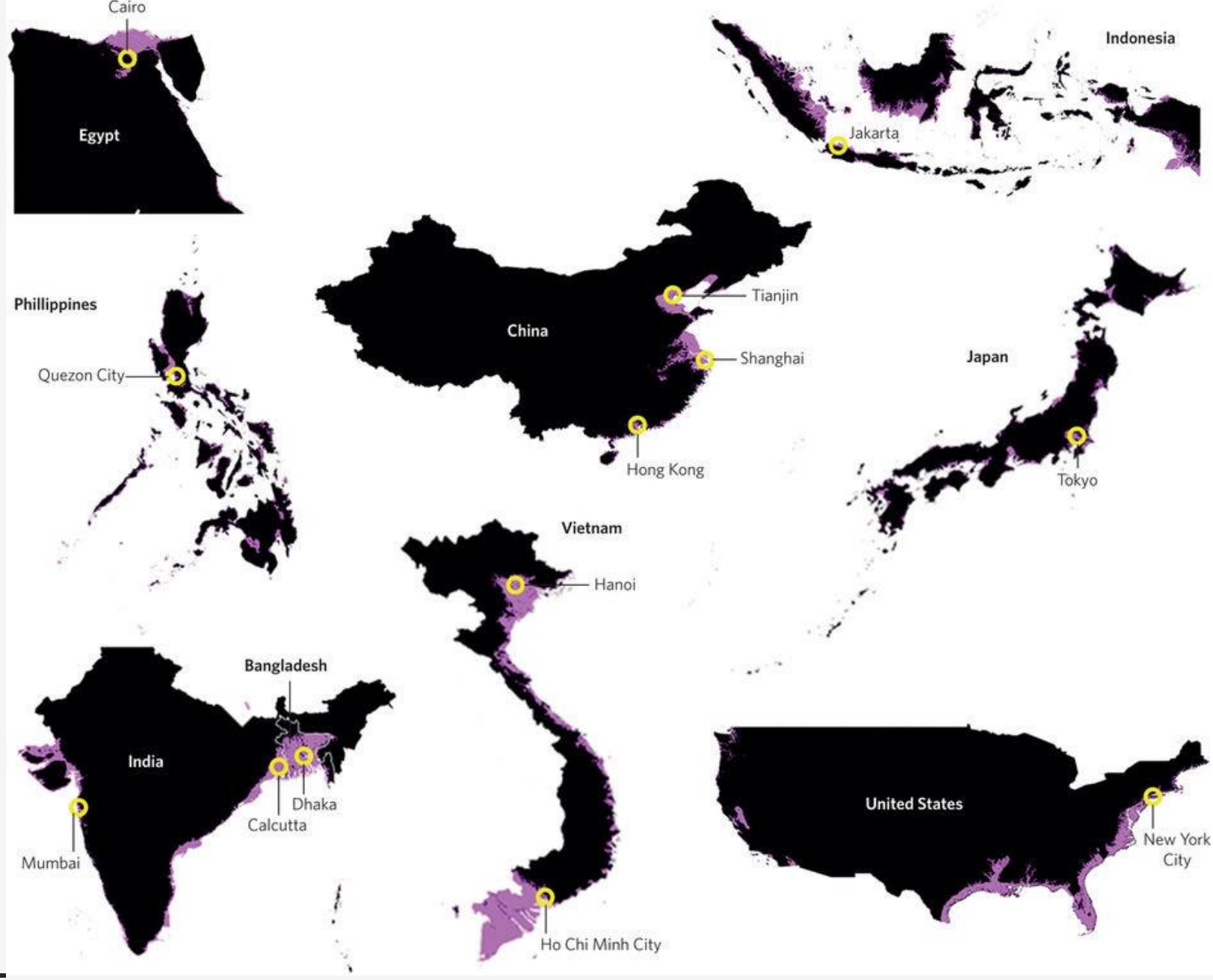
SEA-LEVEL CHANGE, MIGRATION AND THE DETERMINING ROLE OF ADAPTATION AND MITIGATION POLICY

DAVID J. WRATHALL
Asst Prof | Oregon State University, College of Earth, Ocean and Atmospheric Sciences
Lead Author | IPCC AR6 WG2, Ch8. Poverty, Livelihoods and Sustainable Development

Rising sea-levels, extreme tides, storm surge, inundation, erosion, salinity (i.e. "sea-level change") will affect where we can live and work.

EXPOSURE TO SEA-LEVEL CHANGE

Clark et al. 2016: Areas of submergence for countries with at least 50 million people living on land affected by long-term sea-level projection based on the 1,280 PgC emissions ("business as usual" through the 21st century).



THE BURNING QUESTIONS:

How many people will migrate due to sea-level change? Where? When?

Are outcomes already determined or do we have choices?

MENU

nature climate change

Comment | Published: 26 November 2019

Meeting the looming policy challenge of sea-level change and human migration

D. J. Wrathall, V. Mueller, P. U. Clark, A. Bell, M. Oppenheimer, M. Hauer, S. Kulp, E. Gilmore, H. Adams, R. Kopp, K. Abel, M. Call, J. Chen, A. deSherbinin, E. Fussell, C. Hay, B. Jones, N. Magliocca, E. Marino, A. Slangen & K. Warner

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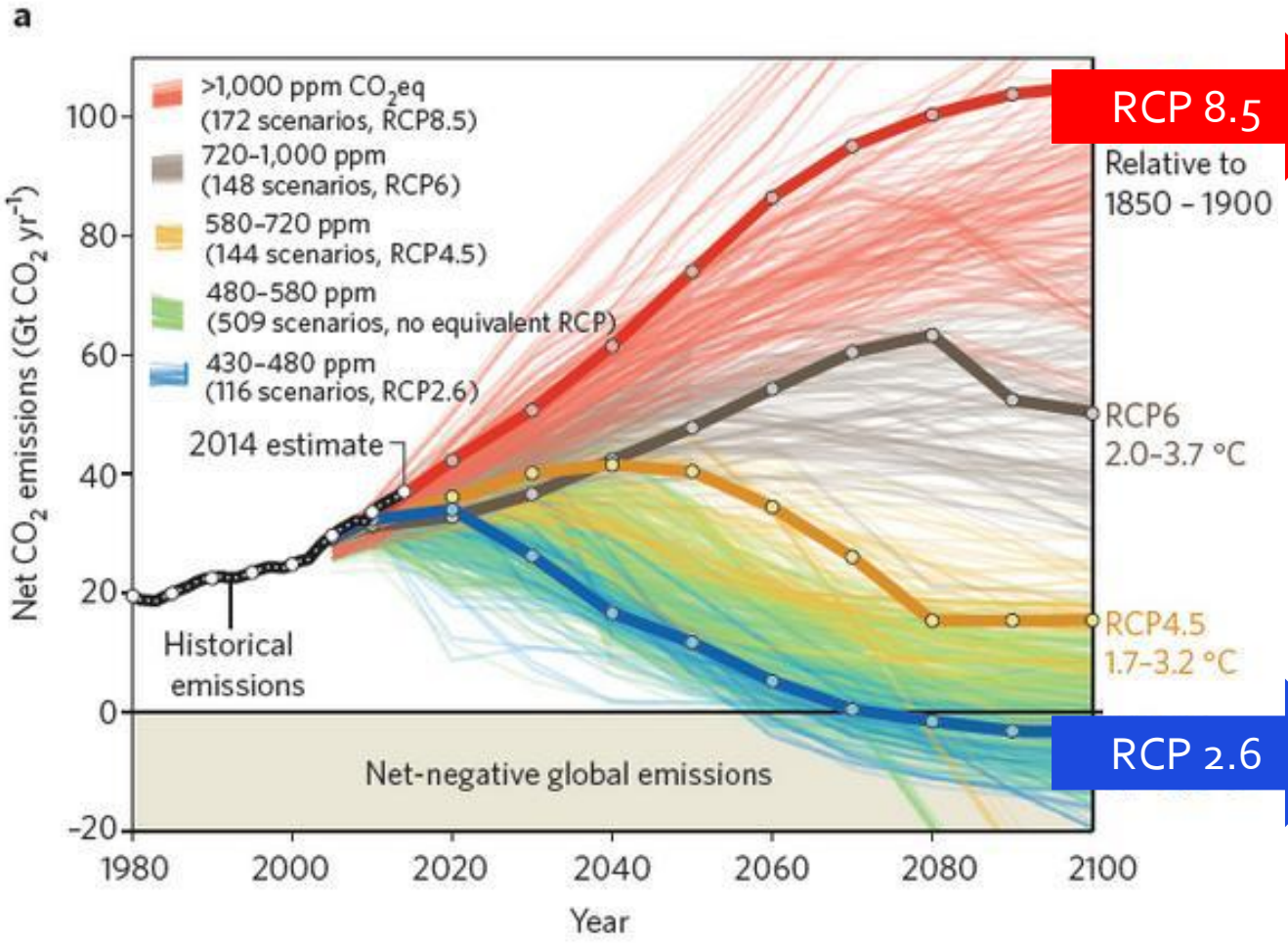
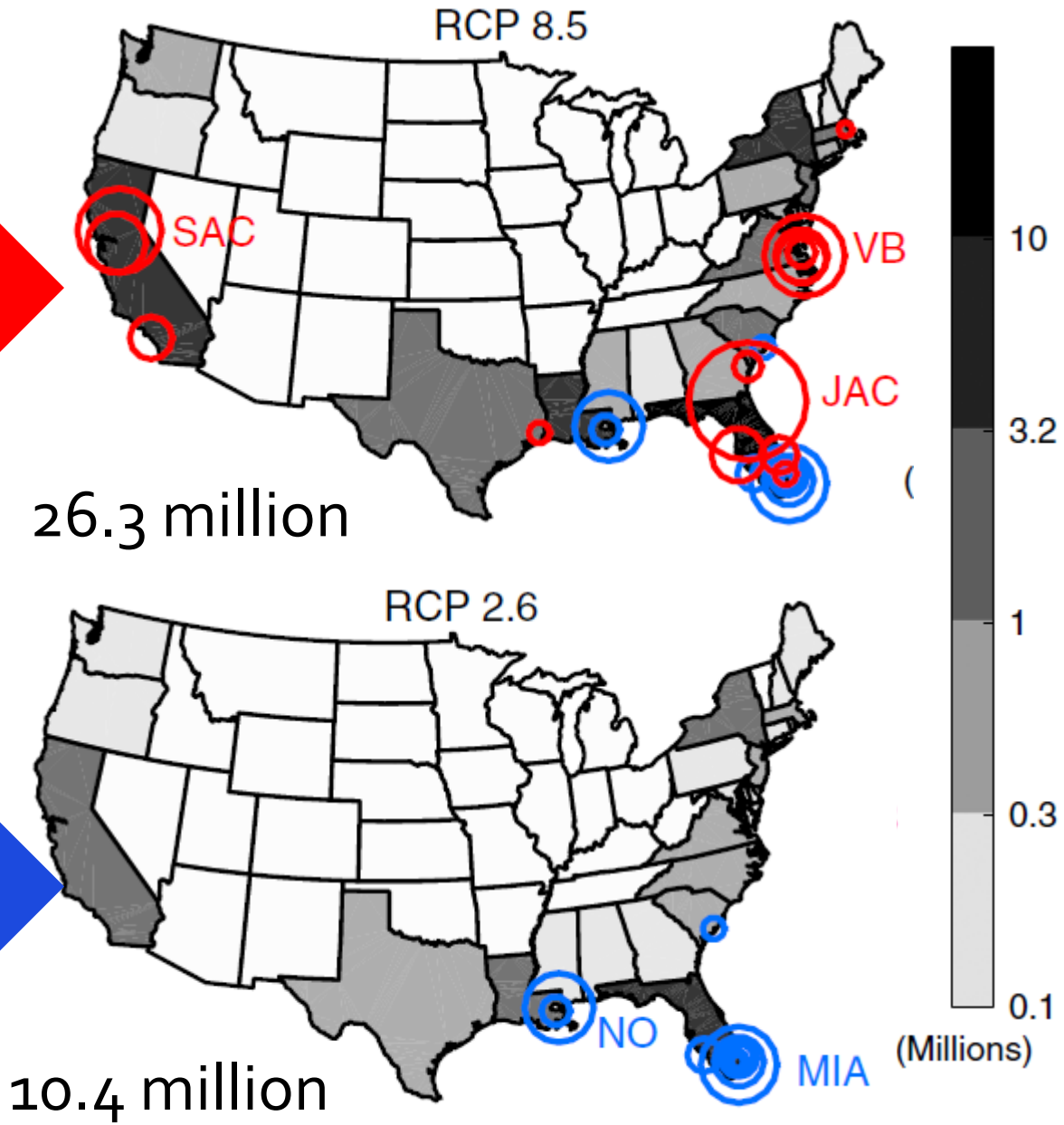
Minimizing the adverse consequences of sea-level change presents a key societal challenge. New modelling is necessary to examine the implications of global policy decisions that determine future greenhouse gas emissions and local policies around coastal risk that influence where and how we live.

THE ARGUMENT:

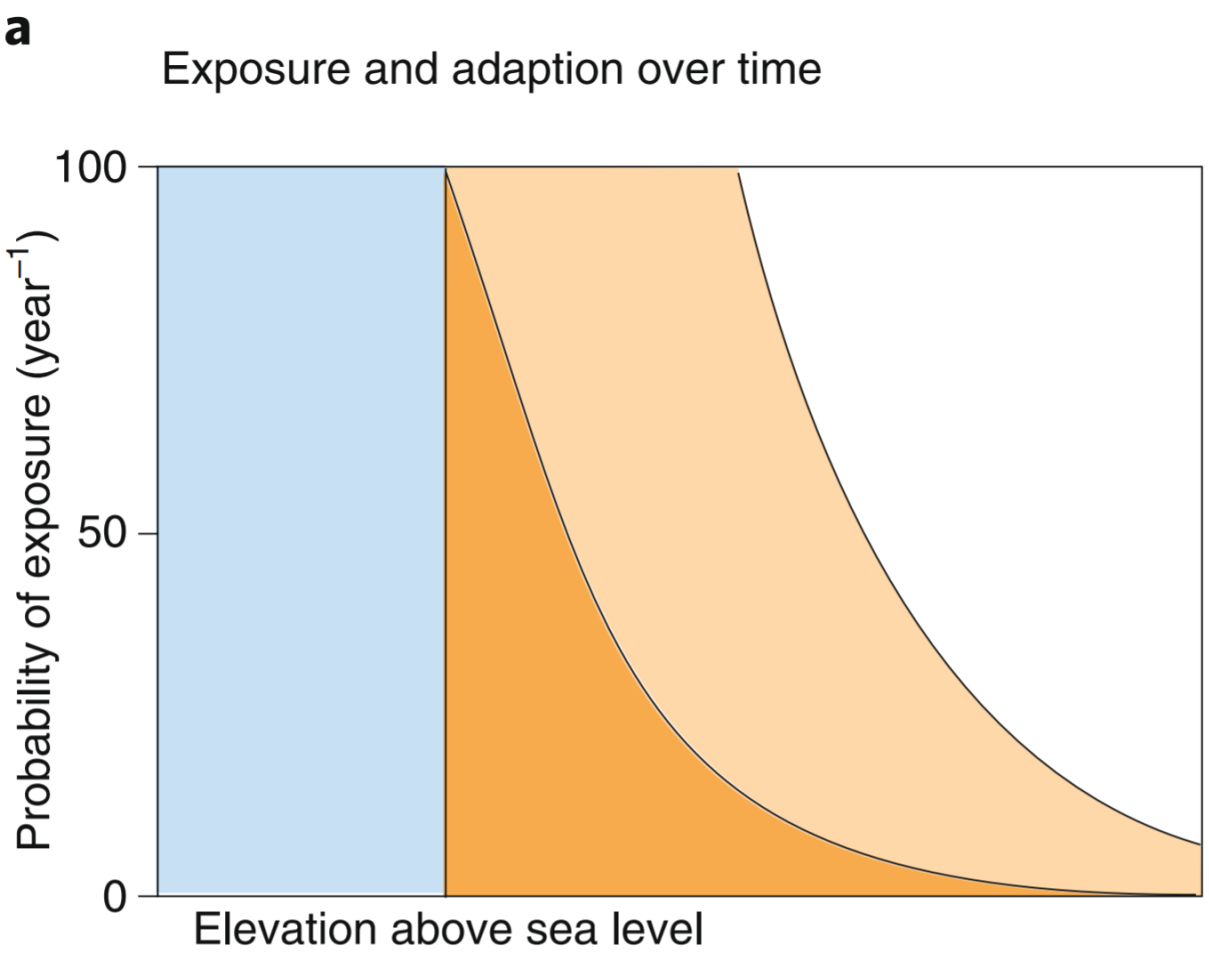
1) *Yes, exposure may trigger migration…*
2) *…But <u>policies</u> determine everything else.*
3) *Key need: Policy Labs*

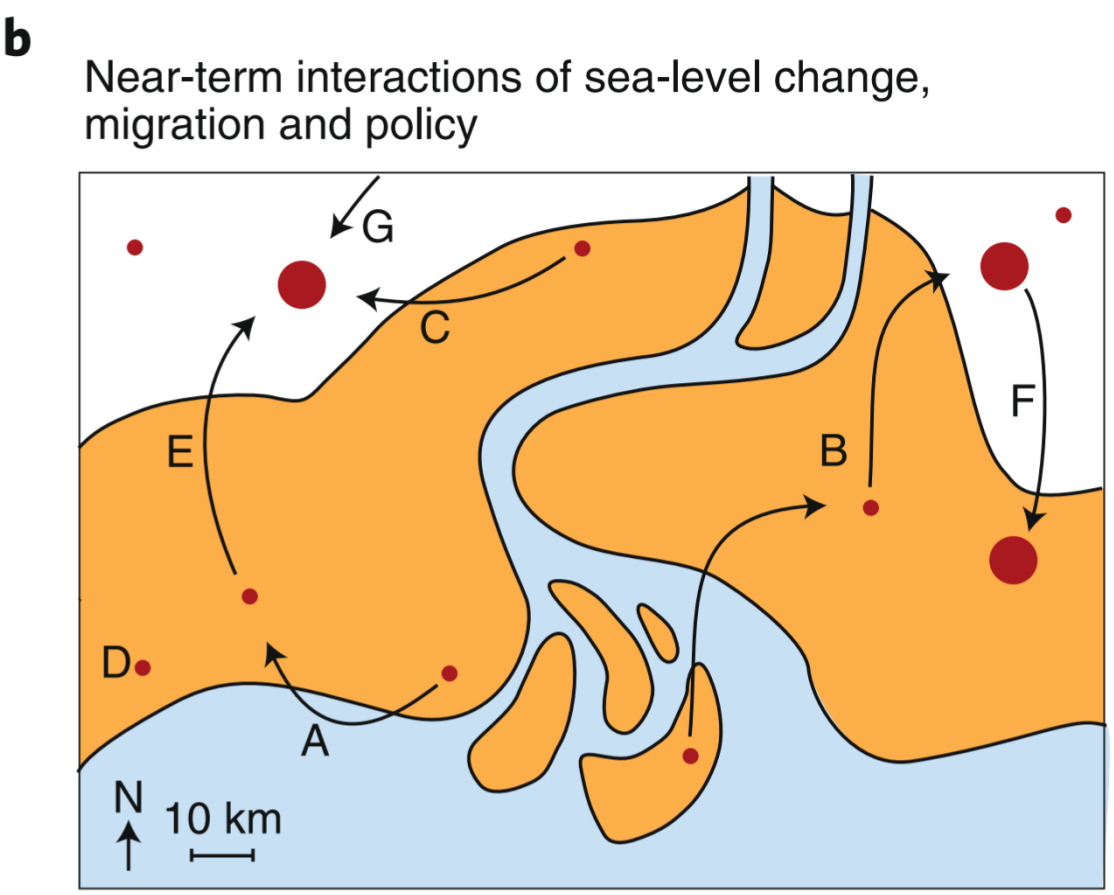
Emissions = Exposure





Strauss et al. 2015





a) Current and future risk of exposure to sea-level rise

b) Many migration dynamics emerge simultaneously.

Migration dynamic

A. Short-distance, temporary or seasonal migration

B. Urbanization

C. Permanent migration

D. Mobility traps

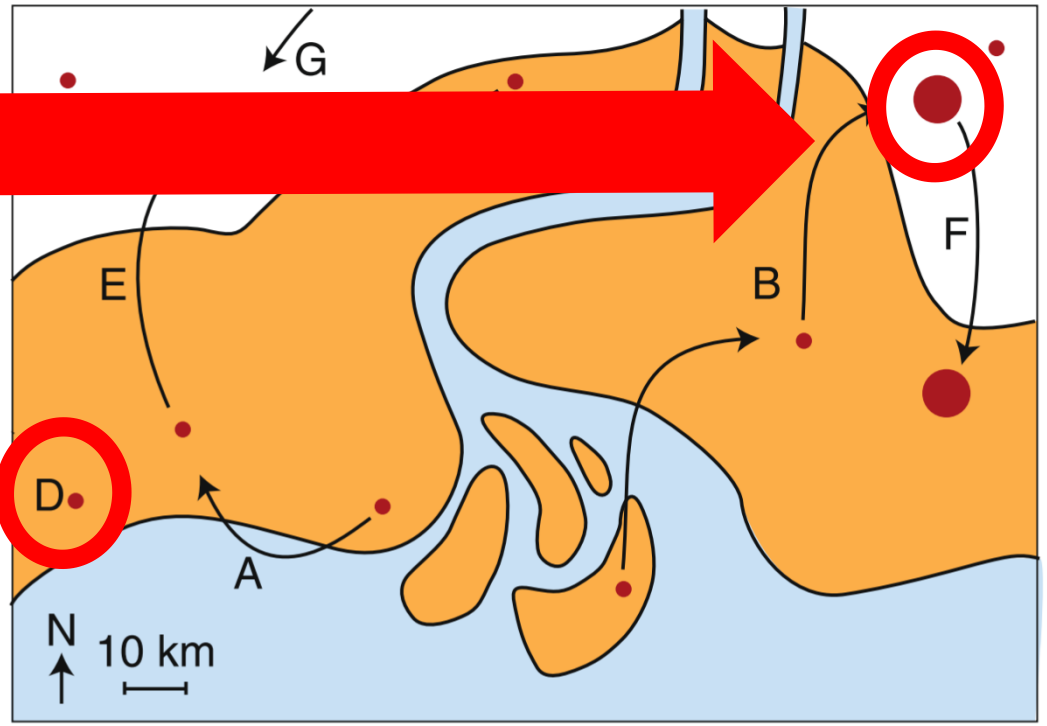
E. Prospective migration

F. "Climate gentrification"

G. Background coast-wise migration

b

Near-term interactions of sea-level change, migration and policy



b) Many migration dynamics emerge simultaneously, with many policies influencing outcomes.

Migration dynamic
A. Short-distance, temporary or seasonal migration
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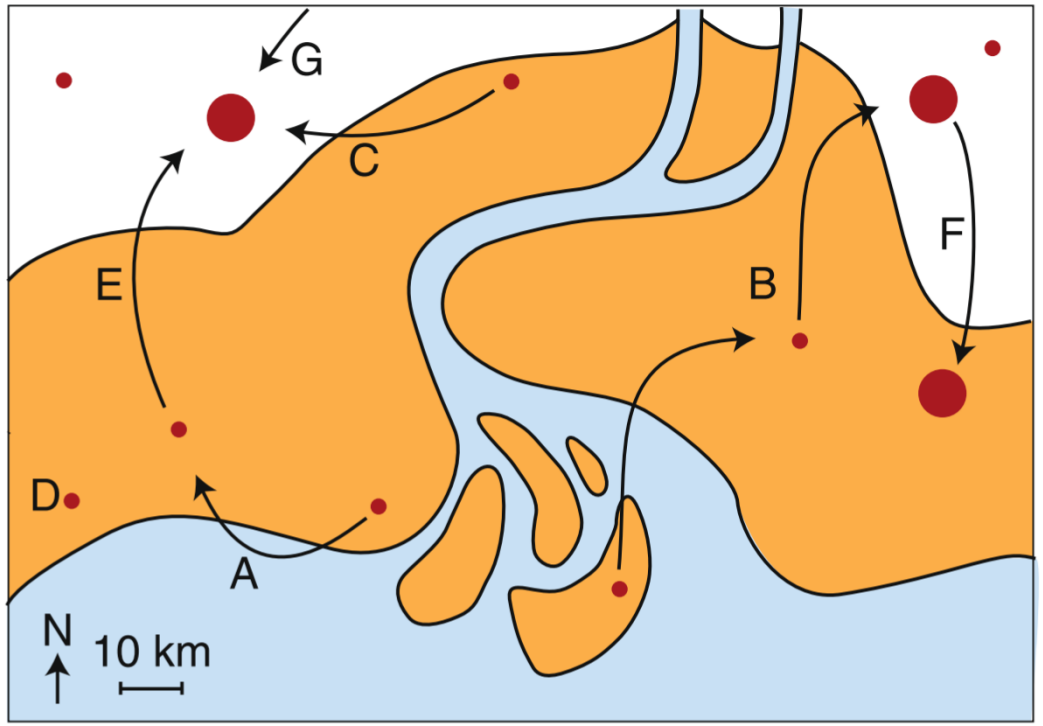
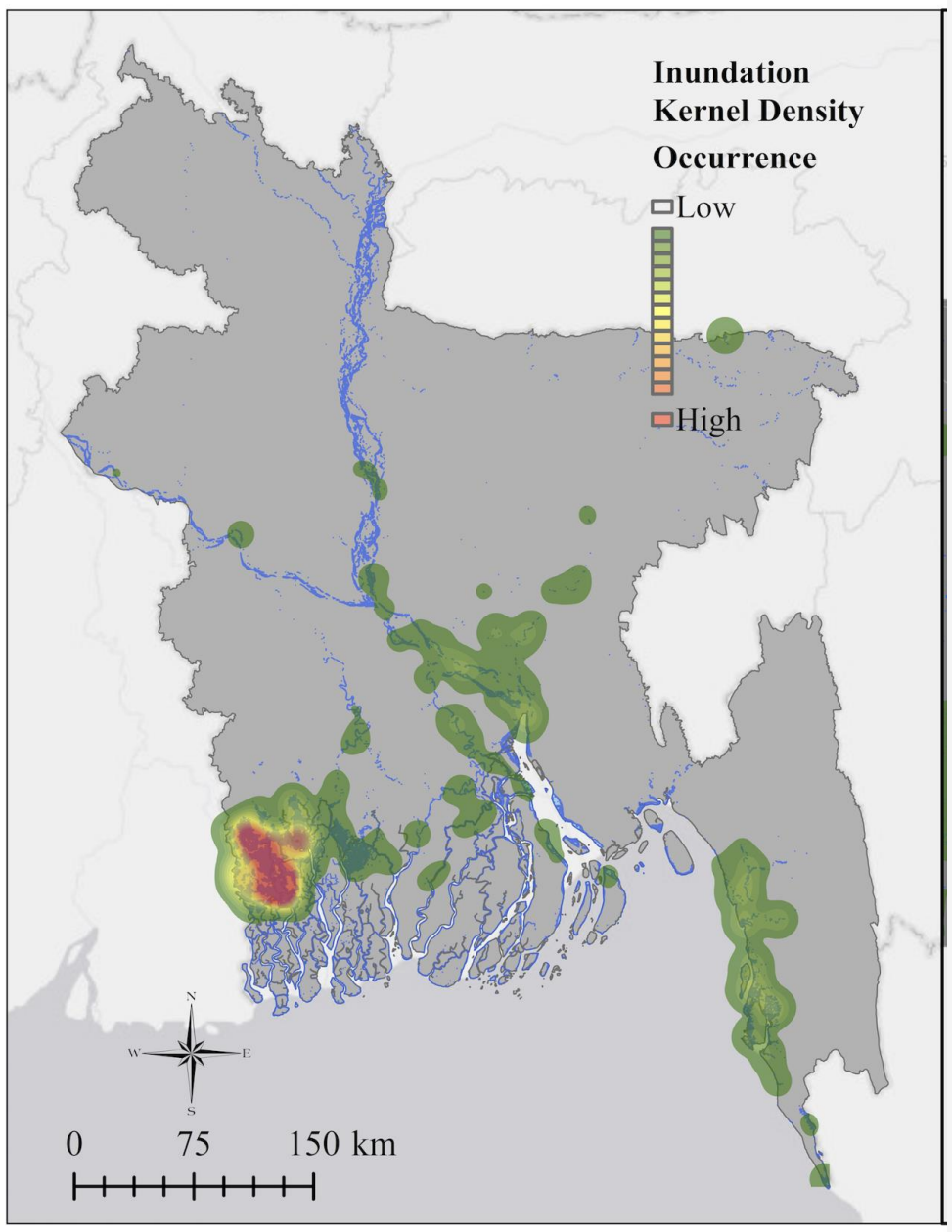
Near-term interactions of sea-level change, migration and policy



b) Many migration dynamics emerge simultaneously, with many policies influencing outcomes.

*GOOD NEWS: Migration is responsive to policies**

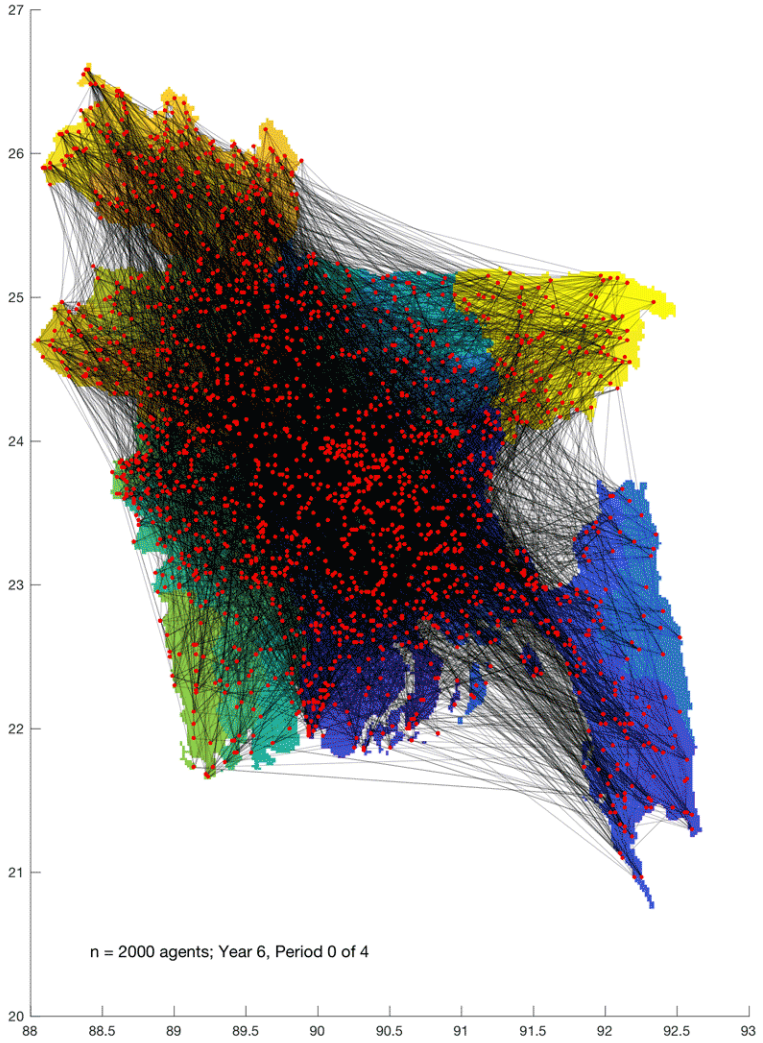
**Experimenting with policies affecting migration is HIGH RISK and should be avoided real-life vulnerable populations.*



Bangladesh already seeing the effects of coastal inundation: *Density of coastal settlements that existed prior to 1990 but were inundated between 1990 and 2015*

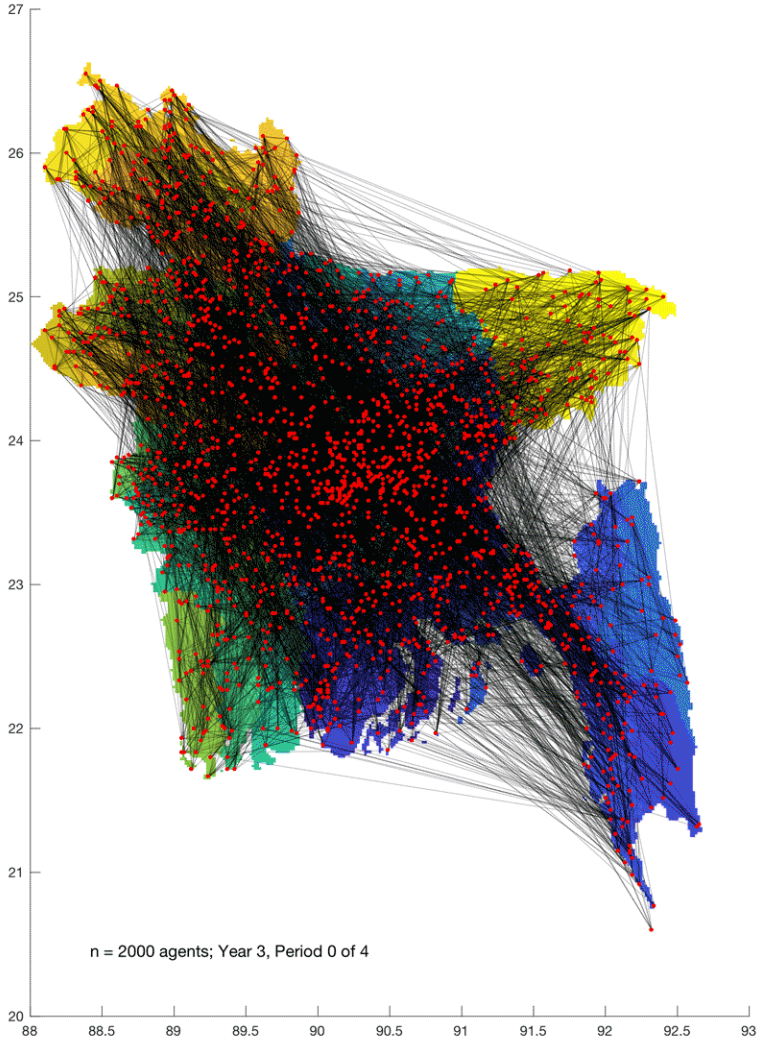
An agent-based model of migration and sea-level change: **M**igration, **I**ntensification, and **D**iversification as **A**daptive **S**trategies (**MIDAS**)

Baseline sample run

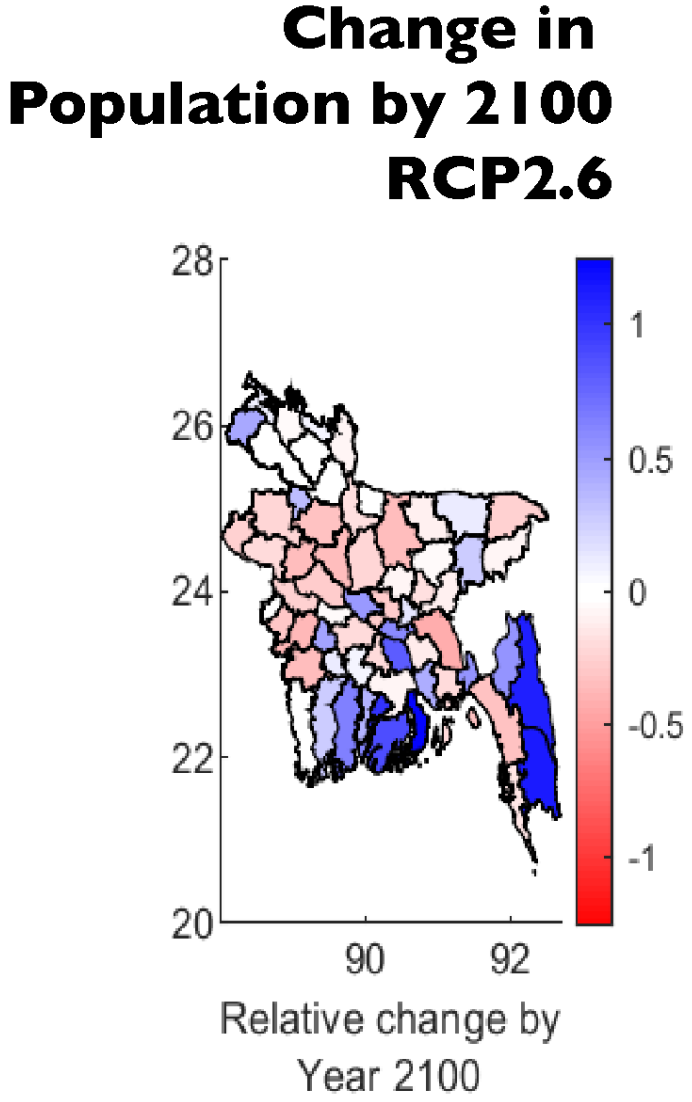


An agent-based model of migration and sea-level change: **M**igration, **I**ntensification, and **D**iversification as **A**daptive **S**trategies (**MIDAS**)

Sample run – simulating a complete shock to coast



Finding: Migration toward the coast!



SIMULATING MIGRATION and POLICY

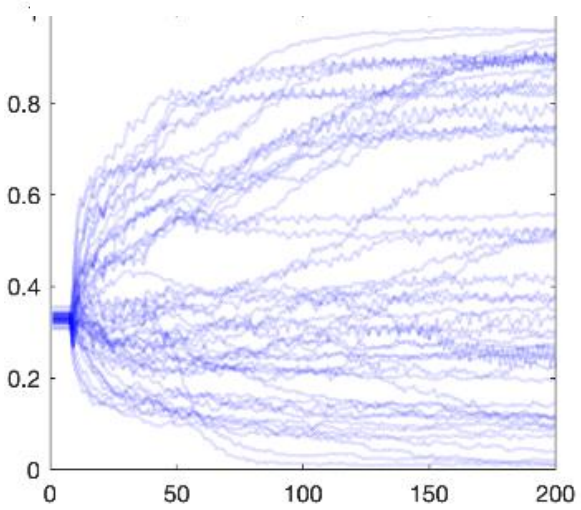
Sea-level exposure

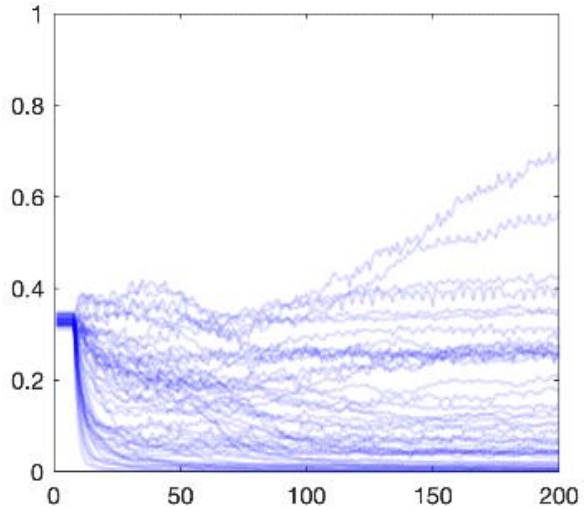
Sea-level exposure + policy

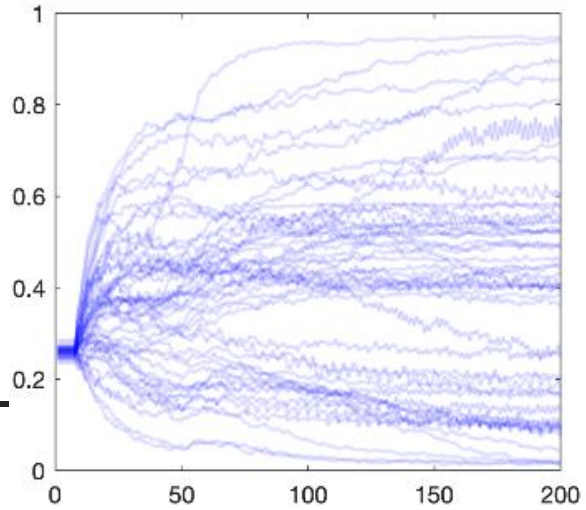
Farmers (proportion of all agents)

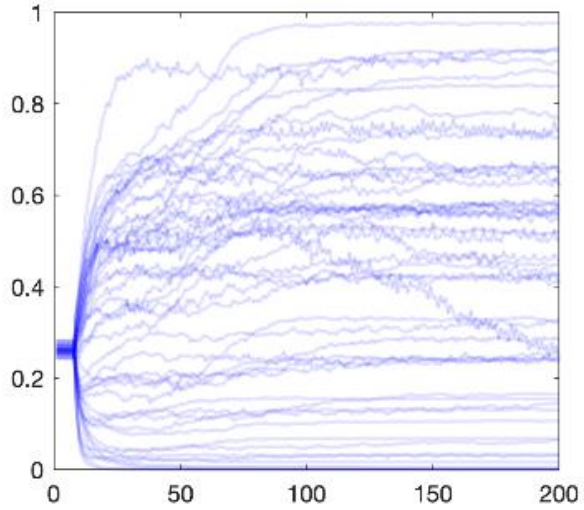
VS

Wage earners (proportion of all agents)









KEY NEED: POLICY LABS

Identifying, parameterizing and modeling specific policies at local, national and international scales.

…then we can answer: how many migrants? When? Where? And what can we do?

A forecast of the timing, locations, sequence and likeliest destinations of populations displaced by sea level rise and coastal extremes, 2018 -2020

David J. Wrathall (PI), Oregon State University
Valerie Mueller (PI), Arizona State University
Peter U. Clark (PI), Oregon State University
Michael Oppenheimer, Princeton University
Mathew Hauer, Florida State University
Scott Kulp, Climate Central
Elisabeth Gilmore, Clark University
Helen Adams, King's College London
Andrew Bell, New York University
Robert E. Kopp, Rutgers University
Maya Call, SESYNC
Joyce Chen, Ohio State University
Aimee Slangen, Royal NIOZ
Nicholas Magliocca, University of Alabama
Alex deSherbinin, Columbia University
Beth Fussell, Brown University
Carling Hays, Harvard University
Beth Marino, Oregon State University
Koko Warner, United Nations Framework Convention on Climate Change

Migration dynamic given future investments in adaptation

a. Concentration of migration flows to single destinations

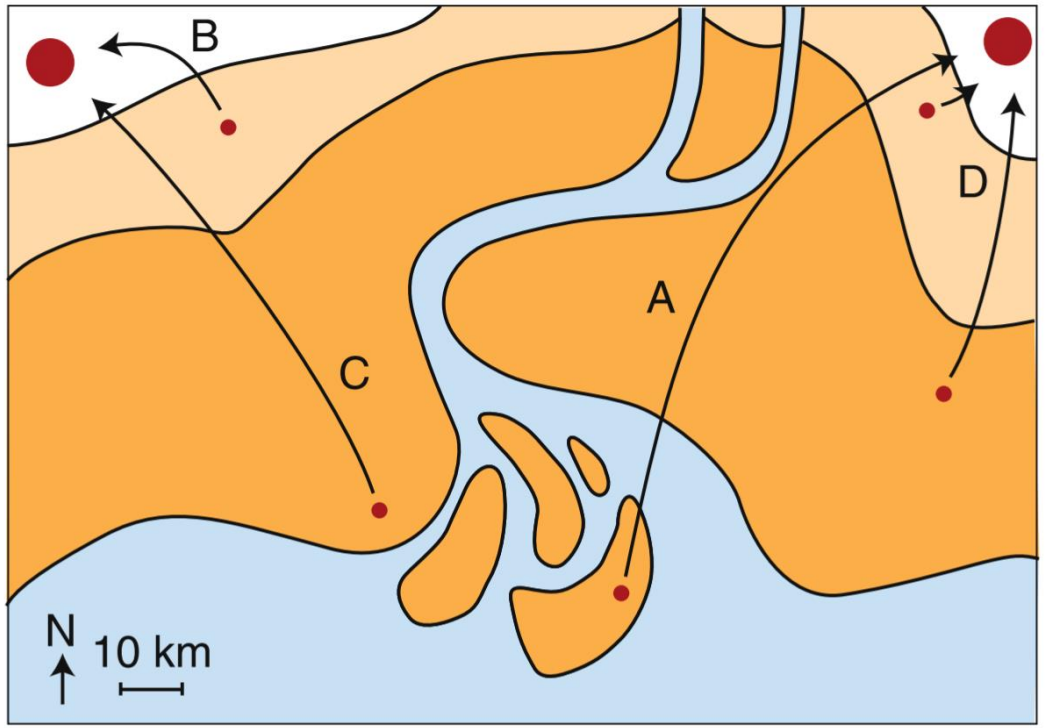
b. Abandonment

c. Resettlement

d. Adaptation limits and migration

c

Interactions of sea-level change, migration and adaptation policy over time



c) One projection of sea-level change with associated adaptation interventions and migration outcomes.