

1 **The weather does not support farmers: an exploratory qualitative study in Kavre district,**
2 **Nepal.**

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8
9 **Abstract**

10 Kavre district, Nepal, is highly vulnerable to climate change impacts, including increases in erratic
11 rainfall, drought, floods, and landslides. As gender roles, culture, age, physical and physiological
12 characteristics increase, mainly Nepalese women's and children's, health risks associated with climate
13 change and air pollution, listening to and learning from women is critical. This study explores women's
14 perspectives and lived experiences concerning climate change, consequent adverse impacts on
15 agriculture and health, and ongoing adaptation and mitigation strategies. Assessing perspectives and
16 lived experiences related to climate change can offer opportunities to explore understanding, local
17 beliefs, experiences with adverse impacts and adaptation. We used a descriptive qualitative approach.
18 An equal number of focus group discussions (FGDs, n=8) and key-informant interviews (KIIs, n=8) were
19 conducted. Purposive and snowball sampling were used to recruit participants. Four research assistants
20 with public health backgrounds and climate change training were employed to assist with this work. All
21 interviews were conducted in the Nepali language using an interview guide. All KIIs and FGDs were
22 audio-recorded and transcribed verbatim in Nepali. Data were analyzed in NVivo 1.7 using content
23 analysis. Forty-two of the 48 participants identified as women. The largest proportion of participants
24 was aged greater than or equal to 50 years (18/48), had no formal education (21/48), and were either
25 older women (>55 years) (13/48) or mothers of children younger than five (11/48). Three main topical
26 areas emerged from the FGDs and KIIs: (i) the winds of change, (ii) the unpredictability of weather, and
27 (iii) acting locally. The study provides insights into how women and children in rural communities in a
28 Nepali hill district experience, adapt and mitigate climate change impacts. These findings can help
29 inform the development of interventions to better address women's and children's needs and concerns,
30 essential to promoting well-being and reducing impacts exacerbated by climate change.

31 Keywords: lived experience, climate change, health, women, children, Nepal

32

33 **1. Introduction**

34 Human activities are estimated to have already caused a mean rise in global surface temperature of
35 approximately 1.1°C since 1850-1900, according to the 2021 Intergovernmental Panel on Climate
36 Change Sixth Assessment Report (1). It is projected that if the current trend persists, this will reach 1.5°C
37 between 2030 and 2052 (2), resulting in significant threats to human health, mediated through social
38 and environmental determinants of health, including clean air, safe drinking water, sufficient food and
39 secure shelter (3). Globally, under mid-range emissions scenarios, climate change is expected to cause
40 around 250,000 additional deaths annually just from malaria, malnutrition, diarrhea and heat stress by

41 2050 (4). The world must limit temperature rise to 1.5°C to prevent additional catastrophic human
42 health impacts.

43 Climate change threatens Nepal's agriculture, food security, water resources, and health. The agriculture
44 sector contributes over one-third of Nepal's Gross Domestic Product, and two-thirds of its population
45 remains heavily dependent on rain-fed agriculture for subsistence (5). However, extreme climate
46 conditions, notably persistent increases in mean annual temperature and precipitation, have adversely
47 affected the agricultural production system, exacerbating food insecurity and undernutrition (4,5). The
48 retreat of glaciers in Nepal's Himalayan region is occurring faster than in other mountain ranges and is
49 one of the most noticeable impacts of climate change (6). Such rapid glacier retreat is likely to increase
50 the risk of catastrophic natural events such as glacial lake outburst floods and landslides, impacting
51 human mortality and morbidity (6). Thus, the adaptation of climate change-relevant behaviours and
52 actions is urgent.

53 All countries are at risk of climate change impacts. However, those harmed first and worst by climate
54 crisis are those that have contributed least to its causes and have the least adaptive capacity, including
55 low-and middle-income countries like Nepal (7). Nepal's contribution to greenhouse gas emissions is
56 0.027 percent of global emissions (8) but was ranked ninth among the countries most affected by
57 climate change between 1999 and 2018 (9). Approximately 80% of its population is at risk from natural
58 hazards (10). Nepal's complex topography and comparatively low socioeconomic status further increase
59 its vulnerability to climate change (8).

60 Gender roles, decision-making power, culture, age, physical and physiological characteristics
61 disproportionately expose Nepalese women and children to bear the greater impacts associated with
62 climate change and air pollution (7,11–13). For example, pregnant women have a critical concern about
63 the safe delivery of a child following a disaster (14). Kabir et al. (15) reported that young girls and
64 women face a shortage of sanitary pads and appropriate toilet facilities due to a lack of privacy following
65 disasters. Women, particularly in low-income countries, also travel a long distance to fetch water after
66 natural disasters. The reduced availability and contaminated water cause hygiene-and sanitation-related
67 problems, such as urinary tract infections and diarrhea (14,15). Disasters put women and girls,
68 particularly those in marginalized sectors, at higher risk of physical and sexual abuse (16,17).

69 Problem-solving and decision-making capacity of women is vital to developing climate change solutions.
70 Therefore, assessing women's perspectives and lived experiences related to climate change, local
71 experiences with adverse climate change impacts, and adaptation is critical. This study explores
72 women's perspectives and lived experiences related to climate change, consequent adverse impacts on
73 agriculture and health, and ongoing mitigation and adaptation in response to these changes.

74 **Methods**

75 **1.1 Study setting**

76 Kavre is one of 77 districts in Nepal and is composed of 13 rural and urban municipalities. The district,
77 with Dhulikhel municipality as its headquarters, falls within Bagmati Province and comprises an area of
78 1,396 Km². We conducted this study in two rural municipalities: Bhumlu and Mahabharat (Figure 1).

79 Bhumlu rural municipality covers over 91 km² and is culturally, linguistically, and ethnically diverse. It
80 has a population of 15,858, according to the 2021 Nepal Census (18). Brahmin, Chhetri, Tamang, Pahari,
81 Dalit, Majhi, Newar, and Dashdani are the major ethnic groups in the region (18). Most of the population
82 is Hindu, followed by Buddhists (18). Agriculture is the primary livelihood, while business and
83 remittances from foreign employment are other important sources of income for people in this
84 municipality (18).

85 Mahabharat rural municipality occupies an area of 186 km², divided into eight wards. The region's
86 geography includes steep hills and mountains. Nepal's 2021 census reported a total population of
87 16,148 (18). There are an estimated 3,297 households, with the largest ethnic group being Tamang,
88 followed by Brahmin, Chhetri, Newar, Dalit, and Majhi (18). The population of this municipality is largely
89 Hindu or Buddhist. The primary source of income is also agriculture. Other sources include livestock
90 farming, tourism, and herb collection (18).

91 Fig 1: Map of Kavre district highlighting study locations

92 **1.2 Participants and recruitment**

93 Eligible participants included women, particularly family caregivers of children under five years.
94 Women participants were further grouped into pregnant women, mothers of children under five years,
95 and older women (≥ 55 years). We also included participants representing community health groups,
96 such as the chief of community health centers and members of health mothers' groups (community
97 groups that bring together women of reproductive age to discuss and promote safe motherhood,
98 maternal and child health, and nutrition, family planning, water, sanitation, and hygiene (24)), Health
99 Facility Operation Management Committee members, and Female Community Health Volunteers.
100 Furthermore, to be eligible, participants needed to:

- 101 (i) Be permanent residents of one of the included municipalities, and
- 102 (ii) Have lived in the region for the past 20 years.

103 Each category of participants was grouped into separate FGDs. The primary reason for including
104 women, particularly family caregivers of children under five, was to learn about their firsthand
105 experiences and perspectives concerning weather change, changes in precipitation and agricultural
106 patterns, and consequent health impacts on women and children. The other participants from
107 community-based health-related groups (members of the Health Facility Operation Management
108 Committee, health mother's group members, Female Community Health Volunteers, and chief of
109 health centers) were included to elicit broader community perspectives. Written informed consent was
110 obtained from each participant.

111 We received support from community members to identify eligible participants meeting the study
112 inclusion criteria. A purposive and snowball sampling technique was used to recruit eligible participants
113 between November 2021 and January 2022. All potential participants we reached out to agreed to
114 participate in the study.

115 **1.3 Data collection**

116 We employed four local research assistants, two females and two males, to collect in-person
117 qualitative data using an FGD and KII guide in English and Nepali (Table 1). KII includes interviewing
118 persons who know what is happening in the community and have firsthand knowledge about the
119 community (19). Each research assistant had an undergraduate degree in public health and at least one
120 year of community health experience. We trained research assistants by conducting repeated mock
121 interviews to enhance familiarity with the discussion topic, build confidence, and deal with the
122 potential issues that could arise, such as participants deviating from the discussion topic and unequal
123 participation. We also oriented the research assistants on the study proposal, including giving them a
124 primer on climate change and health.

125 **Table 1: Interview guide questions and emergent topical areas**

SN.	Interview and FGD Questions	Topical areas emerged
1	What do you think of when you hear "climate change?"	First topical area
2	How have you experienced/witnessed or heard of changing rainfall patterns, extreme temperatures, increased intensity and frequency of natural disasters, loss of water sources, or poor air quality?	
3	What do you think are the factors that drive climate change/air pollution or the effects mentioned above?	Second topical area
4	How have you experienced or heard of adverse impacts of climate change/air pollution, changing rainfall patterns, extreme temperatures, increased intensity and frequency of natural disasters, or poor air quality? If so, can you share that with us?	
5	What are you doing to mitigate or adapt to those adverse impacts? Or what do you think should be done to address those issues?	Third topical area

126
127 An equal number of FGDs (n=8) and KIIs (n=8) were conducted in the two municipalities, four FGDs and
128 KIIs in each rural municipality, with 4-6 participants per FGD. Each KII and FGD was approximately one
129 and a half hours in length. Within each pair of research assistants, one conducted all the interviews,
130 while the other took reflexive and observational notes during and after the KIIs and FGDs. We also
131 collected socio-demographic data from the participants at the start of the KIIs and FGDs (Table 1). At
132 the end of the interview, each participant was paid an honorarium and provided with refreshments.
133 The other two research assistants collected socio-demographic data and paid honorariums. All research
134 assistants participated in regular debriefing sessions throughout the data collection process to discuss
135 interviews, amend the interview guides, and refine lines of inquiry.

136 All KIIs and FGDs were audio-recorded. The recordings were transcribed verbatim and were proofread
137 for accuracy.

138 **1.4 Data analysis**

139 We obtained ethics approval from the University of Alberta Health Research Ethics Board (Pro00107397)
140 and the Ethical Review Board of Nepal Health Research Council (Protocol Registration # 340/2021)
141 before beginning the study.

142 Content analysis (20) of the Nepali transcripts was completed using NVivo 1.7 (21) by the principal
143 investigator, a native Nepali speaker. Only selected references were translated into English for quotes in
144 the results. The principal investigator familiarized himself with the data and rigorously read transcripts
145 to generate ideas for codes to describe the content. Codes were assigned to data to describe points
146 raised in the KIIS and FGDs. Each time the principal investigator noted something different in the data, a
147 new code was generated, critical to organizing data into meaningful groups. Codes were then sorted
148 into broader topical areas. The principal investigator and supervisor reviewed and refined the main
149 topical areas, checked for overlapping sub-topics, and confirmed that codes supported them, naming
150 and describing each.

151 Throughout the data analysis steps, we used an inductive approach to identify, examine and report
152 topical areas within the data through an iterative analytic process. The process helped achieve deeper
153 insight into participant perspectives and lived experiences, thus providing structured and rigorous
154 guidelines to ensure that emergent topical areas were firmly rooted in the data.

155 **2. Results**

156 The study included eight FGDs and eight KIIs (48 participants in total) and explored women's
157 perspectives and lived experiences about climate change. Forty-two of the 48 participants identified as
158 women. The largest proportion of participants was aged greater than or equal to 50 years (18/48), had
159 no formal education (21/48), and were either older women (>55 years) (13/48) or mothers of children
160 younger than five (11/48). Participant socio-demographic data are presented in Table 2. Most
161 participants reported never having heard the Nepali phrase for "climate change," so we used a term
162 meaning "a long-term change in the weather." Participants were also asked about the direct impacts of
163 such changes (i.e., change in rainfall and temperature, loss of previous water resources, increased
164 frequency and intensity of disasters, and poor air quality).

165 **Table 2: Socio-demographic characteristics of study participants**

Characteristics	n=48 (%)
Age in years	
20-29	9 (19)
30-39	7 (15)
40-49	14 (29)
≥ 50	18 (37)
Gender	
Female	42 (88)
Male	6 (12)

Highest completed education	
No formal education	21 (44)
Primary education	5 (10)
Secondary education	16 (33)
Higher secondary education	6 (13)
Stakeholders	
Mothers of children under five	11 (23)
Older women (≥ 55)	13 (27)
Health Facility Operation Management Committee	9 (19)
Female Community Health Volunteer	10 (21)
Others (farmers, primary school teachers, health mother's group)	5 (10)

166

167 Three central topical areas emerged:

- 168 i) the winds of change,
169 ii) the unpredictability of weather, and
170 iii) acting locally.

171 **3.1 The winds of change**

172 This topical area captures women's perspectives on climate change. An area of discussion across focus
173 groups and KIIs was factors they believed drove climate change. A few participants shared that they
174 focused on their livelihoods and were unaware of climate change due to a lack of television and radio
175 access. Most participants who shared their perspectives felt they did not know much and described
176 climate change as seasonal, such as from winter to summer. Others reported that sudden and extreme
177 shifts in weather patterns, such as sudden rain or rapid temperature change, characterized climate
178 change.

179 s

180 *Participant 5 (P5)- I don't know what to say. When the weather changes, it gets very cold.*

181 *P4- Winter is about to pass, and summer starts. Wind blows. Climate change is like that.*

182 *P3-I don't know.*

183 *P2-climate change is starting of summer after winter and afterwards rainy season. (U-5 mothers,*
184 *FGD-7)*

185 A small proportion of participants who reported they had previously heard of climate change reported it
186 as a phenomenon characterized by changing rainfall patterns, extreme temperatures, disasters such as
187 floods, landslides, and wind storms, and the increased duration of foggy weather. Participants described

188 these changes as a shift from previously steady and uniform regional natural patterns to the current
189 state where established patterns have been altered.

190 *Climate change is a change in the climate between now and before. It is getting hotter in Jumla*
191 *[a district in western Nepal] now. The rainfall is untimely and heavy, but it was not like this*
192 *before. The heat was tolerable in the summer, but now it is too hot, and winter is colder. The*
193 *temperature and rainfall pattern has changed. (Health Facility Operation Management*
194 *Committee, P3, FGD-4)*

195 Participants who reported having heard of climate change were asked about the factors driving climate
196 change. Others were asked about the causes of specific direct impacts of climate change. Most
197 participants identified deforestation as the principal cause. Participants reported that population
198 increases led to more human activity resulting in deforestation, which led to changes in rainfall,
199 temperatures, loss of water resources, and disaster events. Responses suggested that there was more
200 forest cover in the past and highlighted the impact of human population growth on the environment.

201 *There used to be dense forests and fewer people before, but now the population has grown, and*
202 *people started cutting down trees for different things. The forests are shrinking. So, the rainfall*
203 *has become unpredictable. The lack of forest area has caused an increase in temperatures. There*
204 *are no shades, even for the land. (Older mothers, P4, FGD-6)*

205 Several participants discussed air pollution as another principal cause. They highlighted the increasing
206 use of plastic, particularly for food wrap, and its haphazard disposal and burning as contributing to the
207 deterioration of air quality in the region. They also expressed concern about adverse impacts on the
208 population. Others compared current air quality to past air quality and linked deterioration to road
209 construction and the increasing use of motor vehicles. They also described people's negligence in
210 deliberately setting wildfires to convert wood into fertilizer, contributing to air pollution and climate
211 change.

212 *It is not good to burn plastics, but people burn them. Many foods come in plastic packs, and*
213 *people throw them in public places and burn them, emitting harmful chemicals into the air. It*
214 *affects every age group and both males and females. When the summer season starts, people*
215 *are mobilized, setting fires everywhere. They believe forest fires are essential to convert wood*
216 *into fertilizer and don't care about the impact on human settlement (Health Facility Operation*
217 *Management Committee, P2, FGD-2)*

218 Overall, participants focused on local factors as the causes for experiencing climate change with less
219 focus on broader and global scale factors.

220 **3.2 The unpredictability of weather**

221 This topical area captures participants' lived experience of adverse impacts that they attributed to
222 climate change. Those who reported not having heard of climate change were asked about their
223 experiences with the effects of irregular rainfall, water scarcity, extreme temperature, and natural
224 disasters on agriculture, the environment, and women's and children's health.

225 **3.2.1 The weather does not support farmers**

226 Almost all participants across the FGDs and KIIs reported that climate change or the specific direct
227 impacts of climate change affected agriculture in the region. Participants highlighted four significant
228 impacts: crop infestation, increased use of pesticides, soil quality degradation, and decreased
229 productivity. They unanimously recognized crop infestation as a significant problem faced by the
230 community. However, participants did not necessarily link specific climate factors (i.e., temperatures,
231 precipitation, wind, or humidity) and the emergence of pests. Some participants reported that crop
232 infestation created a compelling need for the use of pesticides, resulting in increased use. Others
233 expressed distress that pesticide use was not helping to mitigate the problem, but instead, they felt it
234 was contributing to undermining soil quality, resulting in reduced productivity. They mentioned that
235 other factors, such as strong wind, were responsible for destroying crops. They also observed that fruit
236 trees are maturing slower and that the yield and size of the fruit was smaller.

237 *P1Pests are damaging crops. Different diseases are emerging, and we are compelled to use*
238 *pesticides.*

239 *P5 Pests damaged our crops. We hardly manage to protect crops using pesticides, but a strong*
240 *wind destroys them. Spinach dies as it begins to grow. There has been a decrease in productivity.*
241 *I wonder if the soil quality has decreased? Soil has been taken for the lab test, but we do not*
242 *know the result yet. (Female Community Health Volunteer, FGD-1)*

243 Participants observed changes with more irregular precipitation than in the past. Most felt this had
244 contributed to reduced agricultural productivity due to this dependence on rainfall.

245 *.....We rely on rain for farming. During the rainy season and when farmers must plant seeds, it*
246 *does not rain. The weather does not support farmers. Other times when rain is not necessary, it*
247 *rains heavily. The rain is unpredictable. (Health Facility Operation Management Committee, P2,*
248 *FGD-3)*

249 **3.2.2 Uncertainty in rainfall timing and intensity**

250 Participants identified several climate change-attributable environmental impacts in the region. The
251 depletion of water sources was most frequently mentioned and was linked to deforestation. Participants
252 reported wells in their area that dried up over time. They also mentioned a growing shortage of drinking
253 water faced by the community.

254 *The water sources have dried compared to what we have seen and used. There were two wells at*
255 *the base of Swami, but they have dried up. The well near the Baraha tree has also dried up, so*
256 *the community in that location faces a severe water shortage problem. The intensity of the*
257 *water flow from the source has decreased. (Female Community Health Volunteer, P5, FGD-1)*

258 Another environmental impact that most participants mentioned was erratic rainfall. They described the
259 challenges of facing unpredictable and unreliable rainfall in their region. Participants mentioned
260 farmers' reliance on rain for farming. It was mentioned that rain is often untimely, highlighting the
261 importance of rainfall timing and its impact on their crops. They emphasized that the current rainfall
262 pattern differs from the past and has affected their livelihood through agricultural loss.

263 *....before there used to be timely rainfall. Now, it rains when it is time to harvest rice. It does not*
264 *rain when we need it. It starts to rain when the rice grain is ready for harvest. Sometimes it rains*
265 *frequently, and other times there is no rain. (Older mother, P5, FGD-5)*

266 Participants also mentioned disasters and extreme temperatures. They experienced landslides in their
267 villages and attributed this to deforestation and earthquakes. Participants also highlighted infrastructure
268 construction in the area, such as road transportation, which may have contributed to landslides.

269 *We have faced landslides in our village. Last year, there were massive landslides near the school.*
270 *(Female Community Health Volunteer, P2, FGD-2)*

271 *It is freezing in the winter and sweltering hot in the summer compared to the past. (Health*
272 *Facility Operation Management Committee, P5, FGD-4)*

273 **3.2.3 Women and children may bear health risks**

274 Participants were asked about climate change-related health impacts or specific direct impacts of
275 climate change on women and children. However, links between climate change and women's and
276 children's health were not explicitly mentioned. Participants were then asked to discuss women's and
277 children's health concerns or significant health problems facing communities. Other probes included
278 asking about the health impacts on women, particularly pregnant mothers and children younger than
279 five years, related to changing agricultural patterns, long-term weather patterns, temperature and
280 precipitation changes, and disaster events.

281 **3.2.3.1 New mothers are becoming weak**

282 Participants mentioned maternal undernutrition, stillbirth, and low birth weight when prompted to talk
283 about the common health issues of women in the region. One participant (a community health worker)
284 reported that:

285 *Due to inadequate crop production and increasing consumption of packaged foods, pregnant women*
286 *are lean. They come to health centers for an antenatal check as required but complain of weakness*
287 *and headaches. We used to give birth to babies weighing 3-4 kgs at home, but they can't bear the*
288 *pain and have to be referred to the Dhulikhel Hospital. (Female Community Health Volunteer, P3,*
289 *FGD-1)*

290 Another participant mentioned a stillbirth but did not mention the reason for such an adverse birth
291 outcome.

292 **3.2.3.2 Seasonal variation in pneumonia cases in children**

293 Many participants across the FGDs and KIIs mentioned respiratory tract infections and diarrheal diseases
294 as critical health problems in young children. Participants believed that respiratory infections were
295 becoming more common and severe, potentially due to changes in weather patterns. Some participants
296 felt diarrhea was becoming less common, possibly due to improved hygiene and sanitation practices:

297 *Diarrheal diseases have decreased compared to the past. In the past, there were poor hygiene*
298 *and sanitation practices; we drink clean water now, every house has a latrine, and there is no*

299 *more haphazard disposal of waste. That's why the cases of diarrheal diseases have reduced.*
300 *(Female Community Health Volunteer, P1, FGD-1)*

301 However, others reported increased diarrhea cases.

302 **3.3 Acting locally**

303 Participants mainly discussed changing patterns in relation to the local context. They pointed out several
304 climate change-related issues (i.e., agriculture, environmental, and human health) experienced in their
305 region. Participants mentioned several local-level behaviours and actions, including at the household
306 level (use of improved cooking stoves), at the community level (water management, reforestation
307 programs and control of forest fires), and at the local government level (strengthening the health
308 system and planned road construction). Behaviours and actions included proposed solutions and
309 currently practiced actions and behaviours.

310 **3.3.1. Drinking water supply at the door**

311 Almost all participants across the FGDs and KIIs mentioned water shortages in their communities. They
312 reported having implemented various solutions to mitigate water scarcity, including constructing a
313 public water reservoir or water tank. Some participants mentioned water reuse to reduce strains on
314 limited water resources.

315 *People used to fetch water from a well. Sometimes they were able to get it, while other times*
316 *not. Now that there is a water tank, we collect water and keep it full. We don't have to walk long*
317 *distances. Everyone has the water pipe connected to the water tank. (Health post incharge, KII-6)*

318 **3.3.2 Collaborate for a greener earth**

319 Most participants mentioned that reforestation could address environmental problems such as poor air
320 quality, water shortages, and disasters. They highlighted the importance of collaborating with local
321 government bodies to protect existing trees and implement reforestation practices.

322 *In our ward, we collaborate with the official from the community forest and have initiated a*
323 *reforestation program. (under 5 mother, P2, FGD-7)*

324 **3.3.3 Build hospital at a local level**

325 Most participants spoke of healthcare system-related issues the community faced. They suggested
326 corresponding actions or improvements to increase access to basic health services and meet maternal
327 and child health service needs. For example, a lack of diagnostic services in the community, such as
328 ultrasound and blood glucose tests, was reported, which compelled them to travel long distances that
329 cost time, energy, and money. They also discussed the lack of qualified health workers, e.g., doctors, as
330 a barrier to receiving quality health services. Overall, participants pointed out a critical gap in providing
331 adequate and accessible healthcare services to the community.

332 *I wish they had constructed a hospital in our municipality. Patients could then commute to the*
333 *hospital quickly and not have to travel a long distance for treatment. We have to go to the*
334 *Dhulikhel Hospital to do the video x-ray. It would have been better if we had the provision of*
335 *video X-rays in our health centers. (Older mothers, P4, FGD-6)*

336 **3.3.4 Collective efforts to protect air**

337 Participants reported that monitoring air pollution could protect and promote the health and well-being
338 of the community. They recognized forest fires as a critical problem in their community. Participants
339 suggested mitigation strategies such as checking on forest fires and emphasizing community awareness.
340 They stressed that the community should be sensitized to the importance of forests and the adverse
341 impacts on human health and lives associated with forest fires. They pointed out the critical role of local
342 government in such initiatives along with other local stakeholders and considered formal rules and
343 regulations important.

344 *I think if I alone go and tell people to stop setting fires in the forest, it will not work. It needs*
345 *combined efforts from local government, different organizations, and schools. We must enforce*
346 *strict rules and regulations, or people will take them lightly. (Health Facility Operation*
347 *Management Committee, P3, FGD-3)*

348 Participants pointed to the benefits of replacing traditional cooking stoves with improved cooking stoves
349 or using cleaner fuels (e.g., gas stoves) in the home, including reduced indoor air pollution, less
350 respiratory illness and improved cleanliness. They acknowledged the lack of improved cooking stoves or
351 cleaner fuels in all households in the community and reported that wood stoves are used in most
352 homes.

353 *People have been advised to use improved cooking stoves at home. Some households use the*
354 *improved cooking stove while others don't. If we use the improved cooking stoves, then it will*
355 *release the smoke outside. We will have less asthma, and the house also looks cleaner. (Under 5*
356 *mothers, P2, FGD-7)*

357 Participants also mentioned the unintended consequences of road expansion, notably ambient air
358 pollution and its consequent effects on respiratory health and vision. They called for a more
359 comprehensive and sustainable approach to infrastructure development.

360 *Our neighbourhood has dusty roads. The daily vehicle use makes the area very dusty. It makes it*
361 *difficult to breathe and open our eyes. It would have been better if they had developed a good*
362 *road. (Under 5 mother, P4, FGD-7)*

363 **3. Discussion**

364 This study explored climate change perspectives and lived experiences of participants who identified as
365 women and family caregivers of children younger than five in two rural communities. Participants'
366 responses highlighted that climate change is perceived as seasonal change. Participants mentioned
367 several impacts of climate change on their daily lives through disruption of agriculture (e.g., crop
368 infestation, increased pesticide use, soil quality degradation, and decreased productivity) and
369 environments (e.g., loss of water resources, erratic rainfall and extreme temperature). They also raised
370 issues of women's and children's health (e.g., maternal and children undernutrition, low birth weight,
371 stillbirth, respiratory illnesses, and diarrhea) as maternal-child health problems of concern to them. All
372 participants highlighted local-level climate-relevant behaviours and actions (e.g., water preservation,
373 reforestation programs, strengthening the health system, controlling air pollution, and solid waste
374 management) as critical to adaptation and mitigation in the region.

375 Participants' responses to the concept of climate change highlighted that they perceived it as a change
376 in weather and season. Most participants reported not having heard of climate change. Those who had
377 heard of climate change perceived it as a change in daily weather or a cyclical change of seasons.
378 Nevertheless, most attributed changes they had experienced, at least partly, to climate change. Nash et
379 al. (22) also discussed participants' perspectives of climate change as seasonal change who reported
380 having observed changes in local weather and climate variability.

381 Study participants mentioned unpredictable changes in climate conditions in their region and concerns
382 about the environment, agriculture, and women's and children's health. They frequently mentioned
383 experiencing and witnessing hotter summers and colder winters, more erratic and lower rainfall
384 volumes, loss of water resources, and deteriorating air quality. A few participants also associated
385 disaster events with weather changes, particularly dry landslides in the region. In most cases, the
386 aforementioned climate-related issues emerged after a direct probe. Some participants also pointed to
387 causal factors beyond immediate local risk factors, such as deforestation affecting precipitation and
388 subsequently landslides and forest fires, increased vehicle use, and conventional cooking stove use
389 affecting indoor air quality. Similar to previous research (22,23), participants in our study offered
390 opinions and shared lived experiences on various climate-relevant issues.

391 Most participants mentioned that their agricultural yields had been adversely affected by irregular
392 rainfall, wind, and crop infestation, through different pathways, resulting in poor harvests. They
393 expressed helplessness about their dependency on rain-fed agriculture. Actions such as pesticide use
394 were reported to mitigate crop infestation. However, decreased soil fertility and consequent crop yield
395 loss were mentioned, attributed to increased pesticide use. The reports of a decline in agricultural
396 productivity associated with climatic factors, particularly temperature increases, are found in studies
397 elsewhere (24–26). Such adverse effects on agricultural yield are important, especially for rural
398 communities in lower-income countries, due to their dependence on agriculture for subsistence and lack
399 of adaptative capacity compared to high-income countries (24–26).

400 The study investigated participants' experiences of adverse health impacts attributable to climate
401 change. We probed this issue, asking participants what they felt were the most critical health problems
402 for mothers and children in their community. They mentioned stillbirth, low birth weight, diarrhea, and
403 respiratory illness among young children as significant health problems. Such climate change-linked
404 health impacts mentioned by participants are consistently observed in published findings (27–32).

405 Participants reported undernutrition in women and children as having a significant health impact, as
406 reported in previous studies examining factors such as temperature and rainfall (33,34). However, our
407 study participants also mentioned undernutrition to decreased agricultural productivity and a
408 consequent shift toward consuming processed foods.

409 As described by study participants, the environmental, agricultural and health impacts reveal their
410 socioeconomic vulnerabilities to climate change. For example, the majority of the participants had no
411 formal education or only primary education, lived in a rural community, reported using traditional solid-
412 fuel cooking stoves, relied on traditional agricultural practices for livelihoods, and had inadequate access
413 to basic maternal and child health services. This predisposes them to increased vulnerability to climate
414 change. In their call for research, Xu et al. (13) also mention that people with low socioeconomic status
415 are particularly at risk of climate change and air pollution-related health impacts.

416 All participants tended to focus on variability experienced in terms of local weather patterns. Therefore,
417 local actions and behaviours were discussed to mitigate and adapt to climate change impacts. For
418 example, water management through the construction of public water reservoirs was the most common
419 action reported to deal with water shortages. Studies in other lower-middle-income countries like
420 Bangladesh have also reported climate change-induced water shortage problems. Pond sand filters,
421 rainwater harvesting, and importing potable water with support from the government and non-
422 government organizations were mentioned as possible adaptation strategies (15).

423 Although reforestation initiatives have not yet been adopted in the two communities in Kavre,
424 participants across all FGDs and KIIs believed that reforestation could help address several problems,
425 including water shortages, poor air quality, and the risk of landslides. Indigenous people in the Dolakha
426 district of Nepal have adopted community-based reforestation and forest management initiatives to
427 mitigate impacts attributed to local climate variability (35). Community awareness programs can further
428 sensitize people to the importance of preserving forests, desisting from cutting down trees and setting
429 fires for a healthier ecosystem, cleaner ambient air, and improved human health (35).

430 A key strength of this study methodology has been its flexibility, which places the research focus on the
431 participants to generate rich data. The study sampled two rural areas with diverse socio-demographic
432 profiles. The findings provide insights into climate change perspective and lived experience of women in
433 a rural setting which has not been well documented. Several areas of concern emerged from the FGDs
434 and KIIs, notably water shortages, reduced agricultural productivity, crop infestations, and increased
435 pesticide use, which can guide long-term climate change adaptation planning by the local, provincial,
436 and the federal government. Such guide can support fulfilling the Nepal's government climate change
437 commitments while promoting well-being and strengthening resilience of women to climate change
438 impacts.

439 A limitation of this study is that it was conducted in only two rural municipalities. Perspective and lived
440 experience of women related to climate change may differ by residence, i.e., rural and urban. Exploring
441 urban residents' viewpoints and lived experiences would have enhanced the generalizability of the study
442 findings to other populations in Nepal.

443 **4. Conclusion**

444 The study provides insight into how women of rural communities in Kavre district of Nepal perceive
445 climate change and their lived experiences. Women have observed and experienced severe impacts,
446 mainly related to the environment and agriculture. These effects are magnified by poverty and poor
447 health service infrastructure. Interventions to address the needs and concerns of women and children
448 are essential to promote their well-being and boost their resilience to climate change impacts.

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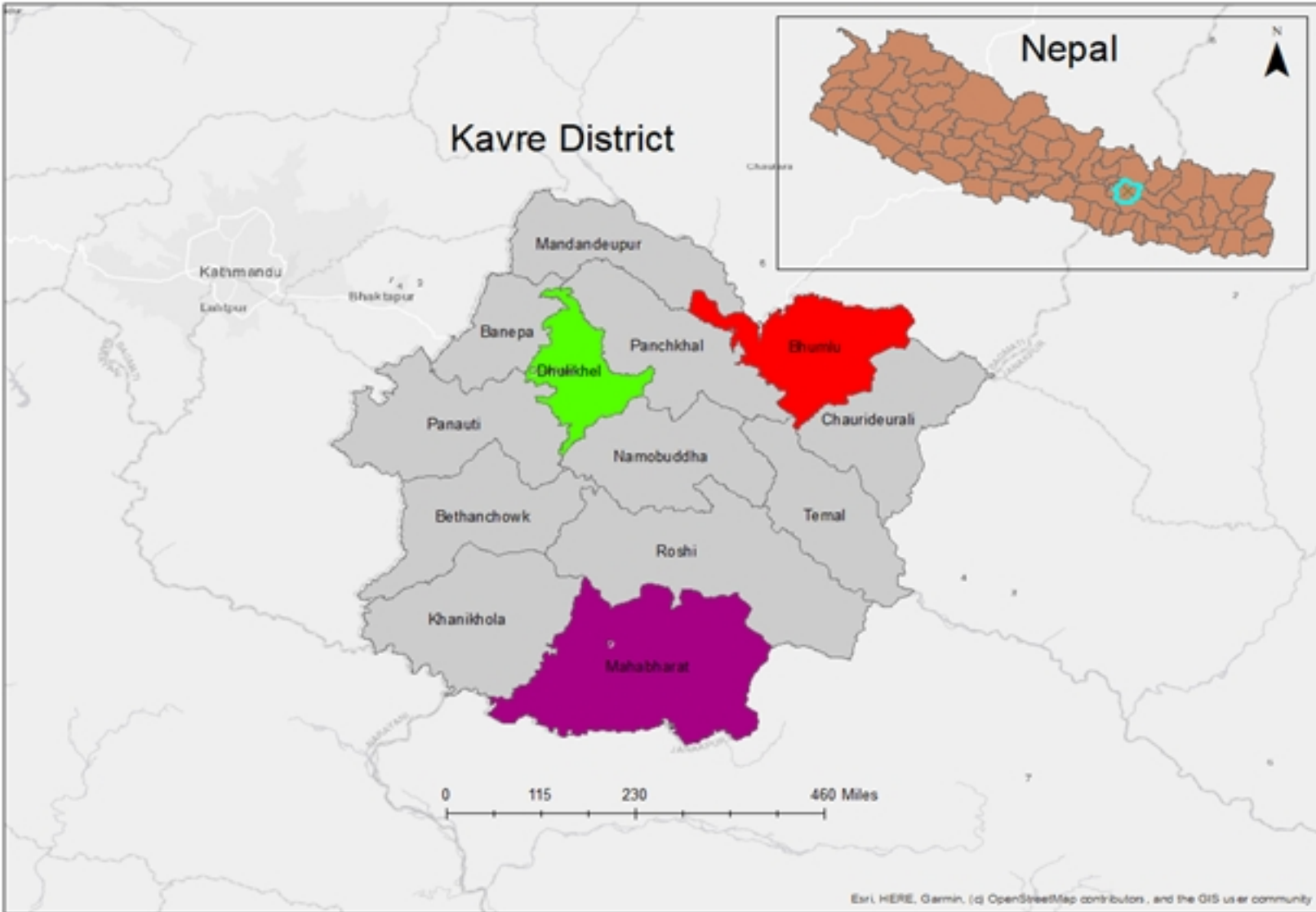


Figure 1