

Population Mobility, Migration, and Climate Stress in Bihar: Patterns and Policy Implications

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Abstract

Bihar State faces rising climate stress from floods, heat, and changing rainfall patterns that increasingly shape population mobility. This study synthesises district-level evidence and recent literature to show how climate variability, flood intensity, and livelihood loss drive mostly seasonal and temporary migration from agriculture-dependent and low-development districts. Recurrent hazards in Seemanchal, Himalayan Tarai and parts of south-west and south-east Bihar push households to use migration as an adaptive strategy to protect income and assets. At the same time, repeated exposure can convert short-term mobility into longer-term displacement, with adverse effects on education, health access, and household welfare especially for women, children and marginal farmers. District climate-risk profiles identify clusters of high exposure where integrated actions are needed. The analysis finds that migration is not solely a distress outcome but a manageable pathway to resilience if supported by targeted interventions. Policy priorities include strengthening climate-resilient agriculture, improving flood preparedness, expanding livelihood diversification, ensuring portable services for migrants, and building safe migration systems. With focused district-level planning and coordinated State and line-department action, Bihar can reduce distress migration, enhance adaptive capacity, and turn climate-related mobility into an opportunity for inclusive development.

Keywords: Climate stress, Migration, Resilience, Flood-prone districts, Livelihood diversification.

(The views expressed in this article are solely those of the authors and do not necessarily reflect the official position, policy or view of the Department.)

Introduction

Bihar's population mobility and migration patterns are increasingly shaped by climate stress, making the topic central to development planning and resilience building. The state's exposure to floods, heat stress, erratic rainfall, and livelihood disruption has created strong links between environmental change and short- and medium-term migration decisions. Recent empirical evidence from Bihar indicates that climate variability and flood intensity are associated with higher out-migration, particularly in agrarian and socioeconomically vulnerable districts. A district-level study concludes that climatic variability and flood hazards contribute to out-migration in Bihar, with stronger vulnerability in agriculture-dependent and low-development districts (Richa, Noy, I. & Sen, S., 2024). A study on selected districts of North Bihar found that changes in temperature and rainfall, along with flood risks, are linked to migration. Figure 1 presents the district map of Bihar to help in understanding the district lay out more clearly. It is evident that repeated exposure to disasters can turn temporary migration into long-term migration (Richa, 2023). More recent evidence from *Frontiers in Climate* in 2026 shows that in flood-prone Seemanchal districts, household migration is shaped by recurrent flooding, crop loss, land submergence, and livelihood insecurity, with migration functioning as an adaptation strategy in the face of persistent climate stress. At the same time, district-level climate-risk assessments identify high exposure, dense populations, poverty, and child malnutrition as key drivers of vulnerability, reinforcing the need for integrated policy responses.

Migration in this context is not only a survival response but also a household strategy to smooth income, protect assets, and maintain welfare during climate shocks. For Bihar, this means that migration must be understood as part of a wider adaptation landscape rather than as a standalone demographic issue. The state's planning priorities therefore include strengthening local livelihoods, improving disaster preparedness, and reducing distress migration through climate-resilient development (CAN South Asia, 2021).

Bihar



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Figure 1: District map of Bihar

Studies on Bihar highlight that migration flows are often seasonal, temporary, and short-distance, but repeated exposure to hazards can lead to more permanent displacement and deeper social disruption. Such movements affect labour markets, education continuity, health access, and family well-being, especially for women, children, and older adults. Bihar's climate challenges also intersect with agriculture, since rural households depend heavily on rain-fed livelihoods and face rising uncertainty from floods and heat stress (CK Jha and et al., 2018). This makes a population-studies lens especially useful for linking migration, vulnerability, and development outcomes. The present paper therefore focuses on how climate stress influences mobility in Bihar and how public policy can support safer, more adaptive, and more productive migration pathways.

Objectives

The study has three objectives.

1. To examine the relationship between climate stress and population mobility in Bihar, with a particular emphasis on seasonal, temporary, and distress migration.
2. To identify vulnerable districts and population groups that are most exposed to climate-related displacement and livelihood disruptions.
3. To derive policy implications for strengthening climate resilience, reducing forced migration, and improving the governance of migration as an adaptation strategy.

Methodology

This paper adopts a descriptive and policy-oriented approach using secondary evidence from published studies, state climate reports, and district-level risk assessments. It reviews literature on climate variability, flood hazards, labour migration, and household adaptation in Bihar to identify recurring patterns and policy lessons. The analysis places Bihar within broader debates on climate-induced mobility, where migration can reflect both vulnerability and adaptive capacity.

The study also draws on district-level climate-risk information that highlights exposure to floods, heat waves, droughts, population density, poverty, and malnutrition. These indicators are used to understand where mobility pressures are likely to be strongest. Particular attention is given to rural and agriculture-dependent districts, since they face direct livelihood losses during climate shocks. The methodology remains qualitative and interpretive, focusing on patterns, risks, and policy relevance rather than statistical modelling. This makes the paper suitable for planning-oriented discussion and for identifying practical interventions that can support vulnerable households and improve adaptive responses across Bihar.

Results

Climate exposure and district vulnerability

Bihar's climate profile reveals a clear and rising exposure to environmental stress, with important implications for mobility and migration. The district-level assessment shows that maximum temperatures have increased consistently across all districts since 1901, while rainfall has generally declined, particularly in ACZ III (A) which stands for Agro-Climatic Zone III (A). It refers to a sub-zone classification used in Bihar's agricultural/climate zoning with high livelihood vulnerability.

Future projections indicate that maximum temperature may rise by more than 2°C in most districts by 2070 under RCP 4.5 which stands for Representative Concentration Pathway 4.5. It is a moderate climate scenario in which greenhouse gas forcing stabilizes at 4.5 W/m² by 2100. It underscores the importance of climate adaptation planning. The highest-risk districts are concentrated in the south-western, south-eastern, and Himalayan Tarai regions, where floods, heat waves, droughts, poverty, and child malnutrition intensify vulnerability (Tables 1 & 2). The classification of districts by broad risk cluster is also appended here. This pattern is important because it shows that climate pressure is not uniform across Bihar; instead, it clusters in districts where livelihoods are most dependent on climate-sensitive agriculture and where adaptive capacity is lower. The Government's emphasis on district-specific resilience planning is therefore well aligned with the evidence (Jha et al., 2025).

Table 1: Bihar district risk clusters

Sl. No.	District	Broad risk cluster	Main risk profile	Recent source base
1.	West Champaran	North-west / high flood and climate stress	Floods, river overflow, agrarian exposure	Bihar climate-risk assessment; flood literature
2.	East Champaran	North-west / high flood and climate stress	Floods, agriculture dependence, livelihood insecurity	Bihar climate-risk assessment; flood literature
3.	Sheohar	North / high flood and vulnerability	Flood-prone, small district, high exposure	Bihar climate-risk assessment
4.	Sitamarhi	North / Himalayan Tarai belt	Floods, heat, poverty, nutrition vulnerability	Bihar climate-risk assessment
5.	Madhubani	North / Himalayan Tarai belt	Flood exposure, dense population, livelihood risk	Bihar climate-risk assessment; Mongabay summary
6.	Supaul	North / Himalayan Tarai belt	Recurrent floods, high livelihood stress	Bihar climate-risk assessment
7.	Araria	North-east / flood-prone Seemanchal	Floods, poverty, child malnutrition, migration pressure	Bihar climate-risk assessment
8.	Kishanganj	North-east / flood-prone Seemanchal	Floods, poverty, nutrition vulnerability	Bihar climate-risk assessment
9.	Purnia	North-east / flood-prone Seemanchal	Floods, agrarian stress, deprivation	Bihar climate-risk assessment; Frontiers study
10.	Katihar	North-east / flood-prone Seemanchal	Floods, riverine risk, livelihood loss	Bihar climate-risk assessment; Frontiers study
11.	Darbhangha	North / high flood exposure	Flood-prone, dense settlement, livelihood disruption	Bihar climate-risk assessment; Mongabay summary
12.	Muzaffarpur	North / high flood exposure	Floods, agriculture exposure	Flood atlas and climate-risk assessment
13.	Samastipur	North / high flood exposure	Floods, agrarian livelihoods, heat stress	Bihar climate-risk assessment; Mongabay summary
14.	Vaishali	North-central / high flood exposure	Flood and riverine vulnerability	Flood literature
15.	Saran	North-central / high flood exposure	Floods, livelihood insecurity	Bihar flood vulnerability study
16.	Gopalganj	North-west / flood-prone	Floods, agricultural exposure	Bihar flood vulnerability study
17.	Siwan	North-west / flood and agrarian stress	Flood and livelihood vulnerability	Bihar flood vulnerability study
18.	Bhojpur	South-central / mixed flood and heat risk	Riverine flood, heat stress, poverty	Bihar climate-risk assessment

19.	Buxar	South-west / drought and heat belt	Drought, heat waves, agrarian stress	Bihar climate-risk assessment
20.	Rohtas	South-west / drought and heat belt	Drought, heat stress, livelihood risk	Bihar climate-risk assessment
21.	Aurangabad	South-west / drought and heat belt	Drought, heat waves, agrarian vulnerability	Bihar climate-risk assessment
22.	Gaya	South / drought and heat belt	Heat and drought stress	Bihar climate-risk assessment
23.	Nawada	South / drought and heat belt	Drought, heat, poverty	Bihar climate-risk assessment
24.	Jamui	South-east / climate stress belt	Heat, drought, poverty, land stress	Bihar climate-risk assessment
25.	Banka	South-east / climate stress belt	Drought, heat, agrarian vulnerability	Bihar climate-risk assessment
26.	Lakhisarai	Central / mixed risk	Flood and heat exposure	Bihar climate-risk assessment
27.	Sheikhpura	Central / mixed risk	Heat and livelihood vulnerability	Bihar climate-risk assessment
28.	Nalanda	Central / mixed risk	Heat stress, development vulnerability	Bihar climate-risk assessment
29.	Patna	Central / dual flood and heat risk	Flood exposure, urban heat, dual risk	PIB risk report
30.	Arwal	South-central / mixed risk	Heat and drought stress	Bihar climate-risk assessment
31.	Jehanabad	South-central / mixed risk	Heat, livelihood stress	Bihar climate-risk assessment
32.	Kaimur (Bhabua)	South-west / drought and heat stress belt	Drought, heat stress, groundwater quality concerns, agrarian vulnerability	Bihar climate-risk assessment; Bihar agriculture contingency plan; district profile; groundwater reports
33.	Begusarai	North-central / flood and heat exposure	Floods, density, heat stress	Mongabay summary
34.	Khagaria	North / high flood exposure	Severe flood-prone district	Bihar climate-risk assessment; flood literature
35.	Munger	East-central / mixed risk	Flood and livelihood vulnerability	Bihar climate-risk assessment
36.	Bhagalpur	East / mixed flood and heat risk	Flood exposure, urban-rural vulnerability	Mongabay summary; Bihar climate-risk assessment
37.	Saharsa	North-east / flood-prone belt	Floods, Kosi river influence, water logging, agrarian exposure, and seasonal climate stress	Saharsa District Disaster Management Plan; recent flood-vulnerability and resilience reports
38.	Madhepura	North/ flood-prone belt	Floods, agrarian stress	Bihar climate-risk assessment

Table 2: Climate risk profile of Bihar districts

Climate-risk dimension	Bihar evidence
Temperature trend	Maximum temperatures increased consistently across all districts from 1901 to 2022.
Precipitation trend	Precipitation showed a general decline, with the sharpest reduction in ACZ III (A).
Future projection	Maximum temperature may rise by more than 2 °C in most districts by 2070 under RCP 4.5.
High-risk regions	South-western, south-eastern, and Himalayan Tarai districts are identified as high to very high risk.
Main vulnerability drivers	Floods, heat waves, droughts, high population density, poverty, and child malnutrition.

Source: Jha et al., 2025, district-level Bihar climate-risk assessment.

Migration as climate adaptation

The evidence suggests that migration in Bihar is increasingly used as a coping strategy in response to climate stress. Studies indicate that flood intensity, rainfall variability, and temperature stress are associated with higher out-migration, especially in agriculture-dependent districts. This pattern is largely seasonal and temporary, allowing households to stabilize income when local livelihoods are disrupted. At the same time, repeated exposure to hazards may shift temporary movement toward longer-term migration or displacement (Richa, 2023).

The findings also highlight the adaptive value of mobility. Migration helps households protect assets, diversify income, and manage risk during periods of climate shock. In Bihar, this is especially relevant in flood-prone and low-development districts, where local employment opportunities are limited and agriculture remains vulnerable (Table 3). The policy implication is positive: with the right support, migration can be managed as a resilience strategy rather than viewed only as distress movement.

Table 3: Bihar migration and climate-stress link

Migration indicator	Bihar pattern
Climate-sensitive out-migration	Strongly associated with flood intensity and climate variability
Common migration form	Seasonal and temporary migration is widespread
Main source areas	Flood-prone, agriculture-dependent, and low-development districts
Main destination type	Nearby urban centres, especially Kolkata and regional labour markets
Adaptive role	Migration helps households smooth income and manage risk

Source: CAN South Asia, *Climate-Induced Displacement and Migration in India*, 2021.

Saharsa as a district example

The Saharsa case provides a grounded example of how climate stress shapes mobility in Bihar. The CANSA report documents repeated flooding, land loss, and livelihood disruption in Saharsa, where migration has become a regular coping strategy for households. The report also shows that women carry a heavier burden when male members migrate; because they must manage both care work and agricultural responsibilities. This district experience is valuable because it reflects the broader pattern across North Bihar, where climate shocks and livelihood insecurity reinforce migration pressure (Table 4).

Table 4: Saharsa and flood-linked mobility

Saharsa/Bihar district evidence	Reported pattern
Main climate hazard	Incessant floods and repeated inundation.
Migration type	Seasonal, temporary, and sometimes longer-term displacement.
Gender pattern	Men migrate more often; women face increased care and farm responsibilities.
Livelihood effect	Agriculture and allied activities are disrupted by floods.
Adaptation response	Households use migration as a coping strategy.

Source: CAN South Asia, *Climate-Induced Displacement and Migration in India*, 2021.

Summary and Conclusions

Bihar's experience shows that climate stress and population mobility are closely connected and must be addressed together in policy. The state's exposure to floods, rising temperatures, and rainfall variability has increased livelihood risks and contributed to higher migration from vulnerable districts. Much of this movement is temporary and seasonal, allowing households to protect incomes and reduce immediate hardship. In that sense, migration is not only a symptom of distress but also an important coping mechanism within rural and agricultural economies.

At the same time, the findings make clear that the burden of climate-induced mobility falls unevenly across Bihar. Poor households, marginal farmers, and flood-prone districts face greater disruption because they have fewer local resources to absorb shocks. This creates a development challenge for the state, since repeated migration can weaken education continuity, health access, and stable employment, especially for women and children. The district-level climate-risk evidence also shows that exposure, poverty, high population density, and malnutrition reinforce one another, making targeted action essential.

The positive policy message is that Bihar already has a strong basis for action. Migration can be better managed through climate-resilient agriculture, improved flood preparedness, livelihood diversification, and district-specific planning in high-risk areas. Supportive measures such as skill development, portable services, and safe migration systems can help households benefit from mobility while reducing its distressing forms. A combined approach offers the best route for Bihar to address climate pressure

effectively. Strengthening communities at home through better livelihoods, climate-smart agriculture, flood protection, and social safety nets can reduce distress migration. At the same time, ensuring protection during movement through safer travel, access to information, decent work conditions, and support at destination areas can make migration more secure and productive. Together, these measures can help Bihar turn climate-related stress into an opportunity for adaptive development.

Recommendations

- Prioritise district resilience plans: prepare and fund district-specific action plans for high-risk clusters identified in the risk assessment.
- Strengthen climate-resilient agriculture: promote drought- and flood-tolerant crops, improved irrigation, and agro-advisory services.
- Expand livelihood diversification: implement skill training, micro-enterprise support, and local job schemes to reduce distress out-migration.
- Improve flood preparedness: upgrade early warning, embankments where needed and community-based response systems.
- Ensure portable services: make entitlements (health, education, social protection) portable for seasonal migrants through inter-state coordination and digital registration.
- Support safe migration: provide pre-departure information, skill certification, and partnerships with destination states to protect workers' rights.
- Focus on vulnerable groups: target programs for women-headed households, marginal farmers, and children to maintain continuity of education and health.
- Monitor and evaluate: set simple indicators for migration, livelihoods and climate risk at district level and review annually for adaptive policy.

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Appendix

Classification of Districts by Broad Risk Cluster

Broad risk cluster	Definition	Districts
1. Climate stress belt	A region where people and livelihoods face repeated climate pressure such as rising heat, irregular rain, or extreme weather. It means the area faces regular climate problems and needs to prepare better to deal with them.	1. Banka 2. Jamui
2. Dual flood and heat risk	An area exposed to both flooding and high temperatures. People there may face water damage during the monsoon and heat stress in the dry season.	3. Patna
3. Drought and heat belt	A zone where drought and high heat occur together or very frequently. This combination reduces water availability, harms crops, and makes living conditions difficult.	4. Buxar 5. Rohtas 6. Aurangabad 7. Gaya 8. Nawada
4. Drought and heat stress belt	A region where long dry periods and hot weather create serious stress on health, farming, and water supply. It usually affects agriculture and increases hardship for rural households.	9. Kaimur (Bhabua)
5. Flood and agrarian stress	An area where floods repeatedly damage farms, crops, livestock, and rural livelihoods. The main concern is that agriculture becomes unstable and income loss becomes frequent.	10. Siwan
6. Flood and heat exposure	A place where people are exposed to both flood events and heat stress. This means the area faces seasonal flooding as well as hot weather-related health risks.	11. Begusarai
7. Flood-prone belt	A geographic zone that gets flooded regularly or has a high chance of flooding. Such areas usually need strong drainage, embankment, and disaster preparedness systems.	12. Araria 13. Purnia 14. Katihar 15. Kishanganj 16. Gopalganj 17. Madhepura 18. Saharsa
8. High flood and climate stress	A geographic zone that gets flooded regularly or has a high chance of flooding. Such areas usually need strong drainage, embankment, and disaster preparedness systems.	19. West Champaran 20. East Champaran
9. High flood exposure	A place where many people, homes, farms, or assets are located in flood-risk zones. The risk is high because more lives and property can be affected when floods occur.	21. Darbhanga 22. Muzaffarpur 23. Samastipur 24. Saran 25. Vaishali 26. Khagaria
10. High flood and vulnerability	A region where flooding is common and people have weak ability to cope with it. Poverty, poor housing, and weak infrastructure make the damage worse.	27. Sheohar

11. Himalayan Tarai belt	The low-lying plains along the foothills of the Himalayas. This belt is usually fertile but also highly exposed to floods, water logging, and river overflow.	28. Sitamarhi 29. Madhubani 30. Supaul
12. Mixed flood and heat risk	An area where both flood and heat hazards exist, but not always with equal intensity. The risk changes by season and location, creating a mixed pattern of climate stress.	31. Bhojpur 32. Bhagalpur
13. Mixed risk	A region that faces more than one type of hazard, such as flood, drought, heat, or water stress. It means the area does not face just one problem, but a combination of climate risks.	33. Lakhisarai 34. Sheikhpura 35. Nalanda 36. Arwal 37. Jehanabad 38. Munger

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