Appendix

Supplemental Table S1. Climate Mobility Models Assessed

Each model (n = 37) was coded for modeling approach, geographic scope, spatial resolution, migration type (internal, cross-border, both, immobility), climate hazards represented, time horizon, treatment of policy interventions, data source, causal mechanism, functional form, scenario inputs, validation methods, assumptions, key findings, and publication venue and year. The following table is a subset of our model mapping and assessment work.

Model	Modeling Approach	Geographic Scope	Spatial Resolution	Migration Type	Climate Hazards Represented	Time Horizon	Treatment of Policy Interventions
Abel et al. (2013)[i]	Bayesian Model	National [United Kingdom]	Administrative	Cross-border	EXPERT ELICITATION	2010 - 2060	Not addressed
Amakrane et al. (2023)[ii]	Gravity Model with Econometric Component	Regional [Africa]	Rasterized View	Internal + Cross-border	MULTI HAZARD (Water Avail., Crop Yield, Flood Hazard, SLR)	Up to 2050	Not addressed
Bariberi et al. (2010)[iii]	Computable General Equilibrium (CGE) Model	Sub-national [North East Brazil]	Administrative	Internal	TEMPERATURE INCREASE	Up to 2050	Not addressed
Bell et al. (2021)[iv]	Agent-Based Model (ABM)	National [Bangladesh]	Administrative	Internal + Immobility	SEA-LEVEL RISE	Up to 2100	Modeled explicitly (Effects of increased access to credit on mobility outcomes.)
Benveniste et al. (2022)[v]	Gravity Model and Integrated Assessment Model	Global	Administrative	Internation-al-Immo-bility	General CLIMATE-ECON (Non-ag Specific)	Up to 2100	Not addressed
Best (2022)[vi]	Agent-Based Model (ABM)	National [Bangladesh]	N/A	Internal (general mechanism)	MULTI HAZARD (Temperature rise, flooding, salinity, cyclones, sea-level rise, and rainfall variability	Up to 2100	Not addressed
Burzyński et al. (2022)[vii]	Computable General Equilibrium (CGE) Model	Global	Rasterized View	Internal + Cross-border	MULTI HAZARD (SLR, Avg Surface Temp, Extreme Events)	Up to 2100	Modeled explicitly (Immigration law and policy scenarios)

Model	Modeling Approach	Geographic Scope	Spatial Resolution	Migration Type	Climate Hazards Represented	Time Horizon	Treatment of Policy Interventions
Burzyński et al. (2021)[viii]	Spatial General Equilibrium (SGE) Model + Gravity Model	Global	Rasterized View	Internal + Cross-border	TEMPERATURE VARIANCE & SEA-LEVEL RISE	2040, 2070, 2100	Modeled explicitly (Effects of changes to international migration restrictions on poverty at origin)
Cattaneo and Massetti (2019)[vix]	Econometric	National [Nigeria]	Administrative	Internal + Cross-border	TEMPERATURE & PERCIPITATION VARIANCE	2031 - 2060 & 2071 - 2100	Not addressed
Cattaneo et al. (2024)[x]	Gravity Model with Econometric Component	Global	Administrative	Cross-border	MULTI HAZARD (Temp, Precipitation, Droughts, Flood)	Up to 2060 (reported by decades)	Static Policy Assumption
Chen and Mueller (2018)[xi]	Source: Econometric	National [Bangladesh]	Administrative	Internal + Cross-border	SOIL SALINITY & FLOODING (Both)	N/A	Not addressed
Choquette-Levy et al. (2021)[xii]	Agent-Based Model (ABM)	Sub-national [Chitwan Valley, Nepal]	N/A	Internal + Immobility	TEMP INCREASE	Up to 2050	Modeled explicitly (Tests risk-transfer/ social-protection interventions (cash transfers, insurance, remittance banks).)
Choquette-Levy et al. (2026)[xiii]	Agent-Based Model (ABM)	National [Senegal]	Administrative	Internal	DROUGHT & SEA-LEVEL RISE (Separate Scenarios)	Up to 2050	Modeled explicitly (Models effects of aspiration-enabling resilience policies.)
Clement et al. (2021)[xiv]	Gravity Model with Econometric Component	Multi-Regional [East Asia & Pacific, North Africa, Eastern Europe & Central Asia]	Rasterized View (14-square kilometer grid)	Internal	MULTI HAZARD (Water Scarcity, Crop Productivity, SLR)	Up to 2050	Not addressed
Davis et al. (2018)[xv]	Radiation Model (Modified)	National [Bangladesh]	Administrative	Internal	SEA-LEVEL RISE	2050 & 2100	Not addressed
De Lellis et al. (2021)[xvi]	Radiation Model (Modified)	National [Bangladesh]	Administrative	Internal	SEA-LEVEL RISE	Up to 2050	Not addressed
Feng et al. (2010)[xvii]	Econometric	National [Mexico]	Administrative	Cross-border	TEMPERATURE, PERCIPITATION & SUMMER TEMP VARIANCE	Up to 2080	Held Constant
Feng et al. (2012)[xviii]	Econometric	National [USA, Corn Belt]	Administrative	Internal	HEAT/ TEMPERATURE & PRECIPIPATION (Both)	2020 - 2049 & 2077 - 2099	Held Constant

Model	Modeling Approach	Geographic Scope	Spatial Resolution	Migration Type	Climate Hazards Represented	Time Horizon	Treatment of Policy Interventions
First Street Foundation (2023)[xix]	Machine Learning + Econometric	National [USA]	Statistical entity (Spatially explicit modeling at census block group level across CONUS)	Internal	MULTI HAZARD (Flood, cyclone winds, wildfire smoke, drought, wildfires, and heatwaves)	Up to 2053	Not addressed
Hassani-Mahmooei and Parris (2012)[xx]	Agent-Based Model (ABM)	National [Bangladesh]	Administrative	Internal	MULTI HAZARD (SLR, Floods, Droughts)	2001 - 2050	Not addressed
Hauer (2017) [xxi]	Migration Systems Simulation Model	National [USA]	Statistical Entity (319 coastal origin counties and 3,113 destination counties across the US)	Internal	SEA-LEVEL RISE	Up to 2100	Not addressed
Hirsch et al. (2026)[xxii]	Econometric	Global	Rasterized View (12.5km Resolution)	Cross-border	MULTI HAZARD (Flood, Wind, Drought, Extreme Heat/Cold, Wildfires)	Up to 2100 (Examined at 2055 and 2100)	Not addressed
Jones (2020) [xxiii]	Gravity Model with Econometric Component	Regional [Central America & Mexico]	Rasterized View	Internal + Cross-border	MULTI HAZARD (Water Availability, Crop Yields, Ecosystem Prod., Flood, Groundwater, Extreme Heat Days, SLR)	Up to 2100	Not addressed
Jones (2024) [xxiv]	Gravity Model with Spatial Allocation	Multi-Subnational [Accra, Amman, Bogotá, Curitiba, Dhaka, Freetown, Karachi, Rio de Janeiro, Salvador, São Paulo]	Rasterized View	Internal	MULTI HAZARD (Crop Yields, Saltwater Intrusion, SLR, Flooding, Water Stress, Drought, Landslides)	Up to 2050 (10-year time steps)	Not addressed
Kniveton et al. (2012)[xxv]	Agent-Based Model (ABM)	National [Burkina Faso]	Administrative	Internal + Cross-border	RAINFALL VARIABILITY	Up to 2050	Not addressed
Martin et al. (2025)[xxvi]	Gravity Model and 'Hybrid Foresight Approach'	Multi-Subnational [Karachi & Ho Chi Minh City]	Administrative	Internal	MULTI HAZARD (Water Availability, Crop Yields, Ecosystem Prod., Flood Hazard, Groundwater, Heat Extreme, Drought, SLR)	2020 - 2050	Not addressed

Model	Modeling Approach	Geographic Scope	Spatial Resolution	Migration Type	Climate Hazards Represented	Time Horizon	Treatment of Policy Interventions
Milan et al. (2016)[xxvii]	Agent-Based Model (ABM)	National [Tuvalu]	Administrative	Internal + Cross-border	MULTI HAZARD (Cyclone, Drought, Rainfall Variability, Floods, SLR, Saltwater Intrusion, Storm Surge)	2015-2055	Not addressed
Naugle et al. (2018)[xxviii]	System Dynamics Migration Simulation Model	National [Mali]	Administrative	Internal + Cross-border	MULTI HAZARD (Temp., Extreme Events, Water availability)	1990 - 2060	Modeled explicitly (Compares governance/ urban-aid investment scenarios ("policy levers") as drivers of migration pressure)
Oakes et al. (2016)[xxix]	Agent-Based Model (ABM)	National [Kiribati]	Administrative	Internal + Cross-border	MULTI HAZARD (Cyclone, Drought, Rainfall Variability, Floods, SLR, Saltwater Intrusion, Storm Surge)	2015 - 2055	Not addressed
Oliviera and Pereda (2020)[xxx]	Spatial General Equilibrium (SGE) Model	National [Brazil]	Administrative	Internal	TEMPERATURE, RAINFALL & SUNSHINE HOUR VARIANCE	2040 - 2070	Not addressed
Reimann et al. (2023)[xxxi]	Gravity Model	Regional [Mediterra-nean]	Rasterized View	Internal	SEA-LEVEL RISE	2020 - 2100 (10 year time steps)	Modeled explicitly (Scenario-tests coastal adaptation and protection policies ("Shared Policy Assumptions") and their effect on migration)
Rigaud et al. (2018)[xxxii]	Gravity Model with Econometric Component	Multi-Regional [Sub-Saharan Africa, South Asia, Latin America]	Rasterized View (14-square kilometer grid)	Internal	MULTI HAZARD (Water Scarcity, Crop Productivity, SLR, Storm Surge)	Up to 2050	Not addressed
Robinson et al. (2020)[xxxiii]	Machine Learning [Artificial Neural Network]	National [USA]	Administrative	Internal	SEA-LEVEL RISE	Up to 2100	Not addressed
Rosengaert-ner et al. (2025)[xxxiv]	Computable General Equilibrium (CGE) Model	Regional [Greater Caribbean (Association of Caribbean States)]	Rasterized View	Internal + Cross-border + Immobility	MULTI HAZARD (Crop Yields, Temperature, SLR, Disasters, Coral Bleaching)	Up to 2050	Not addressed

Model	Modeling Approach	Geographic Scope	Spatial Resolution	Migration Type	Climate Hazards Represented	Time Horizon	Treatment of Policy Interventions
Shu et al. (2023)[xxxv]	Econometric with Spatial Allocation	National [USA]	Statistical Entity	Internal	FLOOD EXPOSURE	2023 - 2053	Not addressed
Smirnov et al. (2022)[xxxvi]	Agent-Based Model (ABM)	Global	Administrative & Rasterized View	Internal + Cross-border + Immobility	DROUGHT	Up to 2100	Not addressed
Speelman et al. (2022)[xxxvii]	Agent-Based Model (ABM)	National [Maldives]	Administrative	Internal + Cross-border	SEA-LEVEL RISE & MARINE HAZARDS (Captured Indirectly	Up to 2050	Modeled explicitly (Tests the effects in some narratives of environmental protection and resettlement policies)

Note: "Migration type" reflects the primary mobility outcome(s) modeled, with "Immobility" appended where a model explicitly represents trapped/immobile populations. "Treatment of policy interventions" indicates whether a model incorporates the effects of a specific policy variable or intervention (for example, adaptation investment, social protection, migration governance) as an explicit input or mechanism. Models that assume the effects of unspecified policy interventions through the use of SSP and/or RCP background conditions are not counted here as modeling policy interventions.

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