Gender Dimensions of Climate-Induced Migration: Evidence from Three Provinces in Rural Cambodia

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Abstract

Climate change has negatively affected agricultural productivity, threatening the incomes and livelihoods of rural farmers. These pressures have led to both permanent and temporary migration. Migration trends are often internal or international, and their patterns vary significantly between men and women. Drawing on primary data from 377 migrant individuals across Kratie, Mondulkiri, and Stung Treng provinces, this paper explores the relationship between climate-related impacts and migration using the Exposure-Sensitivity-Adaptability (ESA) framework, with an emphasis on the gender dimension of vulnerability that induces migration. The findings show that climate hazards are a major driving force, with women being more likely than men to migrate when affected. Key factors include regional household differences, farmland size, and migration type. To address the impacts of climate-induced migration, the paper proposes policy recommendations involving ensuring legal and social protections, promoting climate-resilient agricultural practices, focusing on large-farm households, implementing community awareness programmes on climate adaptation, providing women's leadership training, and improving infrastructure and livelihood diversification, especially in Stung Treng province.

Introduction

The present-day climate change includes global warming and its wider effects on Earth's climate system. Climate change has made severe impacts, manifesting in several direct consequences such as rising sea level, extreme weather events, including drought and flooding, an increase in temperature leading to wildfires, and more unpredictable rainfall patterns (Bolan et al. 2024). These climatic factors that heighten human vulnerability are largely beyond the control of policymakers and are considered a key concern of climate change (Laitonjam, Singh, and Sheikh 2018). Understanding this vulnerability to climate change depends on the degree of exposure, sensitivity, and adaptability, which together determine how severely a system or population may be affected (GSSD 2017).

This paper employed the ESA framework to analyse the differences in climate vulnerability between men and women. This framework is used to assess vulnerability by analysing three interconnected dimensions: exposure, sensitivity, and adaptive capacity. Exposure to climate change refers to the presence of people, ecosystems, infrastructure, and other assets in locations and conditions that could be harmed by climate-related hazards, such as floods, droughts or heatwaves. The degree of harm depends on the frequency of floods and droughts, the volumes, the locations adjacent to flood and drought events, and the structures of the systems (GSSD 2017). Second, sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate-related factors, encompassing climate

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variability, the frequency and magnitude of extremes, topography, land use, and land cover, population density and distribution, culture and ethnicity. The effect may be direct or indirect (Braham and Monia 2018). Third, adaptability to climate change is the inherent ability of a system (whether ecological, social, or human) to adjust to climate change and its impacts, such as extreme weather events, to moderate potential damages, and to take advantage of new opportunities. This capacity is influenced by factors like financial, human, and technological resources, as well as institutional strength, access to information, and established social systems. Enhancing adaptive capacity is crucial for reducing vulnerability to climate change (Braham and Monia 2018).

Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. It is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes (Braham and Monia 2018). The vulnerability to climate change urges the community to construct their responses (Oudry, Pak, and Chea 2016). These pressures, often interacting with other factors like conflict and economic hardship, political dimensions, demographic pressures, and social and environmental problems, force people to migrate, seeking safety, food, and economic stability (Weerasinghe 2021). Building on this conceptual foundation, this study proposed four composite indices—socio-demographic variables, economic variables, migration destination, and migration type. Within the socio-demographic indices, sub-components include age, sex, education, and region of households. The economic index comprises households' farmland, occupation and remittance, migration destination, and migration types. By combining these indices, the study provides a holistic understanding of how gender intersects with socio-demographic, economic factors, migration destination, and migration type. Human mobility in the context of climate change is highly differentiated across social groups and populations globally, shaped by intersecting dimensions of gender, socioeconomic status, identity, and geographic location (GIZ 2023).

The ESA framework is well-suited for current analysis as it captures gender differences in vulnerability to climate hazards. The exposure dimension explains why women's mobility constraints increase their risk during climate events. Sensitivity explains why women perceive greater impacts due to caregiving roles and limited control over resources. Finally, the adaptive capacity dimension highlights structural inequalities such as less access to education, reliance on agricultural labour, and limited livelihood diversification, which reduce women's ability to cope without resorting to migration (Chindarkar 2012).

Climate-induced migration refers to the temporary or permanent relocation of individuals or communities resulting from environmental changes attributable to global warming. Such changes may occur as a rapid-onset event or a slow-onset process, compelling people to leave their location of habitual residences permanently or temporarily (DGAP n.d.). In this context, Locke (2009) defined climate change migrants as individuals compelled to leave their habitual homes due to sudden or gradual environmental changes that negatively impact their lives or living conditions. Climate change affects human health, depletes natural resources, disrupts financial stability, particularly for those who depend on agriculture, and damages physical infrastructure. These cumulative pressures often compel people to seek more secure and sustainable living conditions elsewhere in order to preserve their livelihoods. These migrations can be temporary or permanent, either within their own country or abroad.

Migration decisions are rarely driven by climate factors alone; they are shaped by a combination of socioeconomic, demographic, cultural, and political conditions that influence how households perceive and respond to environmental stressors (Vigil, Steiner, and Kim 2025). However, gender profoundly affects both vulnerability to climate hazards (Oudry, Pak, and Chea 2016) and the decision-making processes associated with migration (Lama, Hamza, and Wester 2021). Women often bear disproportionate climate burdens due to caregiving roles, limited access to resources, exposure to environmental degradation, and heavier responsibilities for water, food, and firewood collection (Chindarkar 2012, Hennebry,

KC, and Williams 2021). These factors heighten their sensitivity to climate impacts and influence their likelihood of migrating. However, gendered migration patterns vary across countries and contexts; for example, climate hazards have increased women's migration in Bangladesh but men's migration in Ethiopia (Borràs and Susana 2024). This underscores the importance of localised analysis.

In Cambodia, climate-related hazards increasingly impact rural livelihoods, especially in the northeastern provinces of Kratie, Stung Treng, and Mondulkiri, where reliance on agriculture remains high. Existing research recognises that human mobility in the context of climate change is influenced by intersecting social factors, including gender, socioeconomic status, and geography, which create highly varied vulnerabilities. However, empirical evidence on how climate change influences migration decisions differently for men and women in rural Cambodia remains limited.

This study seeks to fill this gap by analysing primary survey data from 377 migrants across the three provinces. By incorporating socio-demographic characteristics, economic factors, migration destinations, and migration types into the ESA framework, the research provides a nuanced understanding of how the perception level of climate-hazards impacts intersects with gender to influence migration decisions. The findings provide insights that can inform gender-responsive climate adaptation policies, support vulnerable communities, and strengthen both national and sub-national planning efforts to address climate-induced mobility.

Methods

This paper relies on primary data from the household survey on *Impact of Climate Change on Migrants in Three Provinces: Kratie, Mondulkiri and Stung Treng in Cambodia*, conducted by the Cambodia Development Resource Institute in July 2023. The total sample for this analysis comprises 444 migrants from 240 households. Eighty households were selected from the target communes in each province. The purposive method was employed for targeting households with at least one member who has migrated outside the village.

The analysis was based on clearly defined criteria, including the application of the ESA framework to assess climate vulnerability, with consideration of exposure, sensitivity, and adaptive capacity for men and women. We included only migrant members aged 15 and above, as we could not determine migrants' socio-demographic characteristics for those under 15. As a result, the total sample size is 377 individual migrants, of which 46 are from female-headed households, 118 are from poor households (poor level 1 and poor level 2), and 213 are from general households.

Quantitative data were analysed using column percentages to disaggregate descriptive statistics by gender. Frequency and percentages were used to present these descriptive statistics in Tables 1–5. In addition, ordered logistic regression was employed to examine the association between gender perceptions level of climate-hazard impacts and migration. Besides, this analysis has several limitations stemming from its sample size and study area selection, so these findings may not be representative of rural Cambodia beyond the three provinces studied.

Results and discussion

The study employs the vulnerability framework—exposure, sensitivity, and adaptability—to analyse the impacts of climate change on migrants from rural Cambodia. As climate change impacts are not experienced equally, different groups of people experience climate-related risks in different ways, depending on their age, gender, and geographical location (Okudi et al. 2024).

Exposure to climate change by gender

Table 1 presents the landholdings of 377 household migrants. About 32 percent of migrant households own almost no farmland (less than 1 ha), while 37 percent of migrant households own farmland between 6 and 10 ha, and 31 percent own between 10 and 12 ha. The ownership of farmland among migrants is diverse. About 51 percent of migrants owning farmlands are male, while female migrants owning farmlands constitute 49 percent. However, about 55 percent and 51 percent of female household migrants own farmlands between 8 and 10 ha and 10 and 12 ha, respectively (Table 1).

Overall, the findings indicate that migrants who own smaller farmland are more likely to migrate,

with similar proportions among men and women. This result aligns with a study by Gray and Mueller (2012), which found that farmers with little farmland are more inclined to migrate in search for better income opportunities. In specific contexts, such as Bangladesh, women with less land ownership who experience floods and crop failures tend to migrate more than men. This reinforced the argument that landownership was inversely related to choosing migration as an adaptation. Contrary to this, the current study presents a contrasting result, showing that among the largest farmland-owning category (10.01 to 11.52 ha), a higher proportion of women than men chose to migrate.

Among 377 migrants, 11 percent of females and 5 percent of males perceived high impacts of climate change on their households. In contrast, perceptions of low impacts of climate change on households constitute 47.4 percent for males and 47.6 percent for females. This suggests that females are more likely to report high levels of impact, possibly due to their roles in household management and caregiving, or to limited access to adaptive resources. While males

are more represented in the lower impact categories (Table 2).

Sensitivity to climate change and migration: Age, sex, and education

Agriculture is vulnerable to climate change. Climate change is a push factor to trigger migration to seek alternative livelihoods. Young people are sensitive to migration. Overall, most migrants are young and single, with females constituting 53.5 percent, slightly outnumbering males, 51 percent. There are also married migrants, of which male represents 45.8 percent, higher than females, 35.7 percent. In contrast, the percentage of female migrants is significantly high among the divorced (4.9 percent) and widowed (5.9 percent) (Table 3).

Most migrants are between 15 and 19 years old and 20 and 24 years old, with females constituting 62 percent, a higher proportion than males in the youngest age group. In the age group of 20 to 54, the percentage of male migrants exceeds that of females. However, for the age group of 55 to 64, which is the oldest age group, the percentage of

Table 1: Migrant households' farmland

Households' farmland (Unit: ha)	Gender		
	Male	Female	Total
Less than 1 ha	61	60	121
	31.77	32.43	32.10
6 ha–7 ha	2	2	4
	1.04	1.08	1.06
8.01 ha–9 ha	19	23	42
	9.90	12.43	11.14
9.01 ha–10 ha	53	40	93
	27.60	21.62	24.67
10.01 ha–11.52 ha	57	60	117
	29.69	32.43	31.03
Total	192	185	377
	100.00	100.00	100.00

Source: Households survey data, July 2023.

Table 2: Level of households' perceived impacts of climate hazards

Overall perceptions	Gender		
	Male	Female	Total
Very low	26	19	45
	13.54	10.27	11.94
Low	91	88	179
	47.40	47.57	47.48
Moderate	63	57	120
	32.81	30.81	31.83
High	10	21	31
	5.21	11.35	8.22
Very high	2	0	2
	1.04	0.00	0.53
Total	192	185	377
	100.00	100.00	100.00

Source: Households survey data, July 2023.

female migrants is higher than that of males, with females constituting 66.6 percent compared with males, 33.3 percent. This suggests that young people are more likely to migrate than older people, with a female proportion slightly higher than that of males. Moreover, the percentage of female migrants is also higher than that of males in the oldest age group.

In Kratie and Mondulkiri, women tend to migrate more than men, accounting for 39.4 percent and 34.6 percent of migrants, respectively. In contrast, more males than females migrate in Stung Treng. This suggests that women in Kratie and Mondulkiri have been experiencing a shift in social roles, increasingly engaging in migration to advance their economic status. As migration is recognised as a supplementary strategy in income generation in the face of climate vulnerabilities (IOM 2024). Conversely, in Stung Treng, male-dominated migration may reflect labour-market demands or cultural norms that favour male mobility.

Concerning education, the majority of migrants have completed primary schooling. Specifically, 50 percent of males have completed high school and 15.1 percent hold bachelor's degrees, with 3.65 percent attaining higher education. Conversely, most

female migrants have attended secondary schools. Among all, only one male migrant obtained a master's degree. Notably, illiteracy rates are equal between male and female migrants. Educational attainment among migrants is gender-influenced, with males more likely to attain higher levels of education. Consequently, educational inequality has important implications for post-migration opportunities, potentially giving male and female migrants unequal access to resources, employment, and social mobility in their new environments (Okudi et al. 2024).

Adaptability: Occupation and remittance
About 58 percent of migrants work in the non-agriculture sector. The non-agricultural occupations include entrepreneurs, public servants, company staff, organisation staff, garment workers, and construction workers. About 22 percent work as domestic labourers, such as housekeepers and household workers. About 20.4 percent of migrants work in agriculture. Agriculture occupation here refers to farming, animal husbandry, fishing and selling labour in agriculture. The domestic labour employs 30.2 percent of female migrants, while the agriculture and non-agriculture sectors employ

Table 3: Socio-demographic variables

Marital status of migrants	Gender		
	Male	Female	Total
Married	88	66	154
	45.83	35.68	40.85
Single	98	99	197
	51.04	53.51	52.25
Divorced	2	9	11
	1.04	4.86	2.92
Widow	4	11	15
	2.08	5.95	3.98
Total	192	185	377
	100.00	100.00	100.00
Age of migrants (years old)[2]	Gender		
	Male	Female	Total
15–19 years old	31	51	82
	37.80	62.20	100.00
20–24 years old	65	58	123
	52.85	47.15	100.00
25–34 years old	61	49	110
	55.45	44.55	100.00
35–44 years old	25	16	41
	60.98	39.02	100.00
45–54 years old	7	5	12
	58.33	41.67	100.00
55–64 years old	3	6	9
	33.33	66.67	100.00
Total	192	185	377
	100.00	100.00	100.00

[2] The age groups of migrants were classified based on the 2023 Cambodia Socio-Economic Survey scale (NIS 2023).

Educational level of migrants	Gender		
	Male	Female	Total
Primary school	96	81	177
	50.00	43.78	46.95
Secondary school	46	62	108
	23.96	33.51	28.65
High school	29	24	53
	15.10	12.97	14.06
Bachelor's degree	7	5	12
	3.65	2.70	3.18
Master's degree	1	0	1
	0.52	0.00	0.27
Illiterate	13	13	26
	6.77	7.03	6.90
Total	192	185	377
	100.00	100.00	100.00
Region of households	Gender		
	Male	Female	Total
Kratie	58	73	131
	30.21	39.46	34.75
Mondulkiri	62	64	126
	32.29	34.59	33.42
Stung Treng	72	48	120
	37.50	25.95	31.83
Total	192	185	377
	100.00	100.00	100.00

Source: Households survey data, July 2023.

about 18.4 percent and 51.3 percent of female migrants, respectively. The male migrants tend to work more in agriculture and non-agriculture sectors, accounting for 22.4 percent and about 64 percent respectively (Table 4).

The study found that around 70.5 percent of migrant workers remitted the money home, and around 29.4 percent did not remit the money. Males are more likely to migrate and remit no money. The migrants' remittance pattern was categorised into weekly, monthly and occasional transfers. Notably, in the highest remittance category, ranging from KHR400,000 (USD100) and above, women are more likely to remit money than men, with proportions of around 36.7 percent and 28.1 percent, respectively. While existing studies have

Table 4: The migrant occupations and the remittances

Occupations	Gender		
	Male	Female	Total
Agriculture	43	34	77
	22.40	18.38	20.42
Non-agriculture	123	95	218
	64.06	51.35	57.82
Domestic labour	26	56	82
	13.54	30.27	21.75
Total	192	185	377
	100.00	100.00	100.00
Remittance (Unit: 10,000 KHR)	Gender		
Remitted no money	62	49	111
	32.29	26.49	29.44
Remitted 1 to 9.99	6	5	11
	3.12	2.70	2.92
Remitted 10 to 39.99	70	63	133
	36.46	34.05	35.28
Remitted 40 to 1680	54	68	122
	28.12	36.76	32.36
Total	192	185	377
	100.00	100.00	100.00

Source: Households survey data, July 2023.

Table 5: The migration destination and types of migration

Migration destination	Gender		
	Male	Female	Total
International	84	106	190
	43.75	57.30	50.40
Internal	108	79	187
	56.25	42.70	49.60
Total	192	185	377
	100.00	100.00	100.00
Types of migration	Gender		
Seasonal	65	48	113
	33.85	25.95	29.97
Whole year	91	94	185
	47.40	50.81	49.07
Permanent	36	43	79
	18.75	23.24	20.95
Total	192	185	377
	100.00	100.00	100.00

Source: Households survey data, July 2023.

also highlighted the impact of climate change, leading to reduced incomes for rural farmers and the destruction of livelihoods, thereby increasing local vulnerability (ADB 2012).

Impacts: Migration destination and migration types

The study found that migrants move internationally for work, as well as to some internal areas within the country. Internal migrants in this study refer to those who migrated within their province, or outside their commune in the district, while international migrants refer to those who migrated to the capital city and overseas[3]. Overall, woman migrant constitutes around 57 percent, while men constitute 43 percent. In contrast, 56 percent of internal migrants are male, while 42 percent are female, indicating male preference for internal migration (Table 5). These findings contrast with Chindarkar (2012), who argues that women, when burdened with increased time collecting fodder and firewood and facing reduced agricultural productivity, are more likely to migrate locally within their districts.

Migration type also varies by gender. The whole year migration is nearly gender-balanced (around 51 percent female, 47 percent male). In comparison, permanent migration is more common among females (23 percent), and seasonal migration is dominated by males (around 34 percent). These findings are well-supported by Chindarkar (2012) who highlighted that women typically made

permanent migrations driven by environmental degradation, especially the deterioration of natural resources such as firewood and fodder.

Ordered Logit regression results

The ordered logistic regression results are presented in Table 6. Regression is the outcome of the association between households' perceptions of climate hazard impacts and gender, and other household dimensions influencing migration decision-making. In the first model, only perceptions of climate hazard impacts and gender were included. In the second model, additional household dimensions, including socio-demographic characteristics, economic factors, migration destinations, and migration type, were controlled for. The findings indicate that gender does not have a statistically significant effect on households' perceptions of climate hazard impacts in relation to migration. However, the odds ratio (OR) of female migrants is 1.719, meaning they are approximately 71 percent more likely than males to experience migration linked to climate hazards, and this effect is statistically significant at the 0.05 level.

Moreover, household region, farmland size, and migration type are also statistically significant influences on households' perceptions of climate hazard impacts linked to migration. Regional differences are noticeable, households in Mondulkiri show OR of 2.353, with p<0.01 and Stung Treng has OR of 6.043 with p<0.01, report much higher

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[3] For the purposes of this study, the definition is used specifically during data collection process, which the terms capital city and overseas were used. However, in writing this paper, we chose to adopt the term international migrant to align with the terminology of the International Organization for Migration (IOM).

Table 6: Household dimensions influencing migration decision-making

	(Model 1) Households' perception on climate hazard impacts	(Model 2) Households' perception on climate hazard impacts		(Model 2) Households' perception on climate hazard impacts
Gender	.	.	**Households' farmland size**	
(Reference category is male)	(.)	(.)	*(Reference category is less than 1 ha)*	
Female	1.249	1.719**	(6 – 7) ha	2.588
	(0.241)	(0.368)		(2.505)
Marital status of migrants			(8.01 – 9) ha	3.005***
(Reference Category is married)				(1.128)
Single		1.135	(9.01 – 10) ha	1.841**
		(0.315)		(0.540)
Divorced		1.879	(10.01 – 11.52) ha	2.910***
		(1.338)		(0.819)
Widow		1.428	**Migrants' occupation**	
		(0.799)	*(Reference category is agriculture)*	
Age of migrants (years old)			Non-agriculture	1.742
(Reference Category is 15-19 years old)				(0.631)
(20-24) years old		0.976	Domestic labour	0.922
		(0.295)		(0.385)
(25–34) years old		0.825	**Remittance (Unit: 10,000 KHR)**	
		(0.281)	*(Reference category is remitted no money)*	
(35–44) years old		0.951	Remitted 1 to 9.99	1.238
		(0.420)		(0.754)
(45–54) years old		2.062	Remitted 10 to 39.99	0.675
		(1.433)		(0.194)
(45–54) years old		0.902		
		(0.698)		
Education level of migrants			Remitted 40 to 1680	0.800
(Reference category is primary school)				(0.249)
Secondary school		0.857	**Migration destination**	
		(0.222)	*(Reference category is international)*	
High school		0.952	Domestic	0.941
		(0.307)		(0.218)
Bachelor's degree		0.452	**Migration types**	
		(0.281)	*(Reference category is seasonal)*	
Master's degree		6.238	Whole year	0.274***
		(10.917)	Permanent	
Illiterate		0.509		(0.090)
		(0.234)		0.725
				(0.292)
Region of households			**Observations**	377
(Reference category is Kratie)			Standard errors in parenthesis	
Mondulkiri		2.353***	Note: *** p<0.01, ** p<0.05, * p<0.1	
		(0.706)		
Stung Treng		6.043***		
		(2.073)		
Observations	377	377		

perceived impacts compared to Kratie, which is reference category. Larger farmland holdings are strongly associated with higher perceived impacts, particularly for households with 8.01–9 ha, OR is 3.005, p<0.01, 9.01–10 ha, OR is 1.841, p<0.05 and 10.01–11.52 ha, OR is 2.910, p<0.01. Migration type matters too, whole-year migration statistically reduces perceived impacts with OR is 0.274, p<0.01. Other variables, including marital status, age, education, occupation, remittances, and migration destination, are not statistically significant.

These findings confirmed that females are more likely to migrate when their households are affected by severe climate hazards. However, gender alone does not fully explain migration decision-making in this context. Instead, decisions are shaped by multiple factors, including the region where their households are located, the size of their farmland, and the type of migration.

Conclusion and recommendations

Climate change significantly influences household migration decisions, especially in response to climate-related stressors and disruptions to people's usual environments. When adaptation becomes unfeasible, migration emerges as a key coping and adaptive strategy. This paper highlights that climate-induced migration is not gender-neutral. Women and men experience climate impacts differently, with women often bearing a disproportionate burden due to their roles in caregiving, subsistence farming, and household resource management. To understand how household members make migration decisions in response to climate-related impacts, it is important to consider socio-economic conditions, family dynamics, and social theory frameworks, specifically the Exposure-Sensitivity-Adaptive Capacity. The findings emphasise the importance of understanding socio-demographic status, household farmland ownership, households' geographical location, migration type, and gender roles when designing policy responses.

To address the impacts of climate-induced migration, the following policy recommendations are proposed:

To the national level:

- *Legal protection programme:* Ensure legal protections and safe working conditions for female migrants, including access to legal aid and rights-based support services.
- *Social protection programme:* Expand social protection programmes for overseas migrants, especially in recognition of the growing trend of international female migration.

To the sub-national level:

- *Climate-resilient agricultural practice:* Promote climate-resilient agricultural practices in areas of origin to reduce forced migration caused by environmental stress. Special attention should be given to households with larger farmland, as they tend to perceive a higher impact from climate hazards.
- *Community-based awareness:* Develop community-based awareness programmes focused on climate change adaptation and leadership training for women to enhance their role in household and community decision-making.
- *Climate resilient infrastructure and livelihood diversification programmes:* Implement urgent intervention such as climate-resilient infrastructure, livelihood diversification programmes tailored to the geographical context in response to the very high perceived impact of climate hazards, especially in Stung Treng.

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