'Wetland-related practice' is concerned, male respondents again surpass females by 2.9 percentage points. In the case of 'Restorative agriculture,' in a similar manner, male respondents are familiar with the same by almost double as compared to females.

Figure 5.1.1: Stakeholders' familiarity with NbS by gender

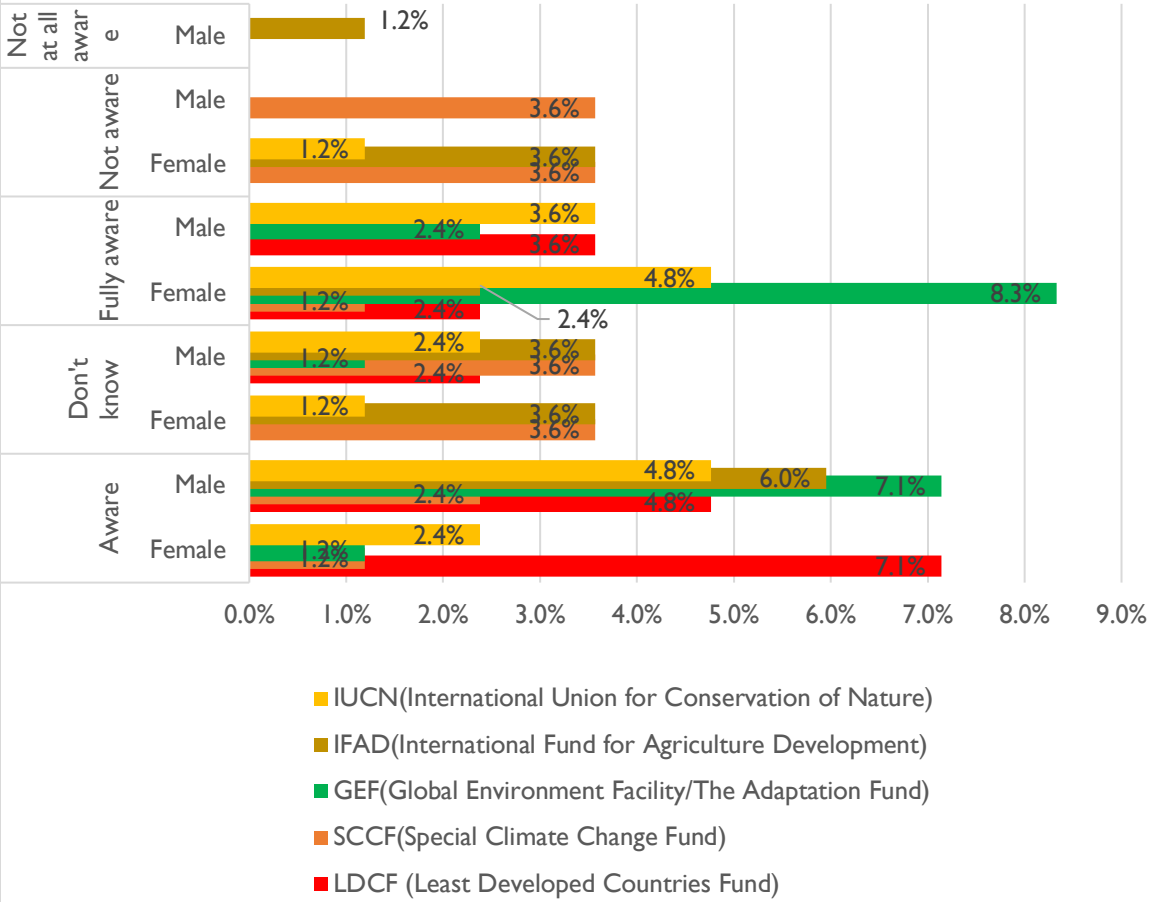


5.1.10. Environment and climate funding sources

The stakeholders were checked of their awareness levels regarding the environment and climate funding sources, which is of paramount importance for securing funding for mitigating the climate-induced impacts. Figure 5.2 depicts their level of awareness on the funding sources. About 10.7 percent of the stakeholders are fully aware of the GEF (The Adaptation Fund/Global Environment Facility) as one of the sources of funding for environment and climate change. This is followed by two others, International Union for Conservation of Nature (8.4%) and Least Developed Countries Fund (6%). About 7.2 percent of the stakeholders are not at all aware of the SCCF

(Special Climate Change Fund) and about 1.2 percent of IFAD (International Fund for Agriculture Development).

Figure 5.2: Stakeholders' awareness level on the environment and climage change funding sources



5.2. Results of FGD

This sub-section presents the qualitative findings from the Focused Group Discussions (FGDs) with youth. A sum total of 11 pertinent questions were asked (details attached as annexure). They were asked about their knowhow on climate change and its impacts, attitudes toward climate change, resilience and adaptive capacity indirectly. A semi-structured questionnaire was administered online. Of the total participants, 95 percent were females as against 5 percent males. An equal proportion of them fell into the age category of 15-20 and 20-25 respectively. About 90 percent were Buddhists followed by an equal proportion (5%) of Hindus and Christians. Close to one-third (65%) of the total participants were with the education level, college and above as against a little more than one out of every three (35%) with an education level, between classes 1-12. All the answers are reported here ad verbatim.

5.2.1. Knowledge on climate change

Upon asked about their understanding of climate change, women and youth-respondents have asserted their answers around the rise in temperature, haphazard weather patterns, and the climate-induced hazards. The majority of the FGD participants were able to express their knowledge on climate change. Most of the findings were in line with the quantitative findings. The participants have mostly showcased their knowledge on climate change via extreme weather patterns observed by them especially rise in temperature.

"The Earth is getting warmer, and weather is becoming more extreme (hotter summers, heavier rains, stronger storms)." (Female, 20-25 years old);

"Shift in global temperature." (Male, 20-25 years old);

"From my understanding climate change is the sudden changes in the weather, sudden rain or sudden sunshine which often lead to floods, forest fire, landslides." (Female, 15-20 years old);

"Long term change in the earths weather patterns." (Female, 20-25 years old);

"Climate change is something to deal with the change in weather pattern due to natural and anthropogenic activities." (Female, 20-25 years old);

"It's bout global warming." (Female, 20-25 years old);

"Climate change is the long-term change in temperature and weather patterns, mainly caused by human activities." (Female, 15-20 years old);

"Climate change is rise in temperature." (Female, 28);

"Climate change is overall rise in temperature." (Male, 21);

5.2.2. Difference between weather change and climate change

The FGD respondents were also asked to differentiate between weather change and climate change. Interestingly, a group of women could not answer this particular question. The weather change and climate change were mostly defined by the participants based on the duration of time. The most common terms associated with weather change and climate change were the daily weather patterns and the long term change in the weather patterns.

"Weather change is a short term change in the earth atmosphere." (Female, 15-20 years old);

"Weather: Short-term, day-to-day conditions. Climate: Long-term average weather of a place." (Female, 20-25 years old);

"Weather change means shift in daily weather pattern whereas climate change is long term change in weather pattern. Weather change has effects on climate in terms of temperature and precipitation." (Male, 20-25 years old);

"Weather change is a short term change in the earth atmosphere. Climate change is the long term change in Earth's weather patterns and temperature. Weather and climate are interrelated because weather represents daily atmospheric conditions, while climate is the long-term pattern of these conditions. Continuous changes in weather over many years determine the climate of a region." (Female, 15-20 years old.

"Weather is for short period of time whereas climate is a longer period." (Agriculture Officer, Female, 35);

"Weather is day to day (short -few). Climate (change of patterns erratic)." (CSO, Male, 38); and

"Weather is a daily phenomenon; climate is a seasonal variation" (Male, 37);

5.2.3. Type of events climate change brings forth

The majority of the participants reported rise in temperature and its aftermath such as water shortage, drying of arable lands, and lack of snow falls at those places where it used to snow

before as events the climate change brings forth. Floods, landslides, and the erratic patterns of rainfalls have been also reported by the participants as the events climate change brings forth.

"No snow falls at places where it used to snow. Rise in temperature." (Female, 33);

"There would be reduce in the production in paddy cultivation due to water shortage. There would be increase in pests and disease outbreak." (Tshogpa, Male, 44);

"There would be 30% risk due to drought. Water shortage leading to dry land. Increase in household and road development near water source." (Tshogpa, Male, 57);"Climate change is not at all a myth, all the mountains are bare and we cannot see snow now." (Municipal, Male, 47);

"Flood was witnessed where people had hard time to run for their life." (Mangmi, Male, 38);

"The rainfall pattern is not what I saw some 30 years ago. Rise in temperature." (Male, 59);

" I have seen a change in vegetation over southern Bhutan" (Male, 37 years);

5.2.3. The term, 'Climate-induced hazards'

The FGD respondents were asked to check their understanding on the term, 'Climate-induced hazards.' Here, the FGD question intended to seek the respondents' level of understanding regarding at least one of the climate-induced hazards viz. forest fire, flashfloods, windstorms, urban floods, and so forth. The ad verbum expression of the participants revealed that hazards such as glacial lake outburst, floods, droughts, heatwaves, and lack of snow falls are some of the hazards that come under the term, climate-induced hazards. The participants have not answered directly indicating the existence of knowledge gap.

"From my understanding climate induced hazards are disaster that is caused due to climate change. (Female, 20-25 years old);

"Hazards which are triggered by shift in climate for instance constant precipitation inducing landslides and flash floods." (Male, 20-25 years old);

"Harmful events that take place dur to change in climate patterns. Eg: floods caused by glacial lake outbursts." (Female, 20-25 years old); and

"Climate-induced hazards are harmful events caused or worsened by climate change, like floods, droughts, or heatwaves." (Female, 20-25 years old).

"No more snow and high temperature." (Woman, 28).

5.2.4. Most vulnerable group to climate-induced hazards

This question was asked to seek the most vulnerable group that would be impacted by the climate-induced hazards. Following are some of the most prominent responses reported here:

"Those most affected by climate change are usually children, women, and disabled persons, because they have less ability to cope with disasters and extreme weather." (Female, 20-25 years old);

"Disabled person as they need to depend on someone." (Female, 15-20 years old);

"I'd say everyone in the community would would be equally affected by uncertainty due to climate change." (Female, 15-20 years old);

"For me I think the most vulnerable will be the disabled person and then comes the children." (Female, 15-20 years old);

"Not sure." (Female, 15-20 years old);

"mother/child affect. Child gets more sick." (Woman, 37);

"All people gets affected." (Woman, 29);

"I guess disabled. Old age will be affected more due to climate hazard." (Gup, Male, 46);

"Women will be affected more because women have more of a motherly instinct." (Tshogpa, Female, 37);

"But in my opinion every individual will be impacted." (Mangmi, Male, 38);

"Children and old aged people." (Female, 33);

"No difference between men and women in times of climate change-induced events. However, women, children, and old age people may differ in their evacuation time." (Female, Civil Engineering Lecturer, 39 years);

The results revealed that all people will be affected by the climate change-induced hazards. However, the majority of the participants have asserted that women, children, and the old-aged people would be the most vulnerable groups getting affected by the same. Most of the participants as well asserted that the persons with disability would be affected more.

5.2.5. The role of government and individuals to reduce the impact of climate change related calamities

The FGD respondents were asked about the role of government and individuals to reduce the impact of climate change related calamities. This question was especially intended to excavate the adaptive capacities of individuals and the policy level. It was also intended to unfold the expectation of the participants of the government's role with regard to the mitigation of impact climate change would bring forth to individual and community at large. Following are the responses of the participants:

"Role of gov: to have proper policy and regulations regrading the climate, to have proper disaster management and to advocate and protect the nature." (Female, 15-20 years old);

"They can advocate every people of the climate change and what causes them and the remedies." (Female, 20-25 years old);

"The government and individuals must work together to reduce the impact of climate-related disasters. Governments play the top-down role by setting policies to cut emissions, investing in resilient infrastructure." (Female, 20-25 years old);

"They should give briefings to the community or individual members so that they can be alert about the climate change." (Female, 20-25 years old);

"Government can implement grassroot level policies to combat CC and as a individual we should be aware of our carbon and water footprint." (Male, 20-25 years old);

"Government: Makes policies, builds defenses, and prepares for disasters to reduce climate risks." (Female, 15-20);

"Government: Make strong climate policies, improve disaster preparedness, and protect the environment." (Female, 20-25).

Another major concern of the FGD participants was the role of the government and the individuals to reduce the impact of climate change. The majority of them have urged that both government and the individuals need to equally play the roles to reduce climate risks.

5.2.6. Steps one can take to reduce the impact of climate change.

" For waste management, waste Tshogpa like sanam zhinglam Tshogpa, Community forest tshogpa, coordinates waste by collecting waste. He is in turn paid Nu. 100 by each household." (Mangmi, Male, 38);

"Every 2nd day of each month; collect waste by Ashi Jetsun Pema." (Tshogpa, Female, 37);

"Maintenance of wetland, maintenance of economics and social aspects." (Tshogpa, male, 57);

"Establish EWS." (Municipal Engineer, Male, 46);

"Key responsibility (MOIT/Thromde/Communities)

- ✓ *Physical labor/uptake cleaning /proper waste responsible of individual level*
- ✓ *People are not taking responsibility*
- ✓ *Start from your house/community engagement." (Female, 40);*

"Climate smart with energy efficient infrstructure in Urban landscape in conjunction with MOIT" such as 'Decongestion of city,' 'Food security with agri-related projects', and 'Plantation project for developing river banks'." (CSO, Female, 47);

"Porous road to absorb rainwater; rooftops to absorb rainwater via clay roofing; rainwater harvesting; CST civil engineering department is ready to help if our experiments are funded; Awareness on the climate friendly building materials need to be done before passing any legislations." (Male, Engineering Lecturer, 37 years);

Many participants came up with the doable suggestions such as waste management, climate smart with energy efficient infrastructure in the urban landscapes, use of latest technology to combat the climate risks.

5.2. Situations or factors that either enabled or hindered from taking the actions for adaptation

The majority of the FGD participants expressed the factors that hindered them from taking the actions for adaptation. The issues related to funding surfaced quite often followed by the usual coordination problems. The carelessness of both the regulator and the implementer was another

concerns expressed by the participants. Filtration of funds and not reaching the actual place where it is needed was one of the grave concerns raised by the participants that hindered the actions for adaption.

"No coordination between colleagues. Government needs to go into depth, allocating budget," (Gup, Male, 47);

"People are reluctant. Individual attitude. Agencies lack of consistence. Lack of collaboration leading to demotivation. No recognition. Lack of cooperation from the public." (Male 46);

"Proper planning –involvement from community: Lack of consultative meeting in the beginning." (Female, 46);

"Bad infrastructure with inefficiency, Not resources. Flashfloods is a man made. Thromde's sole responsibility (Carrot and stick method). Proper design and execution. No accountability e.g road resurfacing. Carelessness of both the regulator and the implementor. Manmade disaster (mitigation: awareness against the calamities)." (CSO, Female, 47);

CSO, Male, 38 asserted the followings:

- ✓ *Nonconstruction zone (encroachment)*
- ✓ *Buffer zone*
- ✓ *Central-grassroot*
  (Simply through BBS-no concrete outreach level)
- ✓ *Coordination of many similar programs (Synergy)*
- ✓ *Grassroots fatigue with stakeholder consultations*
- ✓ *Post consultations effect is oblivious*
- ✓ *People do not get back the resolutions from any of the consultation across all levels*
- ✓ *Government agencies should speak and put spearhead and put together all small projects related to climate change*
- ✓ *Filtration of funds and ultimately reaches the community just with the tickle down effect.*
- ✓ *Duplication of efforts and waste of resources (meeting fatigue).*

"Funding is a solution to mitigate the climate change-induced hazards. On one hand we want resilience but we don't trust our own people and no funding support is given." (Male, Civil Engineer, 37 years);

5.2.6. Types of programs or projects in existence currently helping the area or community to make themselves more climate resilient

The participants have expressed that there existed fairly good practices helping the area or community to make themselves more climate resilient. Some of the local leaders have asserted that they prevent many emissions through regulations. The use of technology is also reported by the participants to have aided to the climate resilient.

"Forest fire prevention; should ask permission and ask for approval.
Burning of crop debris; need permission and approval." (Gup, Male, 46).
"Earth technology and modifying construction materials are contributing to climate change; "To enhance the resilience we use solar panels here at CST, hydroponics, ecofriendly ponds." (Male, Civil Engineering Lecturer, 37 years);
"We have in our module the things like building materials and construction, soil engineering properties, water table location using latest instruments—all these are part of an EWS." (Female, Civil Engineering Lecturer, 39 years);

5.2.7. Your most trusted source of information on climate change and its related issues

The respondents of the FGD were asked about their most trusted source of information regarding climate change and its related issues. This is one of the most important questions to extract their access to information regarding the impact of climate change and its burning issues. The following ad verbatim expressions of the FGD respondents are reported here:

"My most trusted sources are scientific organizations like the IPCC, NASA, and peer-reviewed journals, because they provide accurate, evidence-based information on climate change." (Female, 15-20 years old);
"Cnn." (Female, 15-20 years old);

"Most trusted source is the organization who looks after the climate related issues and who got license to share the information and news." (Female, 15-20 years old);
"Social media." (Female, 20-25 years old);
"BBS." (Female, 20-25 years old);
"BBC and even to my lecturer." (Female, 20-25);
"News channels and research papers." (Female, 20-25);
"Kuensel and BBS." (Female, 15-20 years old);
"My most trusted source of information on climate change is scientific reports and reliable organizations, because they provide accurate and trustworthy information." (Female, 15-20 years old);
"Facebook." (Woman, 28); and
"The Intergovernmental Panel on Climate Change (IPCC) is widely recognized as the most trusted, authoritative, and comprehensive source for climate change science, providing objective, peer-reviewed assessment reports used by policymakers globally. Other highly credible sources include NASA for up-to-date data/visuals, NOAA for scientific records, and UN Climate Change." (Female, 20-25 years old).
"We have an experiment to predict roadblocks, real time flood prediction using machine learning, developed a screen to increase visibility during fogs, investigation of construction waste materials.' (Male, Civil Engineering Lecturer, 37 years);
The participants have unfolded that social media, national TV channels, and academic journals as the most trusted source of information to reach the public on climate change.

5.2.8. Risk level of the area or community respondents dwell at and source of climate change news

The participants were directly confronted with the questions, 'Overall, what is your rating of your area you live or community in terms of risk from climate change-induced hazards?' This particular question was intended to delve into their perception of the risk level of the area or community they dwell at. Figure 5.1 presents the risk level of the area or community respondents dwell at. A little more than half (55%) of the respondents have reported that they are not sure

whether they live in a 'risk-prone' area as opposed to 20 percent of them who reported otherwise (Risk-prone). Exactly a quarter (25%) of them have reported that they live in a risk-free area or community.

Figure 5.4: Risk level of the area or community respondents dwell

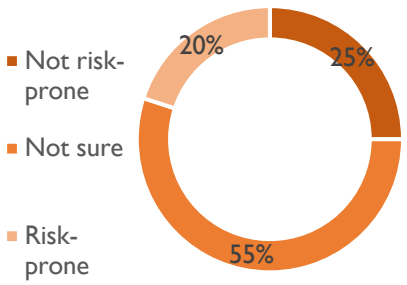
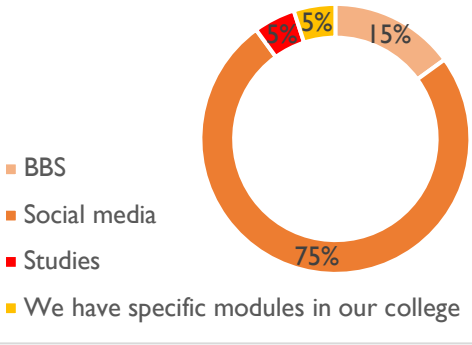


Figure 5.5: Source of climate change news



Upon being asked the source of climate change news, three-quarters (25%) of the respondents or the participants reported 'Social media' as their main source of information regarding the same followed by BBS (15%). An equal proportion (5%) of the participants have reported that they received news or information on climate change either through their own studies or with specific modules in their college as illustrated in figure 5.3. The above figures are from the online participants. Upon asked to rate in a scale of 5 to 1 (5=Highly risk-prone; 4=Risk-prone; 3=Don't know; 2=Not risk-prone; 1=Not at all risk-prone), the FGD participants who were met in person reported the following:

CHAPTER 6| SUMMARY OF KEY FINDINGS

This chapter holistically presents the key findings and discussions. The findings are disaggregated by gender and a few are corroborated and triangulated with the qualitative findings. The survey covered 760 urban households based on the Terms of Reference of this study under the two project landscapes of Thimphu and Paro.

6.1. Socio-demographics, Economics, and Educational characteristics of the respondents

- 9 out of every 10 (90.4%) respondents fell in the project landscape of Thimph as compared to the remaining 9.6 percent in Paro.
- A close to half (48.8%) of the respondents have lived in the current location between 1-5 years followed by about 23.7 percent of them who lived more than 5 years. A sum of 21.9 percent of them have lived in their current location for less than a year, as against 5.6 percent who lived their whole life.
- A little more than half (53.2%) of the respondents are married, as against close to 3 out of every 10 (29.8%), 'never married.' Almost an equal proportion of the respondents were divorced and widowed with a respective percentage share of 6.9 and 6.4 percent. This is followed by about 3.2 percent who were living together and a less than one percent separation.
- More than three-quarters (85.6%) of the respondents spoke Tshanglakha as compared to close to 40 percent Dzongkha and about 87.9 percent of them followed Buddhism and close to 10 percent Hindus. The remaining 2.8 percent followed Christianity.
- Less than one percent of the respondents reported living with a condition of partial disability, as against 1.2 percent did not want to report such condition.
- Almost an equal proportion of civil servants (17.6%) and businessmen/women (17.2%) followed by homemakers (16.9%) and private employees (16.8%) were the occupations of the respondents.

- The mean income and expenditure of the respondents stand at Nu. 30,182.7 and Nu. 21, 787.7 respectively with a median monthly income of Nu. 20,000 meaning 50% of the respondents earned Nu. 20,000 and below and the remaining half with more than Nu. 20,000.

- About 61.7 percent of the respondents owned TV and Cellular phones with intranet and TV and Phone (34%) and Smart phone (28.5%) are the two most often used media in the past one month prior to the date of interview.

- About 73.4 percent of the structures the respondents dwelt were made of concrete walls followed by 18.7 percent 'Wood and concrete.'

- On the front of roofing materials, a glaring 98.2 percent of the structure respondents dwelt comprised 'Metal roofing.'

- More than three-quarters (76.6%) of the respondents did not know whether the structure they dwelt at was insured and around 73 percent of them were oblivious of the insurance related to climate-induced hazards.

6.2. Knowledge

To subjectively evaluate the knowledge on climate change and its detrimental effects is one of the key components of this study. Following are some of the responses pertaining to the knowledge of the respondents on various variables considered to gauge their level of knowhow on climate change and its impacts especially in terms of adaptation and resilience:

- A little more than 9 out of every 10 (92%) respondents were aware of the term, 'Climate change,' as compared to 1.2 percent who were not at all aware of the term. By gender, about 51.6 percent of the females are aware of the climate change as against 40.2 percent males. If disaggregated by project landscapes, about 52 percent of the female respondents in Thimphu were aware of the climate change as compared to 39.9 percent males. In a similar vein, close to half (47.5%) of the female respondents in Paro are aware of the term climate change as opposed to 42.5 males. About 69.1 percent have considered

"Wildfires/forest fires' as an event of climate-induced hazards. Since only about 4 percent of the wildfires is considered as climate-induced hazards (Speck, O & Speck, T, 2024), this particular finding indicated a sizable knowledge gap amongst the respondents as regards to the climate-induced hazards events they reported as have noticed over the years.

- 'Global warming—melting snow in the mountains,' ($\underline{X} = 4.15;\ \sigma = 0.66$) 'Changing weather patterns'($\underline{X} = 4.11;\ \sigma = 0.65$) , 'Increase in air temperature'($\underline{X} = 4.07;\ \sigma = 0.67$), and 'Wildfires/forest fires' ($\underline{X} = 3.83;\ \sigma = 1.16$), have secured the highest means out of the nine climate-induced hazards witnessed over the years by the respondents. To cite one of the above examples in detail, about 89.5 percent of the respondents have noticed global warming over the years. Going by the gender, a little more than half (51.3%) of female respondents have agreed to have noticed the global warming ever since they lived in their current location as compared to 38 percent males. This is corroborated by the ad verbum reports of FGD results as follows:

✓ *"No more snow and high temperature." (Woman, 28).*

✓ *"It's bout global warming." (Female, 20-25 years old);*

✓ *"Climate change is the long-term change in temperature and weather patterns, mainly caused by human activities." (Female, 15-20 years old);*

✓ *"Climate change is rise in temperature." (Female, 28); and*

✓ *"Climate change is overall rise in temperature." (Male, 21).*

The FGD participants have expressed that they noticed the climate change through lack of snows, which they witnessed over the years and the change in temperature.

- One of the interesting findings of this study is the aftermath of the climate change impacts noticed by the respondents over the years. Of the total 10 aftermaths the respondents have witnessed over the years, 'Health hazard' (16.9%) tops the list of which 16.8 percent females in Thimphu. This is followed by 'Damage to property' (5.3%), and 'Lack of portable

water' (4.57%). On the contrary, about 3.7 percent have witnessed the aftermath of the climate change impacts with no effects. These findings conforms the FGD results reported here ad verbatim as follows:

- ✓ *"Extreme weather conditions." (Female, 15-20 years old);*
- ✓ *"No snow falls at places where it used to snow. Rise in temperature." (Thromdoe Ngotsab, Female, 33);*
- ✓ *"Climate change is not at all a myth, all the mountains are bare and we cannot see snow now." (Municipal, Male, 47);*
- ✓ *"Flood was witnessed where people had hard time to run for their life." (Mangmi, Male, 38);*
- ✓ *"The rainfall pattern is not what I saw some 30 years ago. Rise in temperature." (Thromdoe Tshogpa, Male, 59); and*
- ✓ *" I have seen a change in vegetation over southern Bhutan" (Male, Engineering Lecturer, 37 years).*

The extreme weather conditions, the erratic rainfall patterns, and change in vegetation over the years have been some of the aftermaths of the climate change the participants have reported.

- On the front of the causes of climate change, 'Producing more harmful gases; Improper waste disposal by factories and households' (22.1%) followed by 'Deforestation' (5.4%).
- Upon asking the direct opinion of the respondents on the adaptability of climate change, 8 out of every 10 respondents have opined (agreed) that climate change is adaptive, as against 8.4 percent who disagreed. About 10.2 percent of the respondents did not know about it. Going by the third gender, about 0.05 percent of the LGBT++ Individuals have agreed to the statement.
- The respondents were assessed on the possible solutions pertaining to the impacts of climate change. A little more than 4 out of every 10 (43.2%) have reported that they do not know about the solutions against the impacts of climate change. On the contrary, about 20.5 percent of them asserted that if collaboration of different tiers of the

government (e.g. from local to national and international levels) is realized, that could be the solution to the impacts of climate change. Interestingly, around 12 percent have suggested 'Ecosystem-based adaptation' (EbA) and 'Collaboration of different tiers of the government' as the plausible solutions to the impacts of climate change. A sum of 9.8 percent of the respondents have suggested that valuing local knowledge and strengthening local organizations and planning processes as the solution to combat the impacts of climate change. On a similar note, about 8.6 percent have reported just 'Ecosystem-based Adaptation (EbA) as a solution. About 5 percent have suggested both Ecosystem-based Adaptation and 'Adoption of participatory approaches' as the solution to the impacts of climate change.

- The survey also sought to learn about the level of awareness on climate change related terms. About 10 climate change related terms were accorded to the respondents. The top three terms that secured highest means are "Urban agriculture' ($\underline{X} = 3.21;\ \sigma = 1.43$), 'Parks/National parks' ($\underline{X} = 2.73;\ \sigma = 1.38$), and 'Urban landscape design/planning' ($\underline{X} = 2.40;\ \sigma = 1.38$).

- Respondents were specifically asked whether they were aware of the ECRUL Project. Only about 9.8 percent were aware of the same followed by the majority (70.8%) who were unaware of the project. About 19.4 percent did not know about it at all.

- To those who knew about the ECRUL Project, they were asked about the source of information on the same. About 86.3 percent of them have heard about the ECRUL Project through Facebook/Social media. About 3.4 percent of them have reported that they heard it for the first time through this survey.

6.3. Attitude

To measure the attitude of the respondents on climate change, mitigation, and adaptation, about 18 items or indicator items were accorded for them to rate in a 5-point Likert scale (5 being Strongly agree to 1 being Strongly disagree). This is augmented by another set of indicator

variables that made the respondents rate the events of climate change in order of their importance. Some of the key findings are presented as follows:

- Of the top 5 statements the respondents were made to rate, the highest mean is secured by the statement, 'I am concerned about climate change and its impacts to the community' ($\underline{X} = 4.55;\ \sigma = 0.59$) followed by the statement, 'Conserve natural resources and energy to prevent climate change issues' ($\underline{X} = 4.39;\ \sigma = 0.72$), and 'I as an individual am ready to do whatever I can to help to preserve the environment'($\underline{X} = 4.39;\ \sigma = 0.97$). The other two statements that secured highest means are respectively, 'Complying with environmental laws can prevent the impact of climate change'$\left(\underline{X} = 4.34;\ \sigma = 0.71\right)$ and 'Discourage building of infrastructure near vulnerable areas'($\underline{X} = 4.29;\ \sigma = 0.67$).

- The survey also sought to check the level of mitigation and adaptation of climate change-induced impacts. Around 25 percent females have strongly agreed to the statement, 'Complying with environmental laws can prevent the impact of climate change' as opposed to males (20 percent) thereby indicating the mitigation of the impacts of climate change. On a similar note, respondents were asked to rate the statement, 'I am concerned about climate change and its impacts to the community,' about 33.7 percent of female respondents have strongly agreed to the statement as against 25.2 percent males.

- Respondents were delved deeper into their attitude on climate change and its impacts. Three pertinent statements were made to check their overall attitudes. In the statement, 'Nature will take care of the climate change and it is needless to worry' a little more than 10 percent (Male=5.9%; Female=4.5%) have strongly agreed to the same. On the other hand, about 18.8 percent (Male=12.4%; Female 16.4%) of them strongly disagreed with the statement followed by 33.9 percent who disagreed the same. Similarly, the statement, 'Living for today is more important than worrying about the effects of climate change in the years to come' a little more than 2 out of every 10 respondents (Male =9.4%; Female=14.6%) have strongly disagreed with the statement. On the contrary, 29.8 percent

of the respondents have agreed to the statement (Male=14.4%; Female=15.4%). Around 12 percent have chosen the category, 'Don't know' (Male=3.9%; Female=7.8%).

- Similarly, about 41.2 percent (Male=17.9%; Female=23.3%) of the respondents have reported that their area/community cannot do much about climate change. Around 12 percent of the respondents have rated the category, 'Don't know.' With regard to the attitude of respondents on the preservation of the environment. About 95.2 percent (Female=53.9%); Male=41.2%) of the respondents have reported that they are ready to do whatever to help preserve the environment as against a little more than one percent (1.1%) who disagreed.

- As regards to respondents' attitude towards climate resilient structures, close to three-quarters (73.6%) of them have agreed to the statement, 'Building climate-proof structures near the river basin is a solution to climate change.' However, on the contrary, close to 10 percent of the respondents did not agree to the same. About 17 percent of them have remained neutral. In the like manner, the majority of respondents (91%) have opined disaster management plans in line with right technology for adaptation can help prevent the impact of climate change as opposed 1.6 percent of them disregarding the aforementioned statement followed by 6 percent who remained neutral.

- As for the respondents' attitude on encouraging and promotion of community participation to help prevent the impact of climate change, a little more than 9 out of every 10 (91.1%) of the respondents have agreed to the statement, 'Encouraging and promoting community participation will help prevent the impact of climate change.' On the contrary, 92.3 percent of the respondents have disagreed with the statement, 'Dissemination of information on climate change issues to the public needs to be increased.'

- On the front of effects of climate change felt by the respondents, the highest mean is secured by the item,'I believe changing weather patterns affects our area/community'

($\underline{X}$=4.63; $\hat{\sigma}$=0.51) followed by the statement, 'I believe the stronger and more frequent windstorms affects our area/community' ($\underline{X}$=4.41; $\hat{\sigma}$=0.83) and 'I believe increased temperature affects our area/community'($\underline{X}$=4.38; $\hat{\sigma}$=0.60). The two lowest items secured a respective mean of 3.95 and 3.67 corresponding to the items, 'Increased vector borne/water borne diseases affecting our area/community' and 'Frequent forest fires affect the air quality of our area/community' respectively.

- The respondents were also made to rate some statements on events led by climate change based on their level of importance. On the statement, 'I believe changing weather patterns affect our area/community' by gender, about 45.9 percent of females have agreed to the statement as very important as opposed to 8.9 percent of them rating 'Not important.' In a similar vein to the statement, 'I believe flooding, landslides, and river erosions affect our area/community,' about 27.2 percent of females have rated it as very important to the same as opposed to 7.1 percent. About 19.5 percent of males have rated the same statement as opposed to 6 percent who rated it as not important .

- On the situation of vector borne/water borne diseases that affected their community, close to two-thirds (63.4%) have rated the statement, 'Increased vector borne/water borne diseases affected our area/community' as important. Going by gender, 37.4 percent of females rated it as important as compared to 26 percent males. A very insignificant percentage (0.02%) of third gender has rated the statement as important. On a similar note, the majority (89.9%) of the respondents have rated the importance with the statement, 'I believe the stronger and more frequent windstorms affect our area/community.' A little less than 5 percent have chosen the category, 'Don't know' indicating they neither feel the statement important nor not important. A total of 5.4 percent of the respondents have rated the statement as not important.

- The respondents were asked to choose various responsible parties responsible for addressing the impact of climate change. A significant percentage (68.5%) of respondents have asserted that everyone needs to be responsible to address the impacts of climate

change. More than 2 out of every ten (23.7%) respondents felt that the government is responsible for addressing climate change. A small proportion (3.3%) of the respondents feel that local people need to take responsibility for taking action against climate change. Interestingly, quite an insignificant proportion of the LGBT++ Individuals have asserted that everyone should be responsible for addressing the same.

- Respondents were asked to rate the statement that described the timely interventions from the government and the CSOs. Upon rating the statement, 'The government is doing things to help us to adapt to climate change locally,' a significant portion of respondents (77.8%) have agreed to the same followed by around 14 percent who reported, 'Don't know.' About 8.1 percent of the respondents have disagreed with the statement as compared to more than three-quarters of agreement. Similarly on the front of CSO's intervention to adapt to climate change locally, quite a significant portion of respondents (51.1%) have checked the category, 'Don't know.' This is followed by 2.3 percent who did not agree with the statement, 'The CSOs are doing things to help us to adapt to climate change locally.' On the positive note, about 46.5 percent have agreed that the CSOs have done things to help them adapt to climate change locally.

- To check whether the respondents are interested in climate change and its related impacts, a statement, 'An individual should learn more about climate change' was made to rate in order of importance. A huge majority (98.6%) were very interested in finding out more about climate change and rated the scale, 'Very important.' In the like manner, a little more than 9 out of every 10 (91.8%) respondents have agreed to the statement, 'I am hopeful that we could do something to adapt to climate change.'

- The respondents were assessed on one of their pertinent attitudes in terms of their willingness to contribute towards resilience projects via money, time, commitment, mindset, and the rest. Upon being asked to rate the statement, 'I am willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth,' based on their level of agreement, about 94.5 percent of the respondents have agreed as

opposed to 1.1 percent who disagreed. Upon disaggregated by gender, about 53.8 percent of female respondents have agreed that they were willing to contribute towards resilience projects via money, time, commitment, mindset, and so forth as compared to 40.7 percent male respondents.

- The survey also sought to excavate the respondents' stand on mitigation of climate change issues via Nature-based Solutions. The statement, 'Increase reforestation to mitigate climate change issues' revealed 6 out of every 10 (60%) female respondents disagreeing the same augmented by male respondents with about 41.9 percent. On the other hand, about 48.6 percent of female respondents have agreed to the statement, 'Discourage building infrastructure near vulnerable areas.' About 38.1 percent of the male respondents too have agreed to the same statement.

- About 93.4 percent of the respondents have agreed that it is crucial to preserve natural resources and energy to prevent climate change issues. Very little (5.2%) of them have remained neutral to the statement, 'Conserve natural resources and energy to prevent climate change issues.' In a similar vein, it is revealed that about 81.5 percent of the respondents agreed to the statement, 'Water conservation and reuse needs to be encouraged.' On the other hand, 6.4 percent of the respondents strongly disagreed with the above statement with a little more than 1 out of every 10 (12.1%) respondents who chose, 'Don't know.'

6.4. Practices

To assess the level of prevailing practices in terms of climate change related hazards, resilience, and adaptive capacity, the respondents were asked 16 pertinent questions including the source of information on climate change and its impacts. Following are some of the key findings:

- Upon asking the respondents, 'Have you or the community taken any actions till date to lessen the impact of climate change in your area/community?' A little more than one-quarter (26.4%) of the respondents claimed to have taken any actions till date to lessen the impact of climate change in their area or community as opposed to 4.4. percent.

Around 3 percent were not sure if they had done the same. By gender, about 14.1 percent of female respondents in Thimphu claimed to have taken some actions as compared to 10.3 percent males.

- Amongst those respondents who took some actions to lessen or prevent the impacts of climate change in the community they live in, about 45.8 percent have followed 'Water management.' This is followed by 30.2 percent of them who followed 'Waste management' and around 8 percent who involved in reforestation (planning trees) vis-à-vis turned off lights and water taps when not in use. This is closely followed by 'Carpooling' (7.3%). About 6.2 percent have turned off lights and water taps when not in use. Close to 5 percent have conserved energy and less than one percent (0.4%) have raised awareness on the issue of climate change. This finding has been further corroborated with the qualitative findings, whereby the participants were asked to cite the steps taken to reduce the impact of climate change as below.

"(Gup, Male, 47) suggested the followings:

  - *Reservoir tank and water pump into the area in advance needs to be erected for adaptive capacity building and resilience;*
  - *Collaboration with Thromde;*
  - *Starting a project to reduce impacts;*
  - *Prohibition of converting wetland to dryland;*
  - *Gewog ensures everyone in the community to ask permission to burn the wastes; and*
  - *Waste segregation."*

"For waste management, waste Tshogpa like sanam zhinglam Tshogpa, Community forest tshogpa, coordinates waste by collecting waste. He is in turn paid Nu. 100 by each household." (Mangmi, Male, 38); and

"Every 2nd day of each month; collect waste by Ashi Jetsun Pema." (Tshogpa, Female, 37).

- Respondents have reported the hindrances in taking any action to prevent or lessen the impact of climate change as not having access to information on climate change and its impacts. The statement, 'Do not have access to information about climate change' has been reported with a percentage share of 42.5 percent. This response is closely followed by the variable, 'Do not know what exact action to be taken' (40.2%). Around 14 percent have reported that nobody bothered about climate change in their community. About 0.2 percent of the respondents were partially disabled and have reported their incapacity for taking any actions.

- Respondents were further delved with a question on their readiness to overcome climate-induced hazards if faced with any such events. A close to half (48.2%) of them have reported that they would follow the advice of the community leaders and other relevant authorities via media. Upon disaggregated by gender, almost an equal proportion (Female=7.8%; Male=8.2%) of them have reported the same. Interestingly, about 34.9 percent of the respondents reported that they won't know what action needs to be taken in such events. By gender, almost twice the female respondents (7.9%) have reported their incapacity to handle such events as compared to males (3.7%). On the other hand, close to 5 percent of them have checked the variable, 'None of such events can affect me or my community due to our *apriori* knowledge on how to respond to those events.'

- The respondents were asked the type of fuel they used for their daily cooking. The combination of 'LPG gas; Induction cooktop; Rice cooker; Curry cooker' tops the other type of fuel used for daily cooking with a percentage share of 31.8 percent. This is followed by a little more than 2 out of every 10 (21.4%) respondents who used the combination of 'LPG gas; Induction cooktop; Rice cooker; Curry cooker.' This is followed by 16.3 percent of the category of respondents who used only LPG gas and Rice cooker. About 21.1 percent have reported to have used the combination of 'LPG gas; Rice cooker; Curry cooker.'

- Respondents were made to assess the concerned agencies' actions noticed by them against combating the impact of climate change. Close to half (48.8%) of the respondents have reported that they did not notice concerned agencies carrying out any actions to combat the impacts of climate change. Around 18 percent of the respondents have noticed the concerned agencies conducting awareness campaigns in their area or community. One of the actions the respondents' community noticed of the concerned agencies was providing support to the agriculture sector to improve crop performance (15.9%). About 9.2 percent have noticed an Early Warning Systems for floods and health-related impacts installed. A very insignificant proportion (0.3%) of the respondents reported that the concerned agencies helped to disseminate information about climate change in their community. The role of the concerned agencies for mitigating climate change impacts is testified by some of the qualitative findings as below.

  "Mitigating climate change induced hazards is a shared responsibility: governments lead through policies, regulations, and resilient infrastructure planning; local authorities and communities implement adaptation measures and maintain ecosystems; the private sector adopts sustainable practices; and international partners provide technical and financial support. Effective mitigation requires coordination among all these actors to reduce risks and enhance resilience." (Female, 45);

  "Department of Climate Change and Environment; Department of Disaster Management." (Female, Secretary, 51 years);

  "It lies with governments, communities, private sector actors, and international partners working collectively to integrate climate risk reduction into policies, planning, and everyday practices." (Male, 34 years)'

- The respondents were also assessed on the portable water shortages experienced by them over the past one year. The frequency of shortage is reported between 1-2 days (37.2%) closely followed by 30.2 percent who reported no shortages whatsoever. About 16.6 percent experienced the shortages between 3-5 days followed by less than a week

(7.3%). Close to 7 percent have experienced shortages for more than a week. In the similar manner, less than one percent has experienced about half a day. A very insignificant portion (0.1%) could not remember.They were also asked about the portable water supply with a reference period of three months. Over the past three months, the majority (83.5%) of them have reported to have experienced the shortage of portable water supply for the whole day followed by about 6.1 percent experiencing between 5-7 hours a day. Only a very insignificant proportion (0.4%) of them did not experience such a situation. Table 23 also revealed that an equal proportion of male and female respondents in Thimphu (0.8%) and Paro (0.2%) have experienced between 5-7 hours of portable water supply shortage per day over the three months.

- To further delve into the resilience and adaptive capacity of the respondents on the impacts of climate change, a particular question on heating requirements during the cold season and its frequency was asked. A quite significant proportion (98.6%) of the respondents have reported to have used the heating system during the cold season. More than 1 out of every 10 (16%) of the respondents have reported to have used the heating system off and on. A close to 9 percent of them have reported to have used the heating system throughout the season. A close to 5 percent of them have reported to have used the heating system at least 5 hours a day. Around 4 percent have reported to have used the heating system for more than 5 hours a day. On the other hand, respondents were as well inquired whether they used a cooling system during the warm season. More than half (59.7%) of the respondents have reported to have used the cooling system during the warm season. By gender, about 33 percent of female respondents have reported to have required the cooling systems during the warm season by 6.3 percentage points as compared to males (26.7%). In terms of frequency of the requirement of cooling systems, about 26.8 percent of the respondents have reported to have required them off and on. Less than one percent has reported that they did not use or require the cooling system during the warm season.

- Respondents were indirectly asked if the urban setup in the two project landscapes they live in exists some climate adaptation and resilience setups. The item, 'Overall, we can bear the heat in this area' had secured the highest mean of 3.94 with a std. deviation of 0.86. This is closely followed by the item, 'Have urban forest cover to protect us from heat during warm season' ($\underline{X}$=3.92; $\int$=1.05). On the contrary, upon being made to rate on a 5-point Likert scale, the statement, 'We have lots of drainage issues here' secured the third highest mean of 3.52 with a std. deviation of 1.24. The lowest mean was secured by the item, 'Our area has lots of wetlands' ($\underline{X}$=2.25; $\int$=1.11).

- Upon being asked whether they feel safe with the current place of dwelling from climate-induced hazards, a little more than one-quarter (27.5%) of the respondents felt safe with the current location they dwell at from the climate-induced hazards. A little more than 4 out of every 10 (40.7%) respondents have reported that they do not know whether they are dwelling at a safe place from climate-induced hazards. On a similar note, upon assessing the level of adaptability of the community respondents dwell at the current location from climate-induced hazards, about 33.3 percent of the respondents have reported that they are not sure whether they are adaptive to the climate-induced hazards. However, a little more than one-quarter (25.3%) of the respondents have reported that they are ready to respond to the climate-induced hazards as opposed to 20.7 percent who are not ready. On the contrary, a little more than 5 percent of the respondents are completely ready to face any climate-induced hazards in their area or community as compared to 15.3 percent of them who are not at all ready.

- Asked whether the respondents have attended any consultative meetings or school lessons on climate change, around 36 percent of them have done so, as against a huge percentage (63.1%) of them who did not. Those respondents who have either attended the consultative meetings or school lessons on climate change and its impacts were asked about the organizer of the same. More than three-quarters (76.8%) of the respondents have reported that they learned about climate change and its impacts in schools. This is

followed by the Local Government (7.3%) and the Department of Disaster Management (6.2%). Interestingly, about 4 percent share of the respondents have attended from multiple organizers like 'Local Government, UNDP, Local NGOs, School, Department of Disaster Management, and hospital. The UNDP alone secured 2.2 percentage share as the organizer. A close to 2 percent of the organizers were from the Desung organization. To fathom into the respondents' attendance on the climate change and its impacts' lesson, they were further asked the time period of their attendance, which was their last attendance. Around 43 percent of them could not remember their last attendance. However, on the contrary, about 1.4 percent of them have just attended the same in the last week prior to the date of interview followed by 1.8 percent of them who reported 'a month ago.' A little more than one-quarter (26.7%) of them have reported to have attended the lesson or campaign one year ago. Around 14 percent have reported to have attended some 6 months ago. The remaining proportion of the respondents have attended such consultative meetings more than 5 years ago.

- Sources of information on climate change and its impacts is of tremendous importance to both mitigation and adaptation to which a multiple option was presented before the respondents to choose. The top three sources of information that made them learn about climate change and its impacts were from the combined sources such as 'National TV (e.g. BBS) and Social media' (56.6%), Social media alone (10.2%), and National TV (8.1%). The 'National TV (e.g. BBS), Social media, Word of mouth' comprise 7.6% of the percentage share as illustrated in table 28. The lowest source of information on climate change and its impacts is children with 0.2 percentage share.

CHAPTER 7| TOOLS FOR PROJECT MANAGEMENT

This chapter presents some of the important tools the PMU could follow for timely intervention to some of the causes for Theory of Change entailed in the project document. Although these tools are almost comprehensive, it is not the end-all for the project management to realize project MEL activities and indicators. The PMU could use this dataset and report to carry out further thematic analysis as and when the need arises through stakeholders' workshops or the members of PMU with a retreat. Following are some of the examples of indicator variables that could serve as a baseline for measuring the process and perceive project outcomes and behavioral changes. The algorithm presented below will exactly capture the weighted number of households or individuals dwelling at the two project landscapes that are benefited by ECRUL Project. To quantify the actual number of beneficiaries, the algorithm is of paramount importance. However, the PMU and all other implementing agencies or Responsible Parties (RPs) need to be mindful of the spread or randomized areas (EAs), which are handed over to the PMU in electronic form. Table 32 illustrates the algorithm for monitoring the coverage of beneficiaries. As a way of example, a couple of Project Sub Activity Nos are cited here. However, the PMU and RPs could find usage of this algorithm based on their need if any. If the current sample size of this study, 760 households are catered with various project Sub Activities or particularly implement to 3,496 individuals (highlighted in cream color) in the project landscapes of Thimphu and Paro, the total beneficiaries achieved would tantamount to 128,542 population or residents of the project landscapes. In a similar vein, if the current sample size is raised by a little to 770 or implement the Sub Activities of the project to 3,542 individuals (highlighted in Green), the beneficiaries will sum up to 146,186 residents or population. The red highlights indicate the flipside of the targets if the required sample size of 760 (minimum sampling floor) is not intervened. The column 3 of table 32 indicates the Local Area Code, which identifies the Enumeration Areas (EAs) in the field. Along these same areas, if the intervention is made, the targets set in this algorithm is probable up to 95% degree of precision. Table 32 could be directly used to realize the indicator 11.

Table 32: Algorithm for Sub Activity Nos.: 1.5.1.1;2.1.2.5;3.1.2.1;3.1.5.1

Primray Strata	*Sub-strata/LA Name*	*LAC in Map*	*HHs*	*Targeted HHs (Minimum)*	*Targeted HHs (Above minimum)*	*Base weights*	Adjusted weights	*Total Targeted resident population Achieved*	*Male*	*Female*
Thimphu	Dechecholing	1,2,3b,4	1,372	40	45	34.30	38.59	7,988	3,884	4,110
	Taba	5a,5b,5c,6a,6b,6c,6d	2,409	60	65	40.15	43.50	13,005	6,324	6,691
	HejoSamtelingZ Ilukha	7a,7b,7c,8,9,10,11,12,13,14	2,343	60	65	39.05	42.30	12,649	6,151	6,508
	Lower & Upper Motithang	15a,15b,15c,15d,15e,16a,16b,17a,17b,17c,18a,18b,18c	3,142	80	85	39.28	41.73	16,316	7,934	8,395
	Core & Changzamtok	19a,19b,19c,19d,19e,19f,19g,20a,20b,21a,21b,21c,22a,22b,23a,23b,24a,24b,24c,24d,25a,25b	6,209	180	185	34.49	35.45	30,170	14,671	15,522
	Yanchenphu, Changbangdu, & Lungtenphu	26,27,28,29a,29b,29c,29d,29e,29f,29g,30	5,932	160	165	37.08	38.23	29,019	14,111	14,930
	Semtokha, Babesa, & Khasadrabchu Town	31a,31b,31c,31d,32a,32b,32c,33,(LAP1, LAP2:Khasadrabchu Town)	3,844	100	100	38.44	38.44	17,682	8,599	9,097
Paro	LAP 1,2, & 3	1,2,3	1,339	40	50	33.48	41.84	9,624	4,680	4,951
	LAP 4,5,6,&,7	4,5,6,7	1,354	40	50	33.85	42.31	9,732	4,732	5,007
		Total	**27,944**	**760**	**770**	**36.77**	**37.25**		**71,087**	**75,211**

LAC in Map=Local Area Code in Map; HHs=Households; 4.6=Average household size (NSB, 2024)

N.B: Play with the green colored column and check the orange column and corroborate with the target residents. Make sure you maintain the minimum required numbers in the pink column This prediction will come true up to 95% if and only if the sub-strata corresponding to LAC in Map is followed strictly.

Table 32.1: Algorithm for Stormwater Drainage System

Project landscapes	*Project sites*	*Beneficiary Households*	*Estimated Population*	*Factor Weights*	*Adjusted Weights*	*Beneficiaries achieved*			*Required Benficiaries*		
						Both	*Male*	*Female*	*Male*	*Female*	*Both*
Thimphu	Upper Motithang	1,500	6,311	0.070	1.3	1,950	948	1,002	1,309	1,233	2,542
	Lower Motithang	2,000	11,081	0.123	5.8	11,600	5,638	5,962	7,035	6,625	13,660
	Changangkha Area	2,000	6,900	0.076	5.8	11,600	5,638	5,962	5,841	5,500	11,341
	Kaja Throm Area (Sabji Bazaar)	3,000	6,900	0.076	5.8	17,400	8,456	8,944	8,761	8,250	17,011
	Norzin Lam Core + Merorial Chorten Stram	5,000	23,000	0.255	5.8	29,000	14,094	14,906	14,602	13,750	28,352
	Chubachu (RTA to Tarayana)	1,500	4,600	0.051	5.8	8,700	4,228	4,472	4,381	4,125	8,506
	Debsi	2,000	13,800	0.153	5.8	11,600	5,638	5,962	5,841	5,500	11,341
	Babesa-Olakha along Wangchu	3,844	17,682	0.196	5.8	22,295	10,835	11,460	11,226	10,571	21,797
	Sub-total	***20,844***	***90,274***	***1.000***	5.8	***114,145***	***55,475***	***58,671***	***58,996***	***55,555***	***114,551***

Paro	Pa Chu Corridor	1,000	4,600	0.333	2.3	2,300	1,118	1,182	4,030	6,552	10,582
	Jangsa and Paro Town	2,000	9,200	0.667	2.3	4,600	2,236	2,364	8,061	13,104	21,165
	Sub-total	***3,000***	***13,800***	***1.000***	**-**	***6,900***	***3,353***	***3,547***	***12,091***	***19,656***	31,747
	Grand Total	**22,625**	**104,075**	**-**	**-**	**121,045**	**58,828**	**62,217**	**71,087**	**75,211**	**146,298**

N.B: Play with the numbers in the green colored column and check the numbers in the orange column and corroborate with the last three columns. Figures should be nearby them and not necessarily the same.

Similarly, table 33 illustrated the tracking tools for the PMU on various policy variables corresponding to the knowledge, attitudes, and practices in communities and stakeholders. Most of the variables under considerations were done based on the recommendation of the groups or components/factors via Exploratory Factor Analysis. All the items that secured more than 0.5 factor loadings were considered as an eligible candidate for the variable indicators. The figures falling under the year 2026 is a baseline figure, which later will be compared with the midterm and end-line surveys.

Table 33: Tracking Tools for Perceived Project Outcomes

Indicator	*Indicator variables*	*Sub-indicator variables*	*UoM*	*Interventions(Sub Activity No.)*	*2026*	*2027*	*% Diff*	*2031*	*% Diff*
Knowledge	Heard the term climate change	-	3-Point Likert Scale (Yes, No, Not sure): Mean value	To be identified by PMU and RPs	92%				
	Most common understanding of meaning of the climate change	Any climate change events witnessed over the years (Global warming via melting of ice in the mountain)	Frequency (%): Mean value		4.15				
	Witnessed the events related to climate change	Stronger and more frequent floods	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		3.29				
		Frequent landslides (both wet and dry)			2.93				
		Increased in air temperature			4.07				
		Increased use of chemicals for agriculture			2.95				
		Changing weather patterns (erratic rainfall & hotter period)			4.11				
		Windstorm			3.56				
		Wild fires			3.83				
		Poor air quality			3.75				
	Perceived causes of climate-induced hazards	Producing more harmful gases (e.g. CO2, CH4, etc)	Frequency counts (%)		22.1%				
		Deforestration			5.4%				
		Improper waste disposals by factories and households			1.5%				
		Electricity generations			0.1%				
		Climate change occurs when displeasing local deities			1.8%				
		Climate change is natural			1.1%				
Attitude	Mitigation, adaptation, and resilience of climate change-induced hazards	I am concerned about climate change and its impacts to the community	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		4.55				
		Disaster management plans in line with right technology for adaptation can help prevent the impact of climate change			4.27				
		Encouraging and promoting community participation will help prevent the impact of climate change			4.24				
		Discourage building of infrastructure near vulnerable areas			4.29				
		Conserve natural resources and energy to prevent climate change issues			4.39				
		Water conservation and reuse needs to be encouraged			4.03				
	Action of national and local leaders	Community leaders are taking actions to address the impacts of climate change on communities	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		3.59				
		National level govt. leaders are taking actions to address the impacts of climate change on communities			3.73				
		Community members are taking actions to address the imapacts of climate change on communities			3.72				
	Negative attitude towards climate change	Living for today is more important than worrying about the effects of climate change in the years to come	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		2.60				
		Nature will take care of the climate change and it is needless to worry			2.44				
		Our area or community cannot do much about climate change			2.89				
	Perceived importance on climate change-induced hazards	I belive the stronger and more frequent windstorm affects our area/community	5-point Likert Scale (Very important to Not at all important): Mean value		4.41				
		I believe increased temperature affects our area/community			4.38				
		I believe flooding, landslides, and river erosions affect our area/community			4.23				
		Increased vector borne/water borne diseases affected our community			3.95				
Practices	Actions individual or community has taken till date to lessen the impact of climate change	Actions taken till date	Frequency counts (%)		26.4%				
		Water management	Frequency counts (%)		45.8%				
		Waste management	Frequency counts (%)		30.2%				
		Carpooling	Frequency counts (%)		7.3%				
		Conserved energy	Frequency counts (%)		4.6%				
		Turned off lights and water taps when not in use	Frequency counts (%)		6.2%				
		Raised awareness on the issues of climate change	Frequency counts (%)		0.4%				
		Involved in reforestration	Frequency counts (%)		7.5%				
Changes perceived through ECRUL*	Govt. & UNDP's interventions	The government is doing things to help us to adapt to climate change ocally	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		3.94				
		The UNDP is doing things to help us to adapt to climate change locally			3.59				
	Water shortage periods	Frequency of portable water supply in the past one year	Between 3-5 days (%)		16.6%				
		Frequency of portable water supply over the past three months	Whole day (%)		83.5%				
	Heating & cooling systems	Requirement of heating system	More than 5 hours a day (%)		10.4%				
		Requirement of cooling systems	More than 5 hours a day (%)		0.3%				
	Awareness on ECRUL Project	Are you aware of the ECRUL Project?	3-Point Likert Scale (Yes, No, Not sure) (%)		9.8%				
	Source of informaton on ECRUL Project	Social media (Facebook)	Frequency counts (%)		86.3%				
	Perception on ECRUL Project	Do you agree that ongoing projects to building climate resilience are for good?	5-point Likert scale (Strongly agree to Strongly disagree): Mean value		2.1				

** Add questions on the interventions through ECRUL Project in the midterm survey*

Crawford (2001) highlighted that Pareto Principle, which is popularly termed as "80/20 Rule" prioritizes possible changes by identifying the problems that will be resolved by making these changes. To elaborate the Pareto Principle, solving 20% of the problems in a process may resolve 80% of the failures and on the flip side, 20% of customers, for instance, will generate 80% of complaints. So, the Pareto Principle in this particular study is used to identify those 20% of the attributes that will impact 80% of the project initiatives. Table 34 presents the attributes that were recommended by the Exploratory Factor Analysis. The average score for each factor is computed with the corresponding factor weight, which is cumulated to obtain the Pareto Chart.

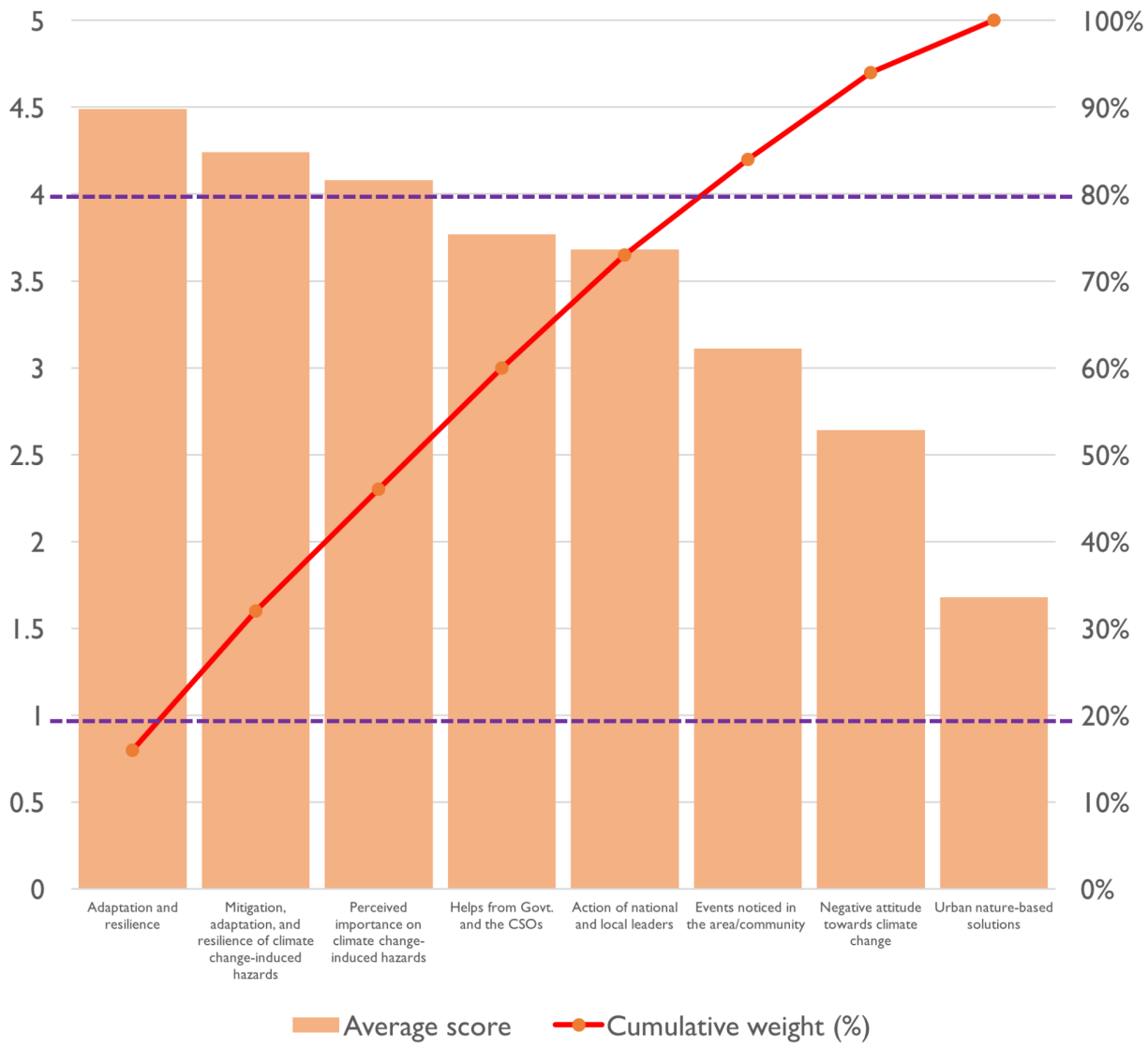
Table 34: Pareto Analysis of attributes of KAP on climate change and its impacts

Attributes	*Average score*	*Factor weight (%)*	*Cumulative weight (%)*
Adaptation and resilience	4.49	0.11	0.11
Mitigation, adaptation, and resilience of climate change-induced hazards	4.24	0.16	0.27
Perceived importance on climate change-induced hazards	4.08	0.06	0.33
Helps from Govt. and the CSOs	3.77	0.15	0.49
Action of national and local leaders	3.68	0.13	0.62
Events noticed in the area/community	3.11	0.1	0.72
Negative attitude towards climate change	2.64	0.15	0.86
Urban nature-based solutions	1.68	0.14	1
Total	**27.69**	1	

Figure 7.1 illustrates the Pareto Principle. The attributes, 'Adaptation and resilience', 'Mitigation, adaptation, and resilience of climate change-induced hazards', and 'Perceived importance on climate change-induced hazards' together form 80% of the vital few. So, if these three aforementioned attributes are taken care of, the results will determine 80% of the project initiatives. This heralds the '*missing middle*' in the Theory of Change that needs to be taken care of. Under these abovementioned attributes, there are indicator items corresponding to each

latent variable (attribute), which are the policy variables that need more focus. The most crucial attribute that falls closer to 20% is '*Adaptation and resilience*.' All these indicator items are displayed in table 31, 'Rotated Component Matrix.'

Figure 7.1: Pareto Chart for attributes of KAP on climate change and its impacts



CHAPTER 8| RECOMMENDATIONS AND WAYFORWARDS

This final chapter broadly presents the insights drawn out of the findings of this study. The insights on Knowledge, Attitude, and Practices presented in this chapter are both from the quantitative survey and the qualitative studies. Both KIIs and FGDs were conducted with the RPs of the ECRUL Project.

For the majority of the respondents, climate change is not a myth but a reality. The respondents have displayed fairly good knowledge on climate change and its impacts. The majority of them were aware of the term, 'climate change.' More female respondents were aware of climate change than males. Most of them have noticed at least one of the events related to the climate change-induced hazards. Amongst the climate-induced hazards witnessed over the years, 'Global warming' that was defined in this study in the context of melting of snow in the mountains had been the most witnessed event by respondents. One of the main objectives of this study was to identify perceptions regarding climate change causes and impacts on settlements. Producing harmful gases, improper waste disposal by factories and households, and deforestation were amongst the top list. Indirectly, the respondents were assessed as to whether they are able to adapt at both individual and community levels. Most of the respondents have reported that climate change is adaptive as against 4 out of every 10 have reported that they did not know about the solutions against the impacts of climate change. However, a little more than 2 out of every 10 respondents have asserted that if collaboration of different tiers of the government spanning from local to national and international levels is realized, there could be many plausible solutions to the problems. Respondents were as well aware of the urban NbS and in particular, 'Urban agriculture' secured the highest mean amongst others. Very little is known about the ECRUL Project through facebook and other social media.

On the front of attitude, most of the respondents were concerned about climate change and its impacts to the community. A little more than male respondents (by 5 percentage points), females have agreed that complying with the environmental laws can prevent the impact of climate change. Interestingly, there are quite some sizable respondents who believe that nature would

take care of the climate change and it is needless to worry. However, there are enough respondents too who disagreed with this proposition. This is followed by more than 9 out of every 10 respondents who are ready to do whatever to help preserve the environment. In a similar vein, a little more than 9 out of every 10 respondents agreed that encouraging and promoting community participation will help prevent the impact of climate change. In a similar vein, the majority of respondents (91%) have opined disaster management plans in line with right technology for adaptation can help prevent the impact of climate change.

As regards the prevailing practices, the majority of the respondents have asserted that everyone needs to be responsible to address the impacts of climate change. Most of the respondents claim that they took part in water management, waste management, awareness campaigns, and some even took part in drawing disaster management plans. However, most of them reported that they do not have much access to information despite the fact that they are interested in finding out more about climate change. A very high proportion of the respondents have asserted that they are willing to contribute towards resilience projects via money, time, commitment, mindset, and the rest. The survey sought to uncover the respondents' stand on mitigation of climate change issues via NbS. The majority of the female respondents have agreed to the proposition. Time and again, the respondents have raised a concern that lack of information or not having access to information on climate change has put a big dent in taking any action to prevent or lessen the impact of climate change. The respondents also complained that they did not notice concerned agencies carrying out any actions to combat the impacts of climate change in their community. Portable water shortages over the past one year, ranging from more than 5 hours a day to one week, had been the detrimental issues the respondents have reported. Gauged by the reference period of the past three months from the date of interview, more than 8 out of every 10 respondents have reported that they faced portable water supply issues between 5-7 hours a day. Respondents were as well delved further if the urban setup they dwell at currently are endowed with the climate adaptation and resilience setups. Most of them claimed to have urban forest cover and tolerable heat. A little more than 4 out of every 10 respondents have reported that they do not know whether the current area they dwell at is a safe place from

climate-induced hazards. A very few of them have attended the consultative meetings or school lessons on climate change. Ultimately, the respondents were asked to cite the sources of information that made them learn about climate change and its impacts. National TV and Social media are the two top sources of information they cited.

As for the qualitative part of this study. The Key Informant Interviews (KII) and Focused Group Discussions (FGDs) were conducted amongst the project stakeholders, youth, and women. Some of the key highlights of the qualitative findings are reported below ad verbatim (without modifying anything). Upon asked about the situations or factors that either enabled or hindered from taking the actions for adaptation, the participants have frantically asserted that the lack of funding and coordination amongst the responsible parties and agencies as the most detrimental factor. The FGD and KII participants have also expressed that the most vulnerable group as a result of the climate change are women, children, and old-aged people.

Some of the interesting qualitative findings that merits mentioning in this chapter are the gaps that hindered implementing NbS (Nature-based Solutions) in urban areas based on the Bhutanese context. The ad verbum expressions of the participants unfolded some of the interesting prevailing facts such as severe lack of capacity of the urban planners on NbS. This is also augmented with the fact that the urban planners are plagued with gaps in research, data availability, and inadequate capacity among the technical professionals to effectively integrate NbS into planning and infrastructure design. Limited land areas in urban areas in another issue unfolded by the qualitative findings of this study.

The quantitative findings of this study recommends the following:

- Gear all the programs under ECRUL sooner especially the demonstration and awareness program in the EAs identified by this study in the form of algorithm;

- To better identify the 'missing middle' of the Theory of Change of this project, conduct the midterm KAP survey right after implementation of some of the programs in the aforementioned EAs;

- Find out the plausible ways to coordinate amongst the RPs for realizing better output and outcome of the ECRUL Project;
- Conduct a thematic study from this report and datasets led by the PMU and update the indicators;
- Align the Sub Activities especially those related to mitigation, adaption, and resilience to the Pareto Analysis results and the EFA results;
- Information on climate change and its impacts needs to be disseminated well; and
- Finally, make the RPs and other relevant officials study this report thoroughly.

The qualitative findings recommended the following (ad verbum expressions):

- *"Maintenance of wetland;*
- *Establishment of Early Warning Systems;*
- *Thromdoe to be more responsible;*
- *Decongestion of city; and*
- *Use of latest technology to combat climate risks.*

In a nutshell, the key takeaway from this survey is to attend to the following attributes. The attributes, 'Adaptation and resilience', 'Mitigation, adaptation, and resilience of climate change-induced hazards', and 'Perceived importance on climate change-induced hazards' together form 80% of the vital few based on the Pareto Analysis. So, if these three aforementioned attributes are taken care of, the results will determine the impact of 80% of the project initiatives. The most crucial attribute that fell within the 20% of the Pareto Chart is the attribute, 'Adaptation and resilience.' If the project aligns the plans and programs in line with the attribute, 'Adaptation and resilience', it will yield 80% of the benefits.

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ANNEXURE-I: HOUSEHOLD SURVEY QUESTIONNAIRE

Questionnaire Form: Circle/check the responses or write the corresponding code

A: GEOGRAPHICAL IDENTIFICATION:

Q1. Project area:……

Q2. LAP No: ……..

Q 3. Location of household:

1. Low-lying area 2.Steep inlcine

3. Near river

Q4. HH sl#: ☐☐☐

Q10. Level of education:

00. No education

Classes 1-12

13. Diploma ☐

14. College & above

15. Monastic/shedra

16. NFE

Q11. Main Occupation:

B. GENERAL CHARACTERISTICS:

Q5. Age (in completed years): ☐☐

1. Farmer

2. Govt. employee

Q 5.1. Gender:

1.Male

2. Female

3. Third gender (Specify): ……..

3. Corp. employee

4. Pvt. Employee

5. Business/trade

6. Others (Specify):…….

Q6. Marital status:

1. Never married

2. Married

3. Living together

4. Divorced

5. Separated

Q12. Your monthly earnings (Nu.):……..

Q12.1. Your monthly expenditure (Nu.): ……..

Q13. Communication facilities available (Please tick more than one):

1. TV 2. Cellular Phone 3. Radio 4. Cellular phone with internet

5. Print media subscription (Specify):……

6. Widow

Q7. Mother Tongue

1. Dzongkha
2. Tshanglakha
3. Lhotsamkha
4. Khengkha
5. Others (Specify): ……

Q8. Religion:

1. Buddhist
2. Christian
3. Hindu

Q13.1. The two most often used media in the past one month:

1…….

…….

2……

……..

Q14.How long have you lived in this area?

1. Less than a year
2. …….Completed years
3. All my life

Q15.Ownership of the household:

1.Owned 2.Rented 3.Other (Specify):……..

Q15.1.Type of construction material of the outer walls used:

1.Concrete 2.Wood 3.Wood and concrete 4.Plywood

4. Others (Specify):……

5.Thatch 6.Sheet metal 8.Brick

9.Other (Specify):…….

Q8.1.No. of household members:

1Male:…… Female:…… .. …...

3.Third gender:……

Q9. Do you consider yourself with any of the following conditions?

1. Disabled

2. Partially disabled

3. No such conditions

4. Don't want to say

Q15.2.Type or roofing material (To be observed and checked):

1.Metal roofing (e.g CGI metal sheet)

2.Concrete roofing

3. Tiles

4.Thatch roofing

5.Shingles

6.Other (Specify):…… ……..

Q16.Is this house or unit insured?

Q19.What are the main causes of climate change according to you?

1.Yes
2.No
3.Don't know (*Probe with owner*)

Q16.1.This house/unit is insured against climate related hazards such as flood, fire, or other natural hazards?

1.Yes
2.No
3.Don't know (*Probe with owner*)

C. KNOWLEDGE

Q17. Are you aware of the term climate change?

1.Aware

[Check multiple options]

1.Producing more harmful gases (e.g. Carbondioxide, methane etc)		
2. Deforestrations		
3.Improper waste disposals by factories and households		
4.Electricity generation		
5. Climate change is natural		
6.Climate change occurs when displeasing local deities		
7. None of the above		
8.Others (Specify):…… ……		

Q20.The climate change is adaptive.

5. Strongly agree
4. Agree
3. Don't know

2.Not aware

3.Not at all aware

Q18. Have you noticed or encountered the following events ever since you lived in this area/community?

[5=Strongly agree; 4=Agree; 3=Don't know;2=Disagree; 1=Strongly disagree]

1.Stronger and more frequent floods

2.Frequent landslides (both wet and dry)

3.Increase in air temperatures

4.General rise in sea level

5.Global warming (e.g. melting ice in the mountains)

2. Disagree

1.Strongly disagree

Q20.1.Rate the following statements based on your level of agreement:

[5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Storngly disagree]

1.Building river walls, improving drainage systems, designing climate -proof infrastructure can help reduce the effect of climate change

2.Restoring lost vegetations via planting urban forests to reduce heat can help reduce the effect of climate change

3.Sustaining the present wetlands in our areas can help reduce the effect of climate change

4.Empowering local decision-making and vertical integration will certainly help reduce the effect of climate change *[Explain this properly]*

6.Increased use of chemicals for agriculture

7. Changing weather patters viz. erratic rainfall, hotter periods,

8. Windstorm

9.Wild fires

10. Poor air quality

11.Others (Specify):……..

Q18.1. What were the effects of the above events had on you and

2. Loss in income

3. Health hazards

4. Lack of potable water

5. Loss in livestock

5.Women's participation in decision-making regarding climate change could surely bring positive impacts to climate resilience

6.Every individual can do something to adapt to climate change

7.Climate change can affect the quality of life for both present and future generations

8.Human activity is responsible for climate change

Q21.Are you aware of the following solutions to climate change? (Multiple choice)

1.Ecosystem-based adaptation (EbA)

2.Collaboration of different tiers of the governance (e.g from local to national and international levels?

3.Local technical capacity

6. Loss in agricultural production

7. Devastating psychological impact especially women and children

8. Others (Specify):……..

4.Adoption of participatory approaches

5.Value local knowledge and strengthen local organizations and planning processes

Q21.1. Are you aware of the following terms:*[1.Yes;2.No;3.Not sure]*

1.Urban Green Infrastructure design/Nature-based urban resilience

2.Socio-ecological resilience

3.Urban agriculture

4. Green-belt Zone

5. Urban landscape design/planning

6. Natural capital

Q21.2. Are you aware of the ECRUL project?

1. Yes

2. No

3. Don't know

Q21.2. If "Yes" how did you come to know about the ECRUL Project?

1. From facebook/social media

2. From BBS

7. Climate change-inducced stresses		3. Others (Specify): ……..
8.Parks/National parks		Q21.3. Do you agree that ongoing projects related to building climate resilience
9.Urban forests		are for good?
10. Wildlife corridors		4. 5. Strongly agree Agree 3. Don't know 2. Disagree
11. Any other (Specify):……..		1. Strongly disagree

D.

ATTITUDE

Sl#	Item	Strongly agree (5)	Agree (4)	Don't Know (3)	Disagree (2)	Strongly disagree (1)
22	I am concerned about climate change and its impacts to the community					
23	Complying with environmental laws can prevent the impact of climate change					
24	Building climate-proof structures near the river basin is a solution of climate change					

25	Disaster management plans in line with right technology for adaptation can help prevent the impact of climate change					
26	Encouraging and promoting community participation will help prevent the impact of climate change					
27	Dissemination of information on climate change issues to public needs to be increased					
28	Increase reforestation to mitigate climate change issues					
29	Discourage building of infrastructure near vulnerable areas					
30	Conserve natural resources and energy to prevent climate change issues					
31	Water conservation and reuse needs to be encouraged					
32	Community leaders are taking actions to address the impacts of climate change on communities					
33	National level government leaders are taking actions to address the impacts of climate change on communities					
34	Community members are taking actions to address the impacts of climate change on communities					

35	I as an individual am ready to do whatever I can to help to preserve the environment					
37	Living for today is more important than worrying about the effects of climate change in the years to come					
38	*Item*	*Strongly agree (5)*	*Agree (4)*	*Don't Know (3)*	*Disagree (2)*	*Strongly disagree (1)*
39	Nature will take care of the climate change and it is needless to worry					
40	I am hopeful that we could do something to adapt to climate change					
41	Our area/community cannot do much about climate change					
44	*Rank the following items in order of their importance*	*Very important (5)*	*Important (4)*	*Don't Know (3)*	*Not important (2)*	*Not at all important (1)*
45	I believe changing weather patterns affects our area/community					

46	I believe the stronger and more frequent windstorms affects our area/community					
47	I believe increased temperature affects our area/community					
48	I believe flooding, landslides, and river erosions affect our area/community					
49	An individual should learn more about climate change					
50	Increased vector borne/water borne diseases affected our area/community					
51	Frequent forest fires affect the air quality of our area/community					

Q52. Who do you think is mainly responsible for addressing the climate change issues in your area/community?

1.Government

2.Businesses/industry

3.Local government

4.Local people

Q55.What prevented you or your area/community from not taking any action to prevent or lessen the impact of climate change if any?

1.Do not have access to information about climate change

2.Do not know what exact action to be taken

3.Nobody bothers about climate change in our area/community

4.Other

(Specify):……

5.United Nations ……

Q56. Type of fuel used for daily

6.Everyone cooking:

7. Don't

know 1. LPG gas

8. Others (specify):

…… 2. Kerosene

E:

PRACTICES 3. Fuelwood

Q53.Have you or the community taken any actions 4. Induction

till date to cooktop

lessen the impact of climate 5. Rice

change? cooker

1.Ye

s 2.No>>Q54 3.Not sure 6. Curry

cooker

7. Others

Q53.1. If "Yes" in Q53, which of the following (Specify):……

actions have been ……..

taken by you or your community to lessen Q57. Where do you dispose

or prevent the impact your wastes?

of climate change in your 1.City waste

area/community? centre

1.Water management

2.Took part in drawing disaster management plans

3.Conserved energy

4.Carpooling

5.Waste management

6.Raise awareness on the issues of climate change

7. Involved in reforestation (planing trees)

8.Helped to maintain public drainage systems from waste

9. Turn off lights and water taps when not in use

10. Others (Specify):……

2.Dispose in an open field

3. Others (Specify):……

Q58. Over the past one year, how many times did you experience water shortages?

1.More than a week

2. Exactly one week

3. Less than a week

4. Between 3-5 days

5. Between 1-2 days

6. None of the above

Q54.Which of the following actions have you noticed carried out by the concerned agency to combat the impact of climate

Q58.1. Over the past three months, how many hours of potable water supply per day did your household receive?

change in your community/area?*[Multiple choice]*

1.Provided support to agriculture sector to improve crop performance

2.Installed an early warning systems for floods and health-related impacts

3.Enforced building code

4.Introduced electric cars to reduce fossil fuel use

5. Conducted awareness campaigns in the area/community

6. Others (Specify):…….

1. Whole day

2. Half a day

3. Between 5-7 hours a day

4. Less than two hours a day

5. Others (Specify):…….

Q59. Did you require a heating system during the cold season?

1. Yes

2. No

3. Cannot say

If "Yes" in Q59, frequency of the heating system used?

Q60.3. Overall, do you think the area or community you currently dwell is safe from climate-induced hazards?

1. Yes 2.No 3. Don't know

Q61.Overall, how adaptive are you or your community in times of climate-induced events?

1. Throughout the season

2. Off and on

3. At least five hours a day

4. More than five hours a day

5. Throughout the day

6. Others (Specify):……..

Q60. Did you require cooling system during the warm season?

1. Yes

2. No

3. Cannot say

Q60.1.If "Yes" in Q60, frequency of the cooling system used?

1. Throughout the season

1. We are completely ready

2. Ready

3. Not sure

4. Not ready for such events

5. Not at all ready

Q62. Have you ever attended a consultation meeting or school lesson on climate change?

1.Yes 2.No 3. Don't know

Q62.1.If "Yes", who organized them?

1.Local Government 2. UNDP 3.School 4.Department of Disaster Management 5. Others(Specify): …….

Q63.When was the last one you attended?

2. Off and on

3. At least five hours a day

4. More than five hours a day

5. Throughout the day

6. Others (Specify):……..

Q60.2. Urban areas here have the following:

[5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Strongly disagree]

1. Have urban forest cover to protect us from heat during warm season.

1.Last week 2. One month ago 3.An year ago 4.Six months ago

5. Cannot remember 6. Others (Specify): …….

Q64. Please rate according to your agreement the following statements:

[5=Strongly agree; 4=Agree; 3=Don't know; 2=Disagree; 1=Strongly disagree]

a. The government is doing things to help us to adapt to climate change locally

b. The UNDP is doing things to help us to adapt to climate change locally

c. I am willing to contribute towards resilience projects via money, time, commitment, mindset, etc

2. Overall, we can bear heat in this area

3.There are enough parks or vegetation covers to combat

heat in our area

4. We have lots of drainage issues here

5. Overall, this urban setup is fine.

6. Our area has lots of urban green spaces with cool and clean

air

7. Our area has lots of wetlands

8. Our area has lots of dusts that were added over the years by

river erosion and other flashfloods

Q60.3. Do you think the structure you presently dwell can withstand

Climate shocks?

Q56. If you or your community is struck with one of the events of

climate change, what will be your immediate response to the same?*[Checks]*

1. Follow the advice of the community leaders and other

relevant authorities
via media

2. None of such events can affect me or my community due to

our apriori knowledge on how to respond to those events

3. We are sensitized on the steps we need to follow by the

concerned
authorities

4. Don't know what step to take in such events

5. We strictly follow existing early warning systems

6. We are trained in disaster management

7. It is none of our business to take action against such events

1. Yes 2. No 3. Cannot say

8. We are quite used to such events and will make no difference

9. Others (Specify):

……..

F: ACCESS TO INFORMATION

Q63. From which of the following top three sources do you get information

regarding climate change and adaption methods?

1.National TV (e.g.BBS)	
2. National Radio	
3.Social media	
4.Print media	
5. No information on climate change is disseminated usually	
6.Others (Specify):…… …	

Any other comments?

ANNEXURE-II: GENERAL FOCUSED GROUP DISCUSSION (FGD) GUIDE

Q I. What is Climate Change?

1.1. According to your individual understanding, what does climate change mean to you?

1.2. Can you differentiate weather change and climate change? What interrelationships do you think exist between the two? *[Probe: Causes of climate change]*

1.3. What types of events do you think climate change will bring forth? *[This should open up the general discussions on the events viz. increased windstorms, erratic rainfall patterns, flashfloods, etc.]*

1.4. What types of climate change impacts have you observed over the past years in this area or community? Any detrimental scenarios you have witnessed that you wish to share?

Q II. Risks involved in Climate Change

2.1. Who do you think would be affected more or more vulnerable such as disabled people, women, children in your area or community from climate change impacts? *[Probe: quality of construction, location of the households [near river, steep incline, low-lying area, etc]*. Please cite a couple of reasons you think they are most at risk. How risk-prone do you feel yourself with the impacts of climate change?

2.2. Overall, what is your rating of your area or community in terms of risk from climate change *[5=Highly risk-prone; 2=Risk-prone;3=Not sure; 4=Not risk-prone; 1=Not at all risk-prone]*

Q III. Adaptation/What can be done to reduce climate risk?

3.1. What steps do you think you can take to reduce the impact of climate change? Please mention the situations or factors that either enable you or hinder you from taking the actions for adaptation.

3.2. Have you noticed those vulnerable groups in your area or community taking any actions to reduce climate impact? What are the factors that do not enable them from taking such actions if any?

3.3. Do you have any ideas regarding 'proper storm water drainage network'? *[Probe the source of information]*

3.4. Where do you think you can approach to take part in reducing climate change impacts? *[Delve into 'Grievance Redressal Mechanism]*

Q IV. Responsible agencies to help improve climate change

1.6. In order for our area or community to get ready for climate change/adapt, everyone needs to be involved and play their role to help reduce climate change impact or prepare ourselves from the impacts of climate change. *[Probe who in the government needs to be involved (both at the community, local, Dzongkhag, to the national level of governance)]*

1.7. Types of programmes or projects in existence currently helping the area or community to make themselves more climate resilient.

1.8. Types of roles and responsibilities your area or community is entrusted with as of now. *[Delve into those adaptive actions especially NbS]*

1.9. Mention some of the preventive measures we could take to avoid contributing to climate change?

Q V. Sources of information regarding climate change

5.1. Any effective ways you could suggest to reach people or communities with information on climate change? *[Probe the type of dissemination that would draw people's attention on climate change].*

5.2. Please tell us about your most trusted source of information on climate change. *[Probe regarding EWS in place, their knowhow on agencies responsible for dissemination of information, etc]*

ANNEXURE-III: KEY INFORMANT INTERVIEW (KII) GUIDE

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Key Informant Interview Consent Form

Introduction: You are invited to join this study pertaining to the KAP (Knowledge, Attitude, and Practices) Baseline Assessment Survey concerning "Enhancing Climate Resilience of the Urban Landscapes and Communities of Thimphu and Paro" (ECRUL) Project. The information collected through these KII will strictly be used to excavate the level of KAP amongst the key stakeholders for the purpose of policy formulations. You are identified for this interview for being a key stakeholder and it will cost you nothing to be in this study. All your personal information will be kept confidential at all times.

Participant ID/SI#:

Key Informant Interview Consent Form

Statement	Please initial/check each box
I have read the information sheet/questionnaire provided by the interviewer that vividly explained the reasons for this study.	
I understand that my interview may be recorded.	

I understand that data collected during the study may be looked at by other researchers and regulatory authorities.	
I understand the reasons for this interview and am willing and happy to participate in it.	
I know that I have the right to leave the interview at any time or to refuse to answer any questions.	
If I do not agree to take part in this interview I understand that I will not be penalized for doing so by the researchers nor by any medical service personnel in the future.	

I voluntarily agree to take part in this interview.

Name of participant:…….. Date: …./…./… Signature: ……..……

Name of the interviewer: ……. Date: …./…./… Signature: ……..……

Key Informant Interviews (KIIs)

Stakeholders [National, Dzongkhag (Project area), Gewog (Project sites), Project site stakeholders, Local and International NGOs, and Intergovernmental organizations.]

Name of agency:…….

Designation:……..

Gender: 1. Female 2. Male

Age (in completed years):

Date of the interview:……..

Questions:

1. What is a climate resilience according to your understanding?
2. Discuss any one of the urban resilience you know *[e.g. economic resilience, social resilience, ecological resilience, infrastructure resilience]*.

3. What are the benefits of climate resilient development? *[Try answering along urban landscape design, Green Infrastructure design/Urban Green Infrastructure (UGI) planning, parks, wildlife, corridors, urban forests, national parks, etc,]*
4. Have you heard of the following terms? *[*1.Yes; 2. No; 3. Cannot say*]*
    a. Forestry practices
    b. Wetland-related practices
    c. Restorative agriculture
    d. River-based practices
5. Are you aware of the following environment and climate funding sources?

[Scale: 5=Fully aware; 4=Aware; 3=Don't know; 2=Not aware; 1=Not at all aware]

a. LDCF (Least Developed Countries Fund)	
b. SCCF (Special Climate Change Fund)	
c. GEF (The Adaptation Fund/the Global Environment Facility)	
d. IFAD (International Fund for Agriculture Development)	
e. IUCN (International Union for Conservation of Nature)	

6. Discuss at least one of the key challenges for the ECRUL Project sector and those relevant agencies with responsibilities for the same.
7. What can be done to improve laws and regulations related to climate risk-informed development approach in Bhutan?
8. Discuss some gaps that hinders implementing NbS (Nature-based Solutions) in urban areas of Bhutanese context. *Hint: Discuss on research limitations, data deficiencies, challenges in accessing and implementing existing knowledge]*
9. Any other comments or suggestions?

ANNEXURE-IV

List of Surveyors/Enumerators & Interview Recorders for KAP-ECRUL Project

SL #	Name	CID#	University/College	Mobile	Designation
1	Sonam Choden	11002002105	Taktse College, RUB	77320606	Surveyor
2	Karma Lhamo	11505004768	Taktse College, RUB	17928679	Surveyor
3	Ugyen Zangmo	10904000699	Taktse College, RUB	17486618	Surveyor
4	Tashi Norbu	11505005800	Sherubtse, RUB	17899067	Surveyor
5	Tashi Dema	10911000099	Gedu College of Business Studies	17846598	KII data compiler
6	Kuenzang Jurme Dorji	11407002758	College of Natural Resources	77653125	FGD recorder, Thimphu
7	Pema Choden	10811000636	Sikkim Manipa, India	17774332	Surveyor
8	Tshering Choden	10705004858	Sherubtse, RUB	17975907	Surveyor
9	Thukten Yoezer	11102000638	Norbuling Rigter College, RUB	17435351	FGD recorder, Paro
10	Tshering Dorji	10703002436	RVM College, India	77773380	Paro Supervisor cum surveyor
11	Karma Lhendup	10710002136		17115900	Thimphu Supervisor cum Overall coordinator

ANNEXURE-V

Enumerators' Manual

Knowledge, Attitude, and Practice (KAP) Baselines Assessment of ECRUL (Enhancing Climate Resilience of the Urban Landscapes and Communities in Thimphu-Paro Region of Bhutan) 2026

1. Introduction

This survey consists of five sections viz. Geographical Identification, Socio-economic Characteristics, Knowledge, Attitude, and Practices followed by Access to Media. Please follow this manual properly whenever you have a slightest doubts and if failed to understand the manual, never fail to ask your Supervisor and if incase Supervisor fails to respond to your queries in turn, always consult the Lead Consultant @ 17115900. This manual mentions in detail only the difficult questions that would stem up the problems in the field.

1.1 Section A: Geographical Identification

This section requires the enumerators to collect the geographical information. However, the enumerators are not to ask the respondents on these information, which can be filled in using external sources. Q3 is simply to observe and check the options based on surveyor's subjective evaluation of the location. For example, Low-lying area means to observe the location of the household in reference to the nearest hill. There is no hard and fast rule to it. Surveyor could check based on his/her idea of the term, 'Low-lying area.'

1.2 Section B: Socio-Demographic Characteristics

This section consists of questions ranging from Q5 to Q16.1. All the concepts are common and simple except the following related to third gender:

Bisexual: The term "bisexual" is used to describe a person who experiences emotional, romantic and/or sexual attractions to, or engages in romantic or sexual relationships with, more than one sex or gender.

Transgender: Transgender is an umbrella term for persons whose gender identity, gender expression or behavior does not conform to that typically associated with the sex to which they

were assigned at birth. Gender identity refers to a person's internal sense of being male, female or something else; gender expression refers to the way a person communicates gender identity to others through behavior, clothing, hairstyles, voice or body characteristics.

Queer is an umbrella term for people who are not heterosexual or are not cisgender. Originally meaning "strange" or "peculiar", queer came to be used pejoratively against those with same-sex desires or relationships in the late 19th century.

-All the above terms and person belonging to those categories are so sensitive. So, one must if encountered as interviewee needs to be asked cautiously as trained during the enumerators' training program.

Q12 needs to be asked with care. Usually income is not disclosed both by the educated and uneducated respondents. If they do not want to reveal their earnings, simply probe into the monthly expenditure from which we can estimate their proxy earnings later. Q13, only communication facilities need to be asked. In the section others, do not mention the non-communication related facilities. Similarly, Q9 is a very sensitive question and if the respondent is educated, handover the phone and make him/her check the option. If the disability is severe, the surveyor could observe and check the option. However, try your best to extract the true information.

As for Q16 and Q16.1, if the occupant is not the owner of the unit/structure, get the mobile number of the owner from the occupant and ask the status of insurance.

1.3 Section C: Knowledge

This section is intended to check the level of knowledge of the respondents pertaining to the respondents' knowhow on the climate-induced hazards and their responsiveness and preparedness. Respondents are also asked to check the level of their knowledge on general impacts of climate change.

This section comprises of questions spanning from Q17 to Q21.3. All are straightforward questions. The following questions need some attention:

-Since all the scales involved in this section are mostly 5-point Likert scale, it is very difficult to gauge especially when the respondents are uneducated. So, use percentage-based response as discussed during the training.

-As for Q21.1, the general definitions are as follows [google if you fail to understand. All the definitions are available online]:

Urban Green Infrastructure design/Nature-based urban resilience: "Urban green infrastructure is comprised of a network of near-natural and designed spaces and elements in cities, planned and maintained in such a way that the infrastructure as a whole offers high quality in terms of utility, biodiversity and aesthetic appeal while also delivering a broad range of ecosystem services."

- Socio-ecological resilience: "Social-ecological resilience refers to the capacity of a social-ecological system to absorb shocks and maintain its structure and functions in the face of stressors and disturbances, while also adapting and transforming to changing conditions over time." Social-ecological means the human activities and ecological processes are interconnected and mutually dependent.
- Urban agriculture: "Urban agriculture is the practice of growing food in urban areas. It can be done on rooftops, balconies, vacant lots, and even in alleyways/paths."

· Green-belt Zone: "A green belt is a designated zone of open land that surrounds or sits alongside urban areas, where most forms of development are either restricted or banned altogether."

· Urban landscape design/planning: "Urban landscape design refers to the planning, designing, and implementation of a city's greenways, plants, and other landscaping elements."

- Natural capital: "The natural resources and environmental features in a given area, regarded as having economic value or providing a service to humankind."

· Climate change-induced stresses: "Climate Stress, at its most accessible level, signifies the strain placed upon natural systems, human societies, and economic structures by the changing global climate."

- Urban forests: "Urban forestry is the care and management of single trees and tree populations in urban settings for the purpose of improving the urban environment."
- Wildlife corridors: "A wildlife corridor is a piece of undeveloped land connecting two habitats so wildlife can move safely between them."
- EbA (Ecosystem-based Adaptation): "Ecosystem-based adaptation is a strategy for adapting to climate change that harnesses nature-based solutions and ecosystem services. For instance, protecting coastal habitats like mangroves provides natural flood defenses; reforestation can hold back desertification and recharge groundwater supplies in times of drought; and water bodies like rivers and lakes provide natural drainage to reduce flooding."
- NbS (Nature-based Solutions): "Nature-based solutions describe the development and use of nature and natural processes to address diverse socio-environmental issues.". They target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable development."

Only the crucial definitions are cited here and the rest are covered in the training of enumerators/surveyors.

1.4 Section D: Attitude

This section deals with the attitude of the respondents on climate change. There are specific items or statement and corresponding 5-point Likert Scale (5= Strong agree; 1=Strongly disagree). So, respondents are supposed to rate according to their level of agreement.

-Again, since all the scales involved in this section are mostly 5-point Likert scale, it is very difficult to gauge especially when the respondents are villagers. So, use percentage-based response as discussed during the training.

Almost all the items/statements are simple and straightforward (Q22 to Q51). The surveyors are not supposed to take lead. No dangling alternatives should be provided. Respondents' opinion is final and binding.

1.5 Section E: Practices

This section pertains to the existing practices of the climate change lessening activities that relate to the climate-induced hazards. This section comprises questions spanning from Q53 to Q63. All the questions are fairly simple and straightforward that do not require elaboration.

-So, explain to them that this survey is simply meant for excavating the facts underlying the responsiveness and preparedness so that government in conjunction with UNDP would come up with climate resilient practices of urban landscaping.

-Further explain that all the information would be kept confidential and as it is there is no mention of any names of the respondents or any signals that would detect the respondent.

-However, when referred to as 'you or your community' the respondent is supposed to report the phenomena observed by him/her and the community over the reference periods as explained in the training.

1.6 Section F: Access to Information

This section intends to excavate the information on climate-induced hazards/climate-change related issues. All the options are straightforward. It is followed by an open-ended column.

Ultimately, do not forget the doorstep courtesy. Thank your respondent repeatedly and neither waste his/her time nor yours. As elaborated during the training, always be gender-sensitive. Be careful of sexual assault from both the ends. Any severe untoward situation needs to be reported to the 'Overall Field Coordinator', Dr. Karma Lhendup @17115900. However, always refrain from creating trouble both to the respondent and oneself.

All the best! May triple Gems bless you throughout your field work!