

Climate Vulnerability and Employment-Related Labour Mobility in India: A State-Level Analysis

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ABSTRACT

Climate change is a multidimensional challenge whose implications extend beyond physical hazards to affect livelihoods and socioeconomic conditions. Climate-related pressures may influence labour mobility, but their effects can vary across socioeconomic contexts. This study examines the relationship between climate vulnerability and employment-related labour mobility across Indian states and union territories using the overall Climate Vulnerability Index published by the Council on Energy, Environment and Water (CEEW) in 2021 and labour mobility data from the Periodic Labour Force Survey (PLFS) 2020-21. The findings reveal substantial interstate variation in climate vulnerability, with Assam recording the highest vulnerability score, followed by Andhra Pradesh, Maharashtra, Karnataka and Bihar. The aggregate analysis shows a negative association between climate vulnerability and labour mobility, but the relationship becomes statistically insignificant after accounting for urbanisation, literacy and per capita Net State Domestic Product (NSDP). The state-level patterns also show that vulnerability and labour mobility do not follow a uniform spatial pattern, with Assam, Tamil Nadu, Jammu and Kashmir and Puducherry illustrating contrasting positions in the overall distribution. Overall, the results indicate that climate vulnerability alone does not independently explain interstate labour mobility in India. Instead, labour mobility appears to reflect a combination of socioeconomic conditions and climate-related pressures, with the former playing an important role in shaping mobility outcomes. The study contributes state-level evidence to the climate-mobility literature and highlights the need to understand labour mobility within the broader socioeconomic context of India.

Keywords: Climate Vulnerability, Labour Mobility, Employment, Socioeconomic Factors, Urbanisation, India.

INTRODUCTION

Climate change is increasingly becoming a question not only of environmental sustainability but also of where people can live, work and sustain their livelihoods. The

World Bank's Groundswell report estimates that, under adverse climate and development conditions, climate change could drive as many as 216 million people to move within their own countries by 2050 across six regions, including around 40 million in South Asia. At the same time, the report emphasises that people move for multiple and interconnected economic, social and environmental reasons, with climate change affecting mobility largely through its effects on livelihoods and the habitability of places. This growing concern has placed human mobility within the broader discussion of climate adaptation and development. UNDP similarly cautions that the direct influence of climate change on human mobility is complex and that the links between climate change, displacement and migration cannot be understood independently of wider social and economic conditions.

The connection between environmental change and human mobility, however, is not simply a matter of people leaving areas exposed to climatic hazards. Climate-related changes can affect agricultural productivity, employment, income, infrastructure and access to resources, thereby altering the livelihood conditions within which mobility decisions are made. The literature has consequently moved away from viewing climate change as an automatic or deterministic cause of migration. Perch-Nielsen et al. (2008) show that the pathways linking climate-related hazards such as floods and sea-level rise to migration depend on the vulnerability of people and places, while Bardsley and Hugo (2010) conceptualise migration as one possible component of adaptation to environmental risks rather than necessarily a failure of adaptation.

The labour dimension is particularly important in this context because climatic conditions can influence the availability and security of employment, especially in climate-sensitive sectors. Changes in agricultural productivity, for example, may affect household earnings and local employment and consequently alter decisions regarding work outside the place of residence. Evidence from India illustrates this broader range of responses. Neog (2022) finds that temperature shocks are associated with labour out-migration and longer-distance commuting among rural workers, demonstrating that climatic stress may be reflected in different forms of labour mobility rather than only in permanent migration. Similarly, studies examining drought and rainfall variability have reported associations with migration, although the magnitude and direction of these relationships differ across locations and forms of mobility.

These differences have encouraged greater attention to the concept of climate vulnerability. Unlike a single climatic shock, climate vulnerability captures the broader conditions that determine how severely populations and regions may be affected by climatic risks and their capacity to respond. The CEEW framework assesses vulnerability through exposure, sensitivity and adaptive capacity, thereby incorporating socioeconomic conditions alongside climatic characteristics (Mohanty & Wadhawan, 2021). This perspective is particularly relevant for labour mobility because exposure to a climatic hazard does

not necessarily produce the same livelihood consequences or mobility response across regions. Economic conditions, human capital, infrastructure and livelihood structures can influence both the consequences of climatic stress and the options available to households and workers. India provides an important setting in which to examine these processes. The country contains substantial regional differences in climatic exposure and vulnerability, while labour mobility remains closely connected with differences in economic and employment opportunities. Indian studies have examined the effects of drought, rainfall and temperature variability on migration and labour mobility, including temporary migration, inter-state migration and commuting. Dallmann and Millock (2017), for example, find an association between drought frequency and inter-state migration, while Keshri and Bhagat (2013) show that temporary labour migration is also closely associated with socioeconomic conditions. These studies indicate that environmental and socioeconomic conditions need to be considered together when examining patterns of labour mobility.

The existing literature nevertheless remains diverse in terms of the climatic measures, geographical contexts and mobility outcomes examined. Much of the empirical evidence focuses on individual climatic shocks such as drought, rainfall or temperature, while vulnerability-based approaches consider broader combinations of exposure, sensitivity and adaptive capacity. The evidence also varies across forms of mobility, making it difficult to infer a uniform relationship between climatic conditions and labour movement. This leaves scope for further empirical examination of whether a broader measure of climate vulnerability is associated with variations in labour mobility when socioeconomic conditions are considered alongside it.

Against this background, the present study examines the relationship between climate vulnerability and employment-related labour mobility across Indian states and union territories. More specifically, it asks whether differences in overall climate vulnerability are associated with variations in labour mobility and whether this association changes after accounting for selected socioeconomic conditions. The study is therefore framed as a state-level association analysis rather than a causal test of migration as an adaptation strategy. Overall climate vulnerability is measured using the reported CEEW vulnerability score, while per capita NSDP, urbanisation and literacy are considered alongside climate vulnerability in examining differences in labour mobility.

LITERATURE REVIEW

Climate Vulnerability and Labour Mobility: Global Evidence

The relationship between climate vulnerability and human mobility has increasingly emerged as an important area of interdisciplinary research. Earlier literature often

approached environmental change as a direct driver of migration, particularly through hazards such as floods, droughts and sea-level rise. Subsequent research, however, has moved away from deterministic explanations and emphasised that climate-related conditions interact with socioeconomic, demographic and institutional factors. Climate hazards may influence mobility through direct effects, such as the destruction of land and housing, as well as through indirect effects on income, employment and livelihoods. The resulting mobility response therefore varies according to the vulnerability and socioeconomic conditions of affected populations and places (Perch-Nielsen et al., 2008; Oakes et al., 2023; Garip & Reed, 2025).

The literature further demonstrates considerable heterogeneity in climate-related mobility across regions and population groups. Climate factors tend to interact with economic, social, demographic and other environmental conditions rather than operating independently, while the resources available to households can influence their ability to respond through migration. Existing migration networks, employment opportunities and household resources may therefore strengthen or constrain mobility responses to climatic stress. Differences in the measurement of climate conditions and mobility, as well as variations in empirical approaches, also contribute to differences in findings across studies (Oakes et al., 2023; Garip & Reed, 2025). The evidence consequently does not indicate that greater climate vulnerability necessarily results in greater migration; rather, the relationship varies across contexts and depends partly on the mechanisms through which climate-related conditions affect livelihoods and the capacity of populations to move.

Recent research has also extended attention beyond sudden climate shocks to slow-onset environmental changes. Evidence from rural communities in Bangladesh and Tamil Nadu suggests that processes such as salinisation and land degradation can affect agricultural productivity and contribute to labour migration, while migration decisions remain shaped by existing migration histories, social norms, financial constraints and employment opportunities. Such evidence further highlights the importance of considering negotiated and circular forms of labour mobility rather than assuming that climate-related environmental change necessarily results in immediate or permanent displacement (Yea, 2025). Taken together, the global literature indicates that the relationship between climate vulnerability and mobility is complex and context-dependent, with climate-related stress interacting with livelihood conditions and the capacity of populations to respond.

Climate Vulnerability and Labour Mobility in India

The literature on climate and mobility in India indicates that the relationship varies according to the type of climatic stress and the form of mobility considered. Existing studies examine droughts, temperature anomalies, rainfall variability and extreme

weather events, while mobility is examined through inter-state, temporary and permanent migration as well as labour commuting. Consequently, the evidence does not point to a single pattern of climate-related mobility in India (Dallmann & Millock, 2017; Kavi Kumar & Viswanathan, 2013; Neog, 2022; Richa et al., 2023).

Several studies find that adverse climatic conditions can influence migration, particularly in areas where livelihoods are closely linked to agriculture. Dallmann and Millock (2017) find that greater drought frequency is associated with higher inter-state migration, particularly in agricultural states. Kavi Kumar and Viswanathan (2013), however, show that the association differs between temporary and permanent migration, with temperature and rainfall playing different roles across the two forms. Neog (2022) similarly finds that temperature shocks are associated with migration and longer-distance commuting, whereas the effects of precipitation are largely non-significant. Taken together, these findings suggest that the mobility response varies with the nature of the climatic stress and the form of movement considered.

A different pattern emerges when climate vulnerability, rather than individual climatic shocks, is considered. The state-level evidence indicates that climate vulnerability and inter-state out-migration do not follow a uniform or linear relationship. Some highly vulnerable states exhibit comparatively low levels of out-migration, suggesting that vulnerability does not necessarily result in greater mobility (Samudra, 2026). This contrasts with studies focusing on specific weather shocks, which generally identify associations between adverse climatic conditions and particular forms of migration or labour mobility (Dallmann & Millock, 2017; Neog, 2022). The response to climatic stress may also vary according to the climatic conditions experienced by a region over time. Neog (2022) finds that the effects of temperature shocks on labour-market outcomes are weaker in locations characterised by historically uncertain and low monsoon rainfall, while successive weather anomalies can intensify the adverse effects of heat shocks. This suggests that the consequences of a climatic shock cannot be understood independently of the environmental context in which it occurs.

Overall, the Indian literature presents a differentiated climate–mobility relationship. Evidence of migration and labour-mobility responses to climatic shocks coexists with evidence that higher climate vulnerability does not necessarily correspond to higher out-migration (Dallmann & Millock, 2017; Kavi Kumar & Viswanathan, 2013; Neog, 2022; Samudra, 2026). The existing literature therefore distinguishes between specific climatic shocks and broader climate vulnerability, as well as between migration and other forms of labour mobility. This distinction is important for examining the relationship between overall climate vulnerability and labour mobility across Indian states in the present study.

Socio-Economic Determinants of Labour Mobility

The literature on labour mobility in India identifies economic conditions, education and employment opportunities as important factors associated with migration, particularly temporary and seasonal labour mobility. Temporary migration is more prevalent among economically disadvantaged rural households and is often associated with limited livelihood opportunities. Keshri and Bhagat (2013) find that economic status is significantly associated with temporary labour migration, while Sucharita (2020) similarly identifies poverty and limited land ownership as important factors influencing temporary migration.

The literature further indicates that labour mobility is closely linked with regional employment opportunities and the rural–urban economic structure. Temporary migration is particularly associated with rural populations seeking employment outside their local economies, while destination conditions influence the nature of migrant employment (Keshri & Bhagat, 2013; Attah-Otu et al., 2024). Taken together, the evidence suggests that economic conditions, human capital and the spatial distribution of employment opportunities are important dimensions of labour mobility in India.

Taken together, the literature indicates that socioeconomic and employment-related conditions are important dimensions of labour mobility in India, while studies examining climatic factors report varying patterns across locations, climatic conditions and forms of mobility. The existing evidence therefore points to a relationship between climatic conditions and labour mobility that is shaped by the broader socioeconomic context. This provides a basis for examining how differences in socioeconomic conditions, alongside overall climate vulnerability, are associated with variations in labour mobility across Indian states.

DATA AND METHODOLOGY

Data Sources and Variables

The analysis is based on state-level secondary data compiled from different official and institutional sources. The overall Climate Vulnerability Index (CVI) is taken from the Mapping India's Climate Vulnerability: A District-Level Assessment published by the Council on Energy, Environment and Water (CEEW) (Mohanty & Wadhawan, 2021). The CEEW assessment follows the IPCC framework and considers vulnerability in terms of exposure, sensitivity and adaptive capacity. The present study uses the overall CVI score reported by CEEW directly; the index is neither reconstructed nor modified for the present analysis.

Labour mobility is measured using the employment-related labour mobility percentage derived from the Periodic Labour Force Survey (PLFS), 2020-21. The measure captures the

weighted proportion of individuals reporting migration for employment-related reasons, namely “in search of employment,” “for employment/work,” and “loss of job.” Per capita Net State Domestic Product (NSDP) for 2020-21 is used to represent state-level economic conditions. Urbanisation and literacy are taken from Census 2011. These variables are included because differences in economic opportunities, urban development and human capital may influence the capacity and propensity of labour to move across regions. The variables were brought together at the state level for the empirical analysis.

$$\text{Labour Mobility Rate} = \sum_{i=1}^n w_i y_i / \sum_{i=1}^n w_i$$

where w_i denotes the PLFS survey weight (sub-sample multiplier) and y_i takes the value 1 when an individual is identified as an employment-related migrant and 0 otherwise. The resulting rate is multiplied by 100 to express labour mobility as a percentage. Employment-related migration is identified from the reported reasons “in search of employment,” “for employment/work,” and “loss of job.”

Model Specification

To examine the relationship between climate vulnerability and employment-related labour mobility, two regression models are estimated. The first model considers the bivariate association between the overall Climate Vulnerability Index and labour mobility:

$$LM_i = \beta_0 + \beta_1 CVI_i + \varepsilon_i$$

The second model incorporates selected socioeconomic variables to assess whether the association between climate vulnerability and labour mobility persists after accounting for urbanisation, per capita NSDP and literacy:

$$LM_i = \beta_0 + \beta_1 CVI_i + \beta_2 PCNSDP_i + \beta_3 URB_i + \beta_4 LIT_i + \varepsilon_i$$

where LM denotes the employment-related labour mobility rate, CVI denotes the overall Climate Vulnerability Index, and PCNSDP, URB and LIT denote per capita NSDP, urbanisation and literacy, respectively.

The analysis begins with descriptive statistics to examine the distribution of the study variables. Pearson correlation analysis is then used to examine pairwise associations among the study variables. Two regression models were then estimated. The first model examines the relationship between labour mobility and the overall Climate Vulnerability Index, while the second incorporates per capita NSDP, urbanisation and literacy as additional explanatory variables. Cook's distance and leverage values were examined to identify potentially influential observations. The estimated coefficients, model fit and statistical significance of the estimated models are presented and discussed in the Results section.

RESULTS

Spatial Distribution of the Overall Climate Vulnerability Index in India

State	Overall vulnerability index	Rank
Assam	0.616	1
Andhra Pradesh	0.483	2
Maharashtra	0.478	3
Karnataka	0.465	4
Bihar	0.448	5
Manipur	0.424	6
Rajasthan	0.423	7
Arunachal Pradesh	0.408	8
Sikkim	0.37	9
Odisha	0.368	10
Nagaland	0.365	11
Tamil Nadu	0.339	12
Himachal Pradesh	0.329	13
Jammu and Kashmir	0.328	14
NCT Delhi	0.29	15
Gujarat	0.28	16
Uttar Pradesh	0.269	17
West Bengal	0.257	18
Tripura	0.25	19
Kerala	0.226	20
Uttarakhand	0.19	21
Madhya Pradesh	0.182	22
Puducherry	0.175	23
Haryana	0.116	24
Goa	0.101	25
Chhattisgarh	0.087	26
Jharkhand	0.067	27

Source: Mohanty and Wadhawan (2021), Council on Energy, Environment and Water (CEEW).

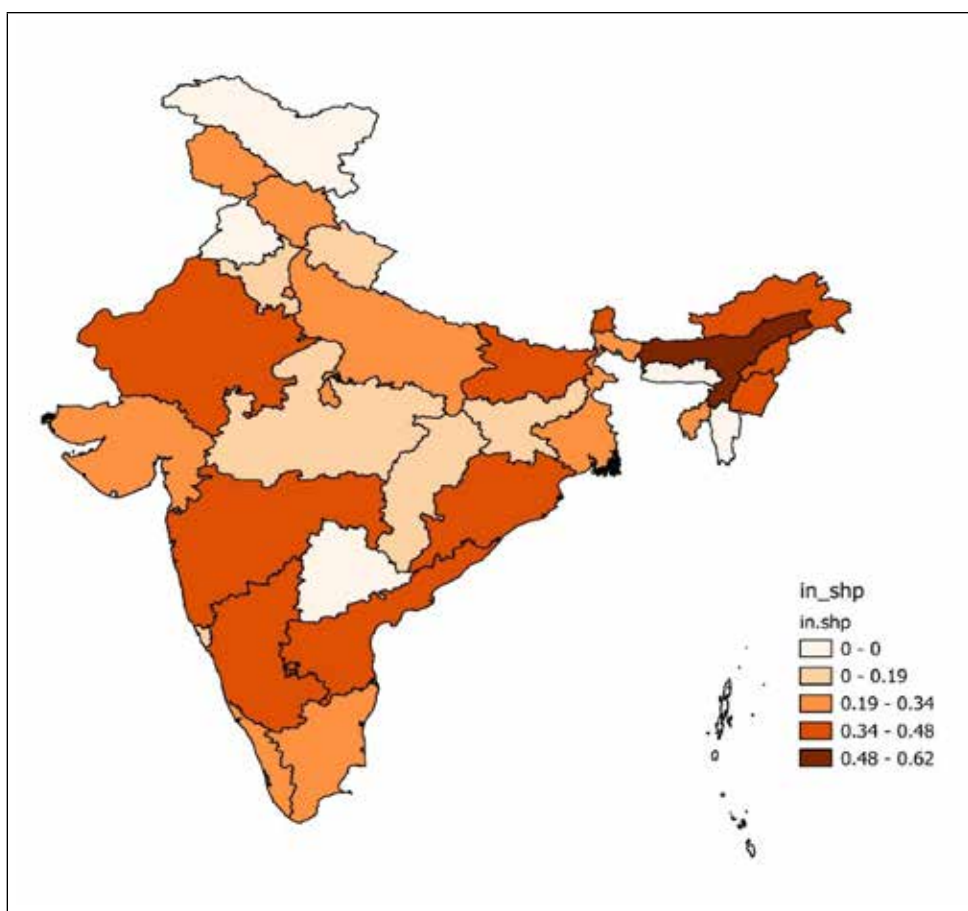


Fig. 1: Spatial Distribution of the Overall Climate Vulnerability Index in India

Source: Author's compilation based on Mohanty and Wadhawan (2021), Council on Energy, Environment and Water (CEEW).

Spatial Pattern of Labour Mobility across India

The state-wise employment-related labour mobility rate was estimated using PLFS 2020-21. The measure is based on individuals whose reported reason for migration was related to employment: “in search of employment,” “for employment/work,” or “loss of job.”

Table 2 shows considerable variation in labour mobility across states. The labour mobility rate ranges from very low levels in some states to substantially higher levels in others. Among the states shown, Delhi records a relatively high labour mobility rate of 13.35%, while several states report rates below 1%. The variation indicates that labour mobility is not uniformly distributed across Indian states.

Table 1: State-wise Employment-Related Labour Mobility (%) across India

State	Labour Mobility (%)
Assam	1.18
Andhra Pradesh	3.76
Maharashtra	4.47
Karnataka	5.14
Bihar	0.38
Manipur	0.04
Rajasthan	2.63
Arunachal Pradesh	1.96
Sikkim	3.84
Odisha	2.58
Nagaland	0
Tamil Nadu	5.61
Himachal Pradesh	4.04
Jammu and Kashmir	2.02
NCT Delhi	13.35
Gujarat	3.9
Uttar Pradesh	1.54
West Bengal	2.95
Tripura	0.61
Kerala	5.49
Uttarakhand	4.44
Madhya Pradesh	2.76
Puducherry	6.42
Haryana	2.97
Goa	6.46
Chhattisgarh	3.01
Jharkhand	1.92

Source: Authors' calculations based on PLFS 2020-21.

The map highlights the geographical variation in employment-related labour mobility across the states.

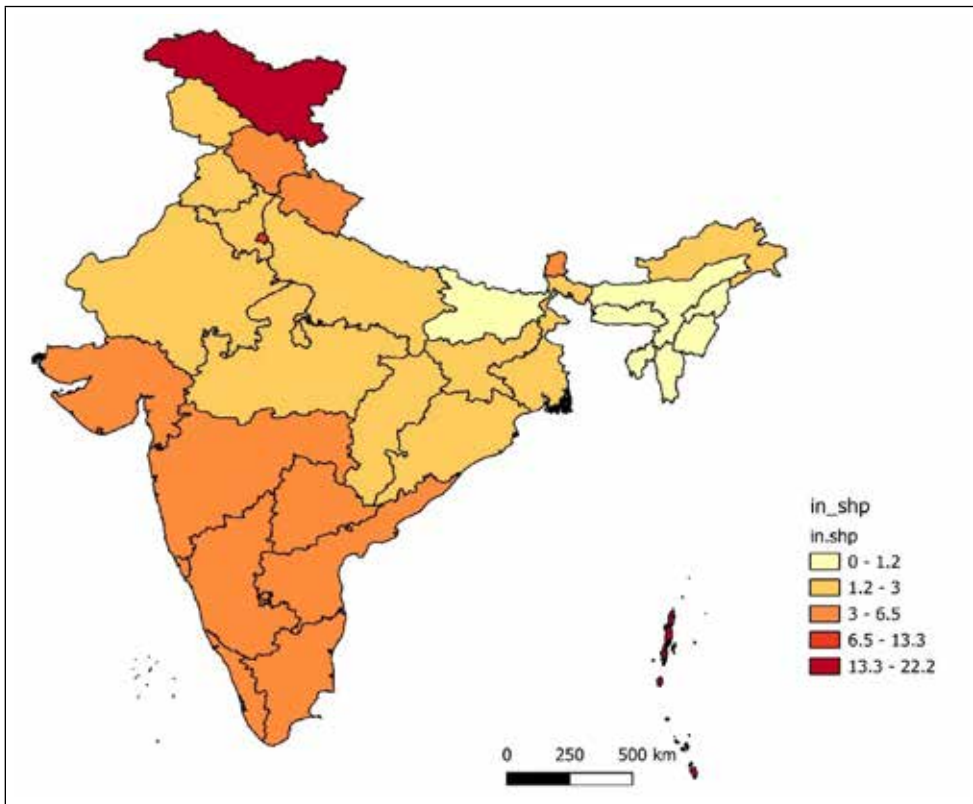


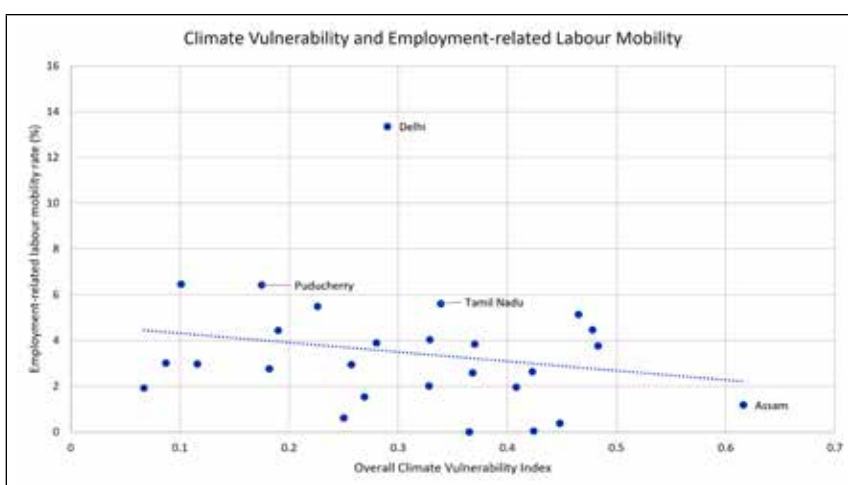
Fig. 2: Spatial Distribution of Labour Mobility Rate (%) across India

Source: Authors' calculations based on PLFS 2020-21.

Aggregate Relationship between Climate Vulnerability and Labour Mobility

To examine the overall association between climate vulnerability and labour mobility across states and union territories, a scatter plot was constructed using the Overall Climate Vulnerability Index and labour mobility rate.

The scatter plot shows a weak negative association between climate vulnerability and employment-related labour mobility. The fitted relationship is not statistically significant in the bivariate regression ($R^2 = 0.044$; $p = 0.295$). The dispersion of observations indicates that states with similar vulnerability levels can exhibit markedly different mobility rates, reinforcing the importance of socioeconomic context.



Source: Authors' calculations

Descriptive Statistics

Table 3: Descriptive Statistics of the Variables

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Labour Mobility (%)	27	0.00	13.35	3.46	2.70
Overall Vulnerability Index	27	0.067	0.616	0.309	0.138
Urbanisation (%)	27	10.00	97.50	33.74	18.89
Literacy (%)	27	61.80	94.00	76.13	8.32
Per Capita NSDP (₹)	27	₹43605	₹431351	₹169655.44	₹97443.55

Source: Authors' calculations based on the respective data sources described in Section 3

Table 3 indicates substantial cross-state variation in labour mobility, climate vulnerability and the socioeconomic characteristics considered in the analysis.

Table 4: Pearson Correlation Matrix of Study Variables

Variables	Labour Mobility	Climate Vulnerability	Urbanisation	Literacy	Per Capita NSDP
Labour Mobility	1.000	-0.209	0.861**	0.527**	0.677**
Climate Vulnerability	-0.209	1.000	-0.269	-0.242	-0.170
Urbanisation	0.861**	-0.269	1.000	0.601**	0.604**
Literacy	0.527**	-0.242	0.601**	1.000	0.597**
Per Capita NSDP	0.677**	-0.170	0.604**	0.597**	1.000

Note: $p < 0.05$; $p < 0.01$ (two-tailed).

Source: Authors calculations.

The correlation results show a weak negative association between labour mobility and climate vulnerability ($r = -0.209$), which is not statistically significant. Labour mobility is strongly and positively correlated with urbanisation ($r = 0.861$) and positively correlated with literacy ($r = 0.527$) and per capita NSDP ($r = 0.677$). Climate vulnerability is not significantly correlated with any of the three socioeconomic variables in this restricted sample.

Regression Results

Two regression models were estimated to examine the relationship between climate vulnerability and the labour mobility rate. **Model 1** examines the relationship between the overall climate vulnerability index and the labour mobility rate. **Model 2** extends the analysis by incorporating urbanisation, per capita NSDP and literacy as socioeconomic control variables.

Table 5: Regression Results for Employment-Related Labour Mobility Rate

Variables	Model 1 B	t	p-value	Model 2 B	β	t	p-value
Constant	4.723 (1.287)	3.670	0.001	0.503 (3.059)		0.164	0.871
Overall vulnerability index	-4.087 (3.817)	-1.071	0.295	0.363 (2.014)	0.019	0.180	0.858
Urbanisation (%)				0.107 (0.019)	0.749	5.526	0.000
Per capita NSDP (₹ lakh)				0.770 (0.369)	0.278	2.084	0.049
Literacy (%)				-0.027 (0.043)	-0.084	-0.627	0.537
R ²	0.044			0.785			
Adjusted R ²	0.006			0.746			
F-statistic	1.147			20.108			
N	27			27			

Note: B = unstandardized coefficient; β = standardized coefficient. Dependent variable: employment-related labour mobility rate.

Source: Authors' calculations.

Model 1 is not statistically significant ($F = 1.147$, $p = 0.295$) and explains 4.4% of the variation in the labour mobility rate ($R^2 = 0.044$; adjusted $R^2 = 0.006$). The coefficient of climate vulnerability is negative ($B = -4.087$) but statistically insignificant ($p = 0.295$), indicating an inverse association between climate vulnerability and the labour mobility rate.

Model 2 is statistically significant overall ($F = 20.108$, $p < 0.001$) and explains 78.5% of the cross-state variation in labour mobility (adjusted $R^2 = 0.746$). Climate vulnerability remains statistically insignificant ($B = 0.363$, $p = 0.858$). Urbanisation has a positive and statistically significant association with labour mobility ($B = 0.107$, $p < 0.001$), while per capita NSDP has a positive marginal association at the 5% level ($B = 0.770$ per ₹1 lakh, $p = 0.049$). Literacy is statistically insignificant ($B = -0.027$, $p = 0.537$).

Comparison of the two models indicates that the explanatory power rises substantially once socioeconomic variables are introduced: R^2 increases from 0.044 to 0.785. The climate vulnerability coefficient changes sign and remains statistically insignificant, while urbanisation emerges as the strongest predictor in the controlled specification. The results therefore suggest that mobility differences are more closely associated with the spatial distribution of urban and economic opportunities than with aggregate climate vulnerability alone.

Regression Diagnostic Analysis

Table 6: Multicollinearity and Influence Diagnostics

Diagnostic measure	Value	Interpretation
VIF	1.091-1.881	No problematic multicollinearity
Tolerance	0.531-0.917	Acceptable
Maximum Cook's Distance	1.184	Influential observation
Maximum standardized residual	2.709	No extreme residual beyond ± 3
Maximum leverage	0.535	High-leverage observation

Note: *VIF and tolerance are reported as ranges across the explanatory variables. Influence diagnostics are reported using the maximum observed value.*

Source: *Authors own calculation.*

Diagnostic checks indicate low multicollinearity, with VIF values below 2 for all explanatory variables. However, Delhi is a high-leverage observation because of its exceptionally high urbanisation and labour mobility. A sensitivity re-estimation excluding Delhi is therefore reported below. The purpose is not to remove the observation from the main analysis, but to assess whether the central inference depends entirely on this influential case.

Sensitivity Analysis

Table 7: Sensitivity Analysis of Model 2: Full Sample and Excluding Delhi

Variable / Statistic	Full sample	Excluding Delhi
Overall vulnerability index (B)	0.363	-0.559
Standard error	2.014	1.840
Standardized β	0.019	-0.042
<i>p</i> -value	0.858	0.765
Urbanisation (B)	0.107	0.067
<i>p</i> -value	0.000	0.010
Per capita NSDP (₹ lakh)	0.770	0.802
<i>p</i> -value	0.049	0.025
Literacy (B)	-0.027	-0.004
<i>p</i> -value	0.537	0.926
R ²	0.785	0.645
Adjusted R ²	0.746	0.578
F-statistic	20.108	9.551
<i>p</i> -value (model)	4.32e-07	0.000146
N	27	26

Note: The dependent variable is the employment-related labour mobility rate. *B* = unstandardized coefficient; β = standardized coefficient. The sensitivity specification excludes Delhi because of its high leverage.

Source: Authors' calculations.

The sensitivity specification excluding Delhi reduces R² from 0.785 to 0.645, but the model remains statistically significant ($F = 9.551$, $p < 0.001$). The climate vulnerability coefficient remains statistically insignificant ($B = -0.559$, $p = 0.765$), while urbanisation remains significant ($p = 0.010$) and per capita NSDP remains significant ($p = 0.025$). The main inference that aggregate climate vulnerability alone does not explain cross-state labour mobility therefore remains unchanged.

DISCUSSION

The results indicate that climate vulnerability and employment-related labour mobility is not uniform across Indian states. States with similar levels of vulnerability do not necessarily exhibit similar levels of labour mobility. The weak negative correlation ($r = -0.209$) shows that higher vulnerability does not mean higher mobility.

The differences in mobility are better understood in the context of the socioeconomic and employment structure of states. The present study finds positive associations between labour mobility and urbanisation, literacy and per capita NSDP, indicating that mobility is also linked to the availability of economic opportunities and the capacity of workers to access them. This is consistent with Keshri and Bhagat's evidence of considerable interstate variation in temporary labour migration and with Kundu's argument that migration is influenced not only by regional disparities but also by access to urban and metropolitan employment opportunities.

This finding is particularly important when compared with studies that report a positive climate–migration relationship. Khairkar and Mahapatra, for instance, identify a positive relationship between their vulnerability index and migration trends, but their vulnerability framework also incorporates socioeconomic dimensions such as income, literacy, infrastructure and adaptive capacity. Therefore, the contrasting results do not necessarily imply that climate conditions are irrelevant to mobility; rather, they suggest that climate vulnerability operates within a broader socioeconomic context. Differences in employment opportunities, income, urbanisation, human capital and adaptive capacity may influence whether climate-related pressures translate into actual labour mobility.

Overall, the findings suggest that employment-related labour mobility not a sufficient explanation of labour mobility in India, rather it is a multidimensional socioeconomic outcome. The study therefore supports a broader socioeconomic interpretation of labour mobility rather than a purely climate-induced migration perspective.

CONCLUSION

This study provides a state-level assessment of the association between climate vulnerability and employment-related labour mobility across India. The evidence suggests that the climate-mobility relationship is more complex than a direct movement from greater vulnerability to greater labour mobility. The contrasting patterns across states, together with the loss of statistical significance after socioeconomic controls are introduced, indicate that labour mobility cannot be understood through climatic conditions in isolation. A key implication is that climate vulnerability and labour mobility should be examined together with the economic and social structures within which mobility decisions are made.

This study has several limitations. First, the analysis is cross-sectional and therefore identifies associations rather than causal effects. Second, the PLFS 2020-21, a period substantially affected by the COVID-19 pandemic and its associated disruptions to employment and mobility; therefore, the observed mobility patterns may partly reflect pandemic-specific conditions. Third, the CEEW vulnerability index combines exposure, sensitivity and adaptive-capacity dimensions; therefore, some conceptual overlap may

exist between the vulnerability construct and the socioeconomic controls used in the regression. Fourth, literacy is based on Census 2011 and may not fully represent conditions in 2020-21. Finally, the study is state-level analysis, which may show some variations, although district-level analysis could provide more better insights into climate- labour mobility relationship, the state level findings remain useful for identifying broad regional patterns.

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