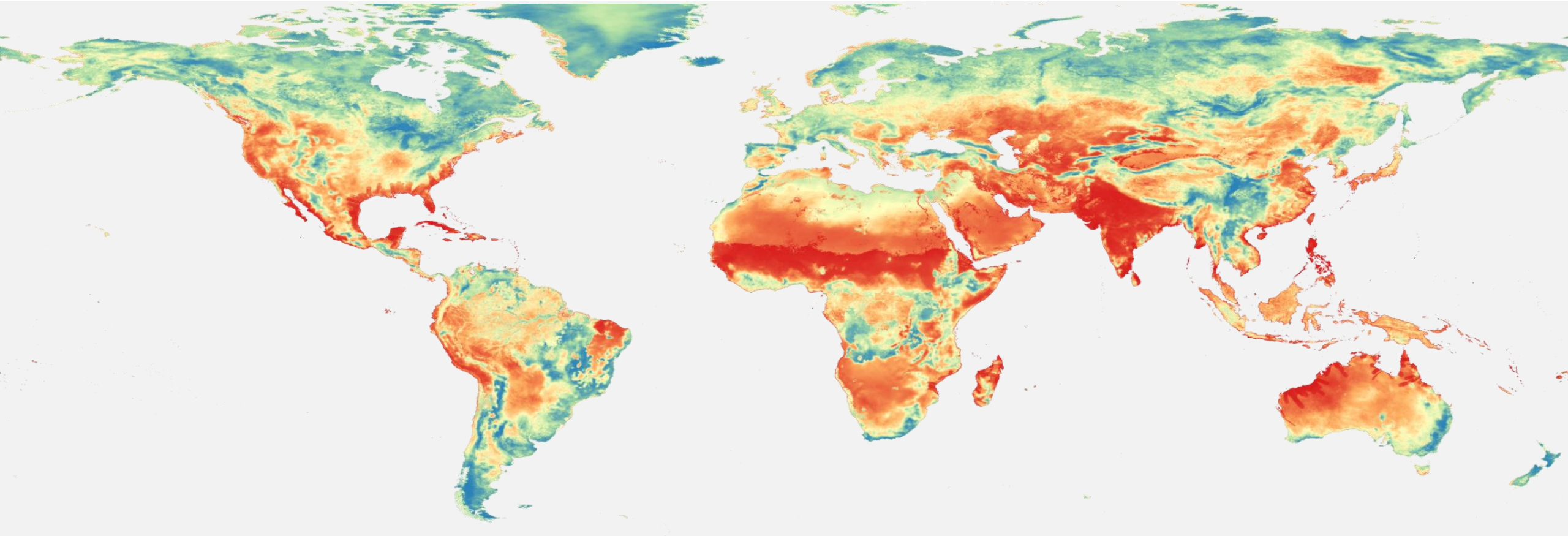
Climate, Capital and the Global Pivot to Resilience

www.alphageo.ai

Dr. Parag Khanna, Founder & CEO, AlphaGeo

parag@alphageo.ai



Climate volatility is a driver of global discontinuities

Another COP summit has come and gone – with predictable failure. Annual greenhouse gas emissions have reached 58 *gigatons*, with six of nine major planetary boundaries exceeded. The exponential chain reactions are having systemically devastating consequences – including >$250B in economic loss in 2023.

Vulnerability

More than 3B humans are at risk from acute or chronic climate stress. This will grow. Adaptation is hugely underfunded at only 7% of climate-related spending.

Exodus

Climate-induced migration is already jumping worldwide (~20M people per year since 2008 and estimated to reach 1.2B by 2050).

Mispricing

Experts forecast a 'climate Minsky moment,' a sharp collapse in asset values as markets price in physical climate exposure and regulatory transition risks.

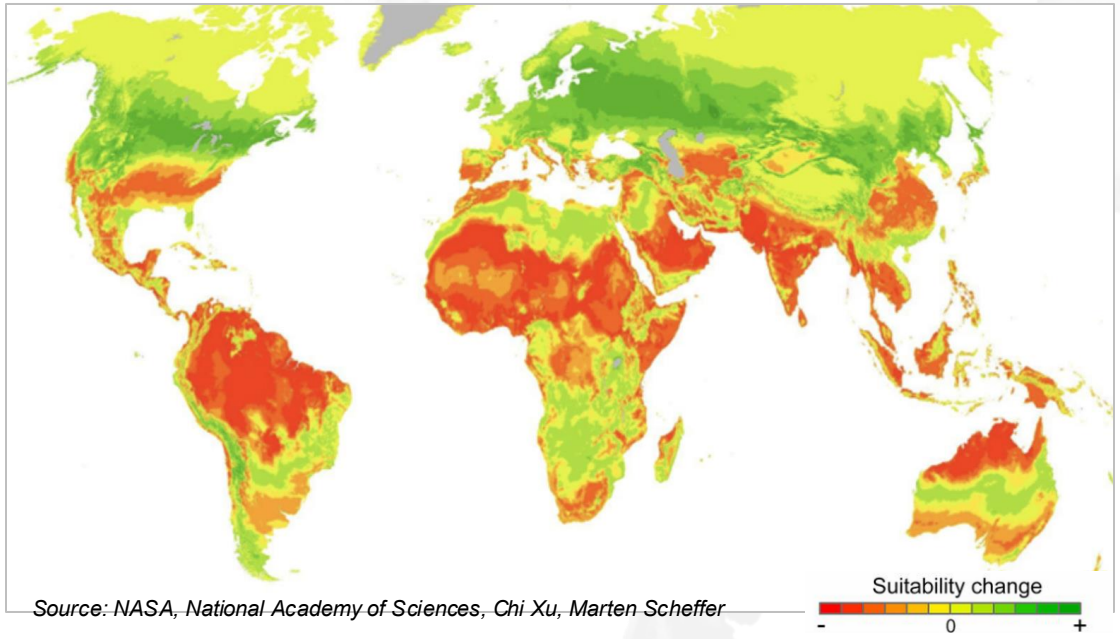
Degeneration

Estimated 10-30% GDP erosion by mid-century across major regions under present scenarios, not factoring in declining investment and other second-order effects.

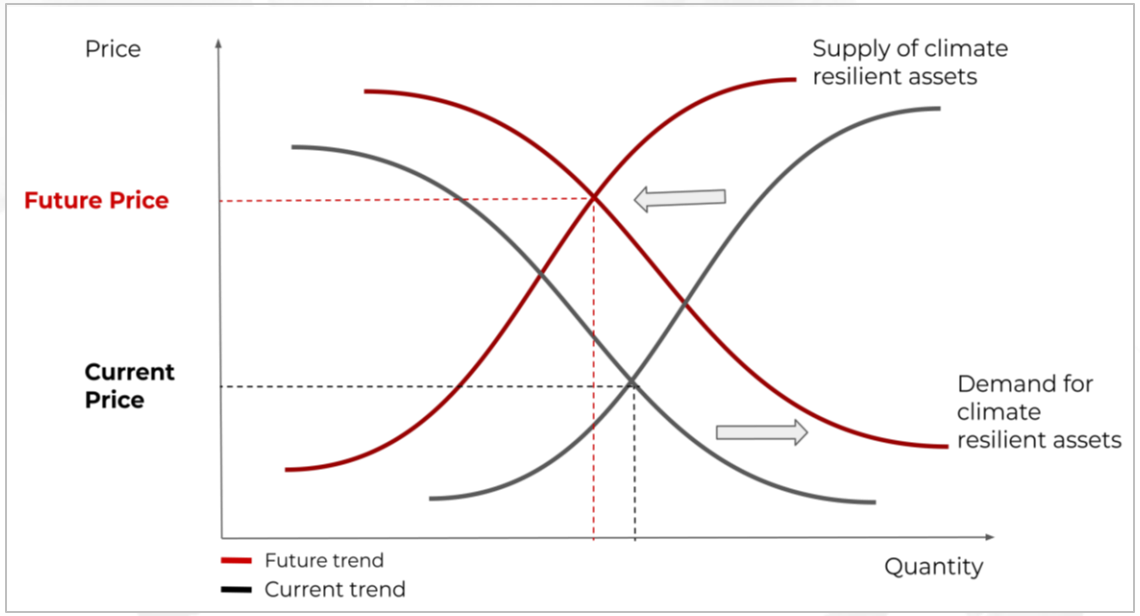
Climate volatility will also drive demand for resilient assets globally

A 2-degree warmer world will increasingly be divided between zones suitable and unsuitable for habitation. Humans must adapt accordingly, primarily through significant new infrastructure investment and migration.

The largest economic sectors – **real estate, finance, energy** – will no longer universally move up and to the right. Resilient geography will emerge as the world's most precious asset as its supply becomes constrained.



Source: NASA, National Academy of Sciences, Chi Xu, Marten Scheffer



A self-fulfilling prophecy:
Anticipate demand and expand the supply of resilient assets

As mitigation efforts lag and climate volatility intensifies, the impetus for adaptation will grow …

“

It is not the strongest of the species that survives, nor the most intelligent. It is the one that is most *adaptable* to change.

Charles Darwin, *On the Origin of Species*

Geographies that fail to *adapt* to climate volatility will suffer:

- **Direct physical devastation**
- **Acute economic losses**
- **Currency debasement**
- **Population decline**

By contrast, resilient locations will attract people, capital and business, with new infrastructure investment delivering economic multiplier effects and generating outsized financial returns.

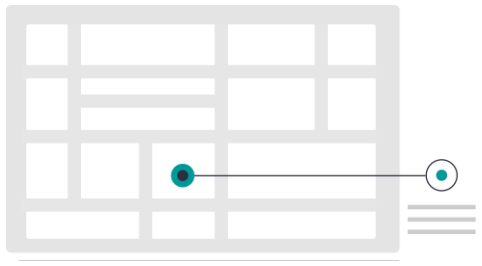
Investing in adaptation is *both* the best risk mitigation *and* absolute return strategy.

The climate will not adapt to us – we must adapt to it

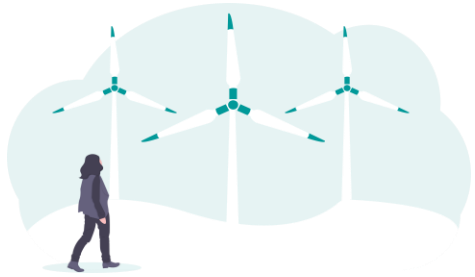
In the last decade, **over 90 percent of climate related financing has been devoted to mitigation**. Despite these significant efforts to decarbonize, the severity of climate change continues to accelerate. The great neglected challenge – and opportunity – therefore lies with **adaptation**.

In contrast to mitigation, **adaptation** focuses on enhancing **resilience**:

Modern spatial administration, land management and master planning



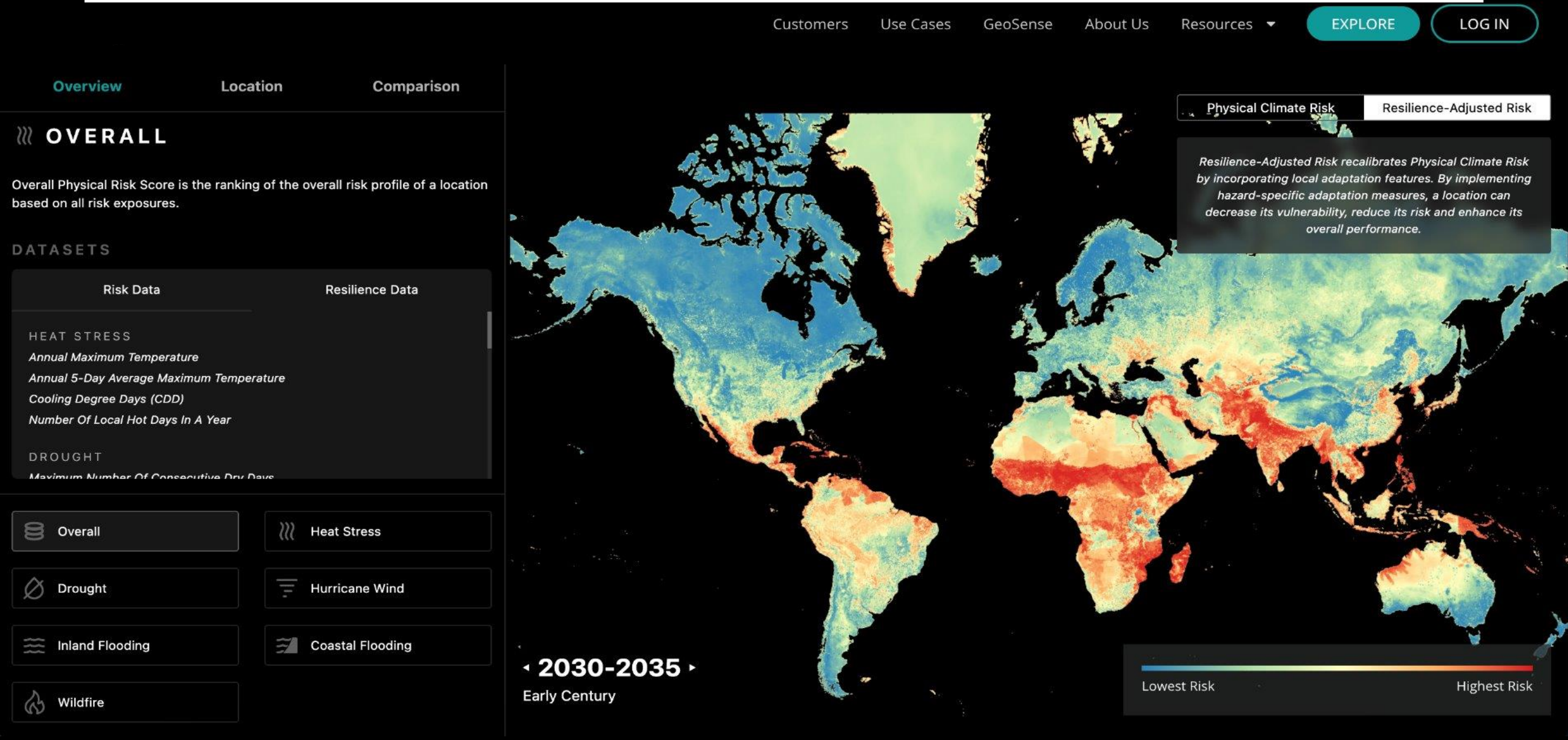
Building new infrastructure for food, energy, water and mobility



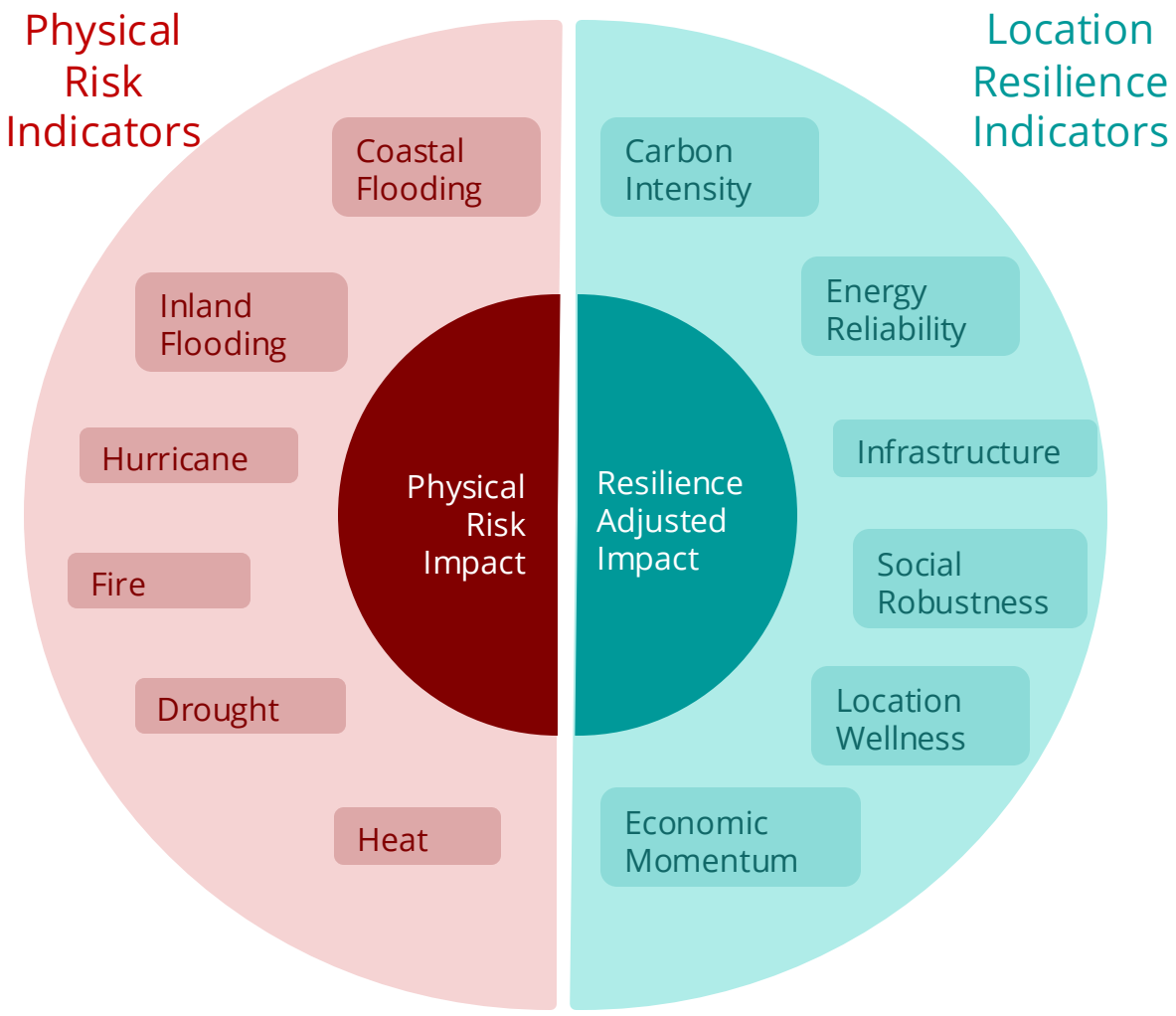
Population resettlement and "circular" real estate developments

The WEF estimates that adaptation investments require at least $2 trillion annually.

Mapping resilience at granular resolution and planetary scale

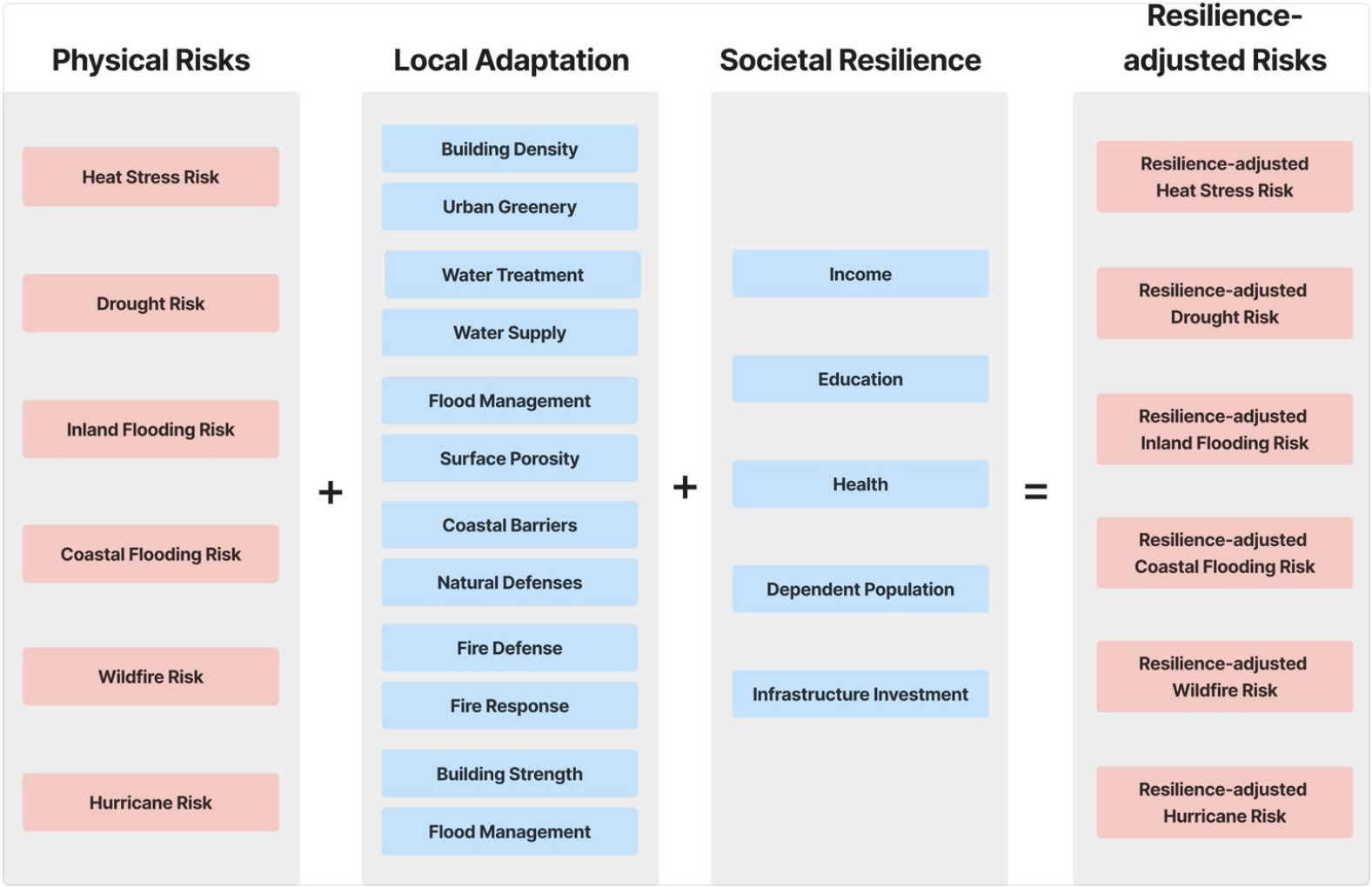


Merging risk and resilience metrics in a single spatial index to calculate their potential impact on location performance



The *future ground truth* of any location is measured not by its risk alone but its resilience.

Resilience = Risk - Adaptation

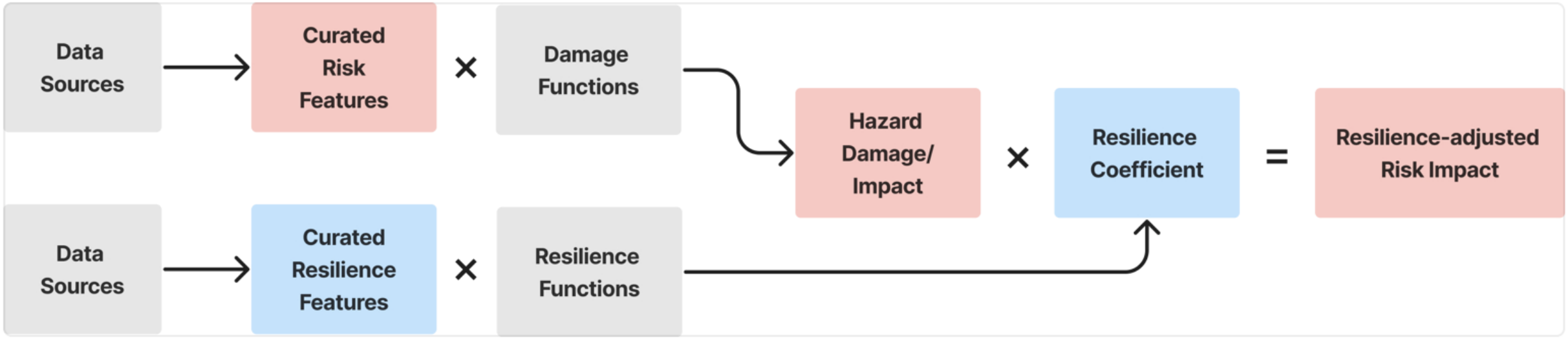


Resilience is beautiful, but not like beauty:

You don't know it when you see it – you must measure it!

Quantifying resilience for more accurate financial impact metrics

From risk analysis to resilience-adjusted investment profiles:



Unlocking "opportunity capital" for adaptation finance

Adaptation as an existential need

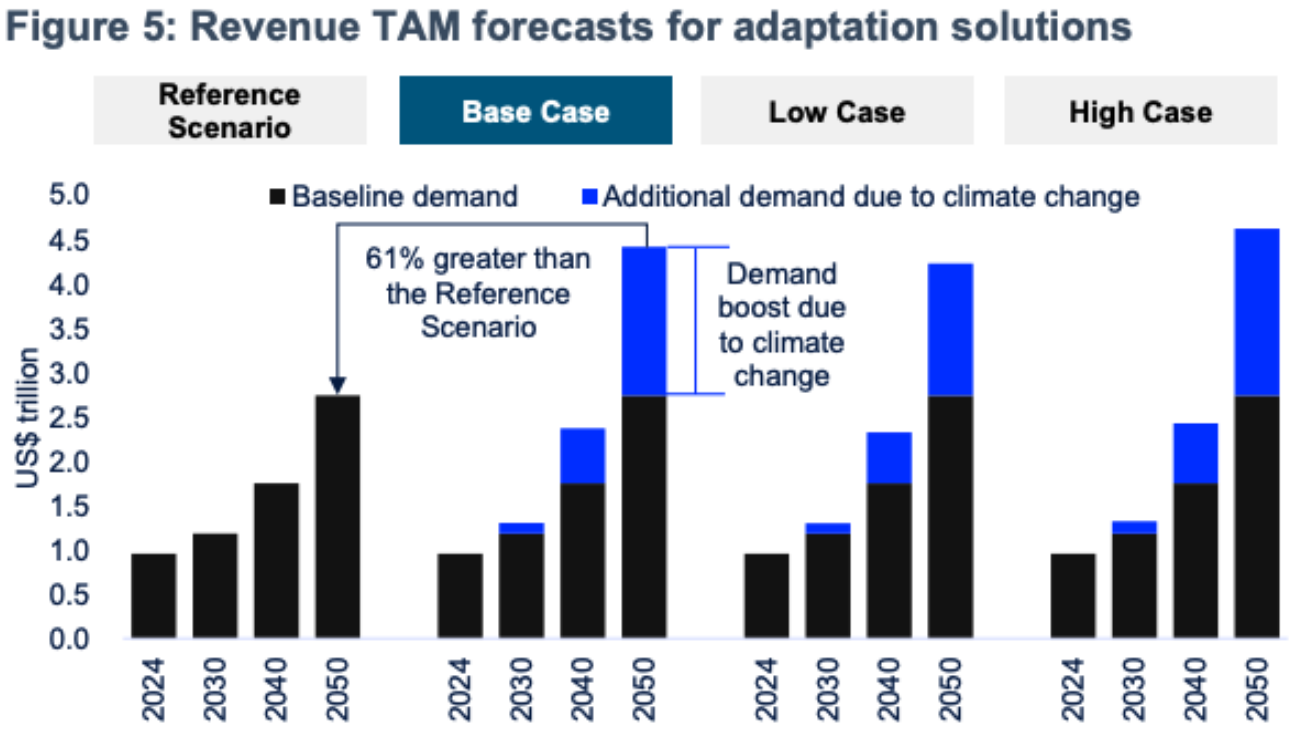
- Adaptation is not a global public good but a local private good
- But investments in food, water, energy, housing and transport infrastructures can contribute to system resilience if connected to global networks
- Long-term, risk-tolerant and mission-oriented finance can be beneficial and profitable
- Deploying global savings towards resilient investing is the key to systemic transformation

Adaptation as a macroprudential measure

- Central banks should be more stringent on physical climate risk modeling
- Precautionary principle: Adaptation investments reduce catastrophic damage, GDP erosion and insurance costs
- Bonds targeting adaptation infrastructure can generate sovereign or municipal credit enhancement

Adaptation is an inevitable and significant investment opportunity

US$4 trillion market opportunity by 2050 (GIC, Bain & Co.)



Source: GIC, Bain & Company, Jefferies, WEF

Key figures

Revenue TAM to increase to US$4T by 2050 accelerated by climate change – translating to US$9T in enterprise value terms by 2050, up from US$2T today

Minimal variation across scenarios suggests potential for investment conviction regardless of trajectory

Adaptation set to deliver $43 in returns per dollar spent (WEF), and generates 14% higher 1-year returns than mitigation; return rises to 21% over 3-year period (Jefferies)

Financing adaptation: The capital stack

Outcome based instruments	Adaptation benefits mechanism	Debt-for-nature-swaps	Nature-based credits	Sustainability-linked bonds	Development policy lending
Catalytic investments	Risk guarantees; first-loss backstops	Subordinate capital; return caps	Credit tranching / bundling / green securitization	Pool investment funds	
Disaster risk	Climate resilient debt clauses	Parametric insurance	CAT bonds	Regional insurance pools	
Traditional mechanisms	Technical assistance	Project preparation facility	Bonds (e.g., green & climate bonds)		
	Loans / credit	Equity financing	Concessional debt (e.g., IDA)		

Future-proof adaptation strategies

From reactive to proactive: Navigating complexity and seizing opportunity


The Washington Post

Opinion | Climate migration is here. The U.S. must invest accordingly.

By Parag Khanna

November 17, 2021 at 8:19 a.m. EST

Federal initiatives

FEMA / Stafford act reforms: from enabling moral hazard to promoting adaptation spending with federal grants
Relocation of military bases and other government installations

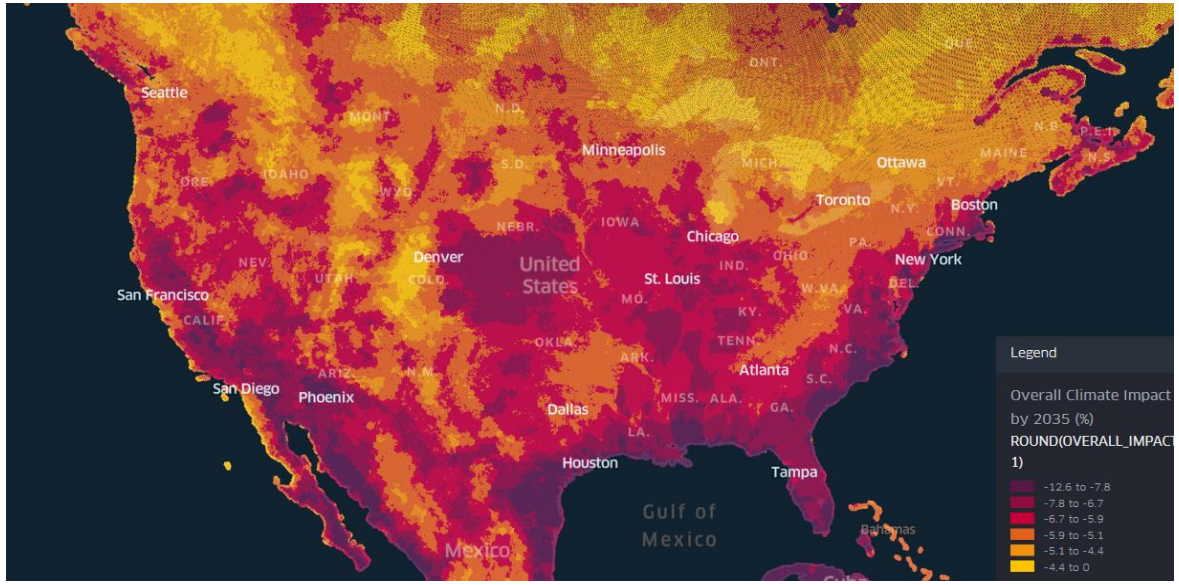
Fiscal strategies

- Municipal asset mapping and governance via Urban Wealth Funds (e.g. DoI "balance sheet")
- Social infrastructure investments in affordable housing
- Land acquisition and designation for resettlement to resilient master planned communities

Infrastructural overhaul

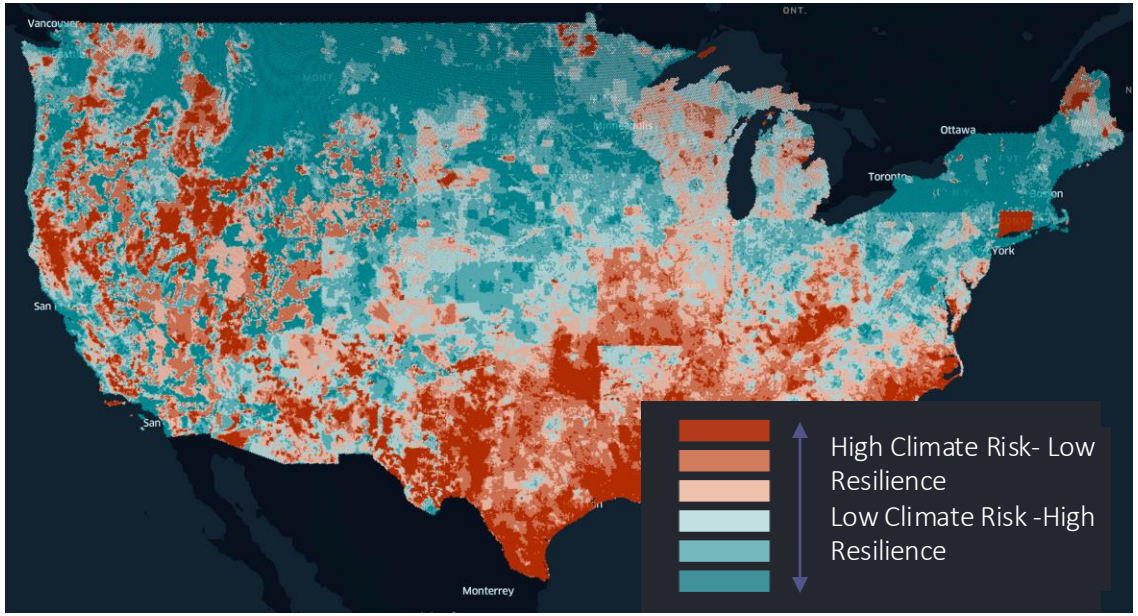
- Roads and bridges, water and sewage, food storage, buried power lines, renewable energy
- Sustainable and “circular” socio-economic models (e.g. recycling and upcycling materials)

Risk tells you where to avoid, while resilience tells you which locations will outperform

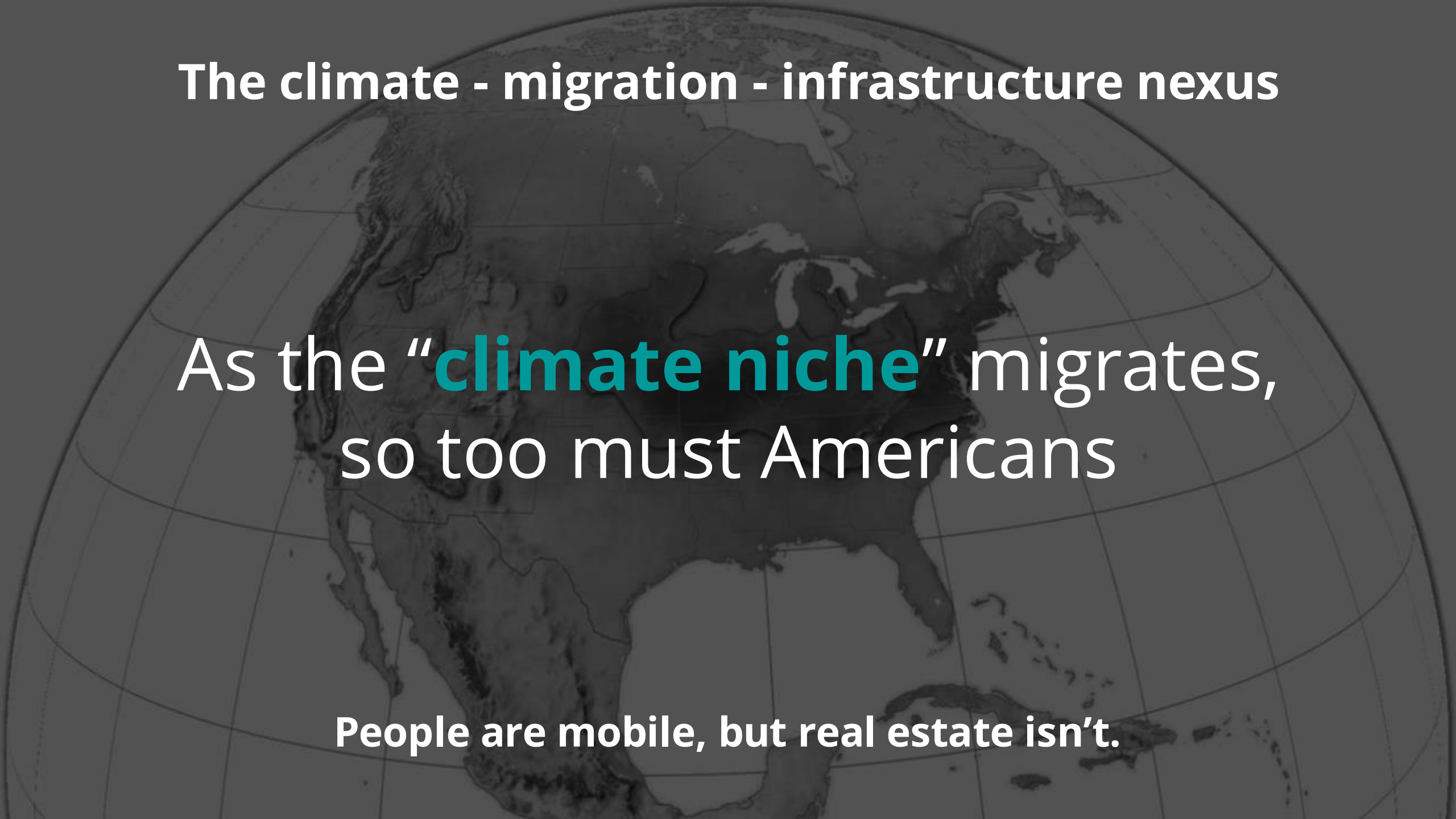


Above: The highest risk US regions face a –6.18% average physical climate impact (from hazards such as extreme heat or flooding) on their economic performance by 2035, with the worst affected locations are forecasted to lose 10.57%. In 2021, wildfire damage was six times higher than associated insurance coverage, driving away residents and businesses.

Below: Blue areas face lower physical climate risk but also boast higher resilience as measured by indicators such as energy grid reliability and renewable power, economic momentum and social robustness, and other variables.



The climate - migration - infrastructure nexus

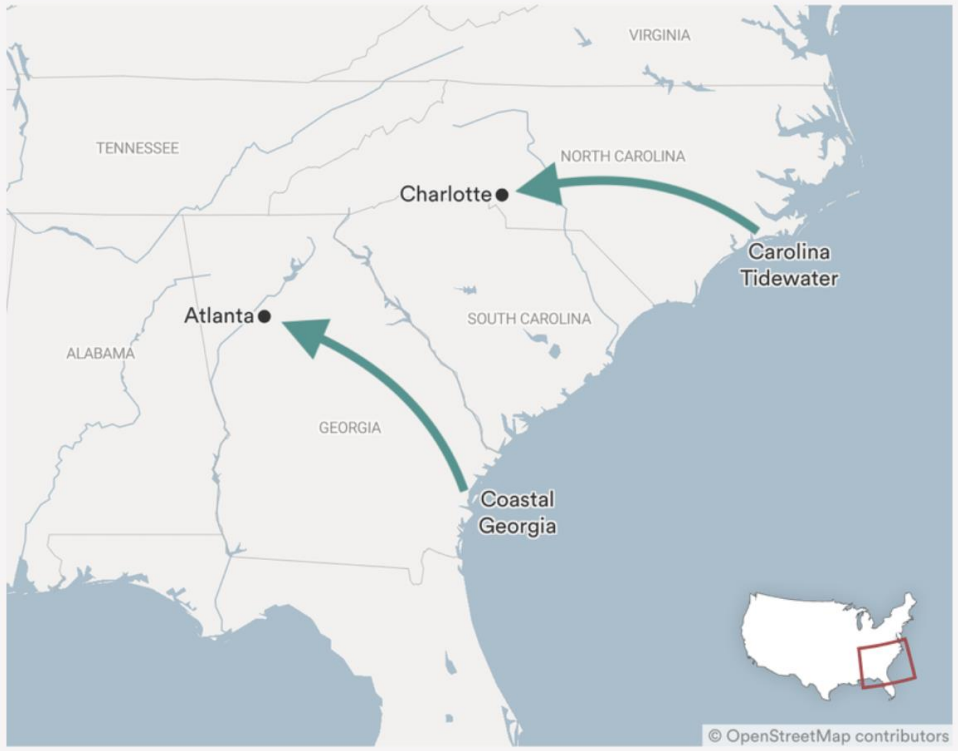


As the “**climate niche**” migrates,
so too must Americans

People are mobile, but real estate isn’t.

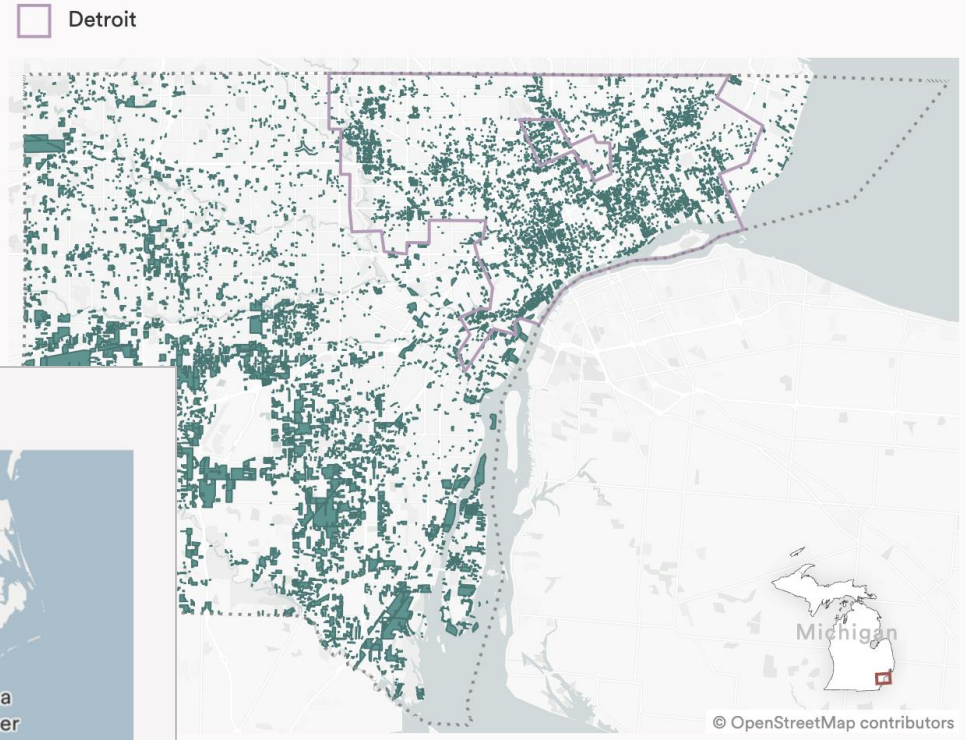
Example of Future Population Movements to Climate Havens

Example of Future Population Movements to Safe Harbors



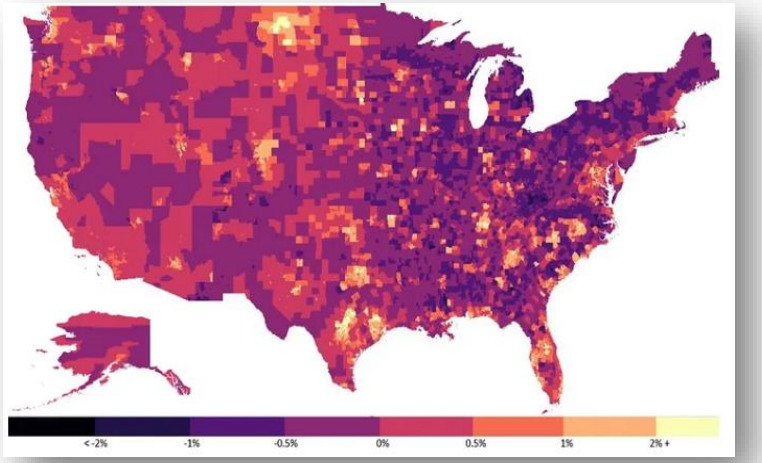
Vacant Property in Wayne County, Michigan

Data Updated March 2024



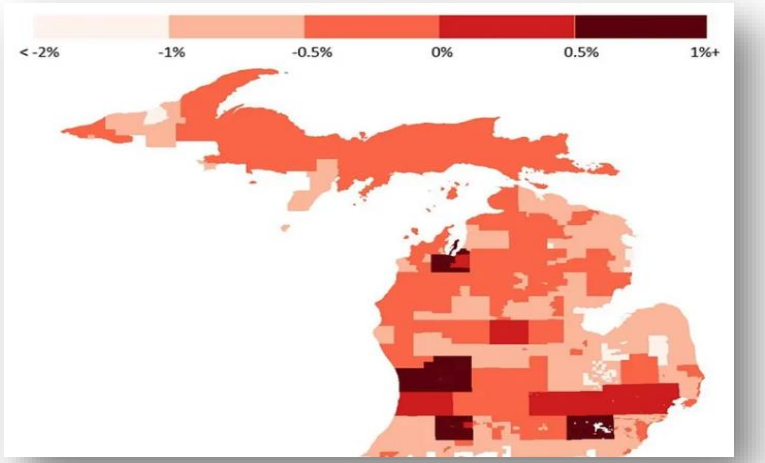
The push-pull between risk and resilience combines with socioeconomic factors to produce a generalizable model of climate-induced migration

Climate volatility is forcing people to move – but it's not all doom in high-risk zones



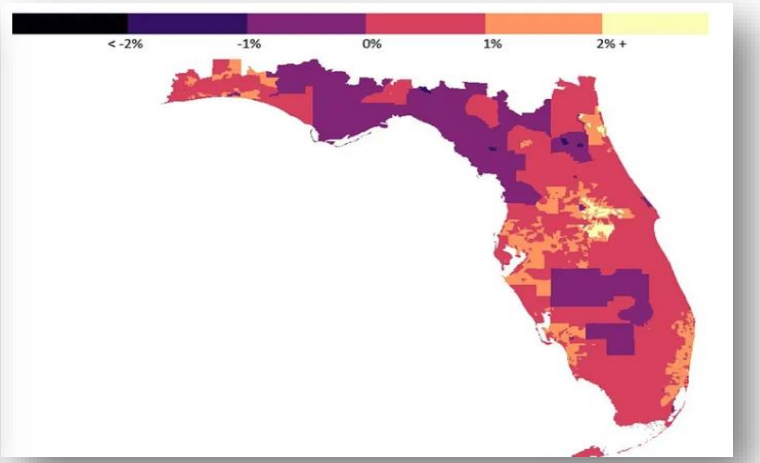
- 43% of flood-exposed census tracts to experience population decline
- But 18% of high-risk census tracts are still projected to grow

While some states seek "resilience" …



- In "resilience-seeking" stages like North Carolina, migration is positively correlated with location resilience, in both high-risk and low-risk zones

… Others remain more amenable to "risk", driven by economic and other factors



- Risky areas in states like Florida are experiencing higher growth compared to non-risky areas
- Risky regions include major economic hubs, suggesting Floridians prioritize prosperity over safety

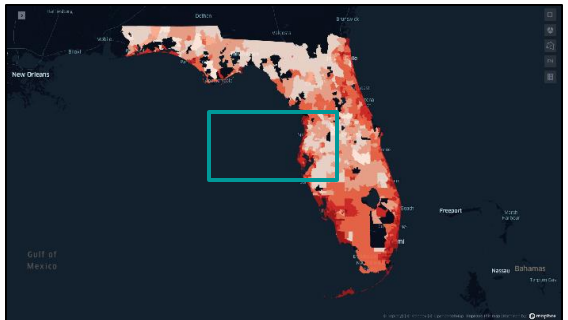
A simplistic “climate-only” view tells you to sell – but a complex systems perspective uncovers profitable opportunities even high-risk zones

"Managed retreat" is underway to the "new coasts". Numerous high-risk geographies nonetheless present strong opportunities in the short to medium term because even after climate disasters, populations exhibit a high propensity to remain within the same county or state, hence relatively more resilient locations will rapidly appreciate as residents vacate proximate riskier locations. In the case of Tarpon Springs, Florida, the inland zip code 34688 has far lower social vulnerability and significantly higher readiness than its coastal neighbor owing to infrastructure quality and societal robustness. Nearby Palm Harbor also stands to benefit from outflows from climate-stressed coastal areas due to its high credit scores, strong education, low crime, and other factors.

CITY	Tarpon Springs
ZIP	34689
RISK_SCORE	35
VULNERABILITY_SCORE	69.8
READINESS_SCORE	32.8
composite_risk	72

CITY	Palm Harbor
ZIP	34685
RISK_SCORE	34.6
VULNERABILITY_SCORE	40.1
READINESS_SCORE	43.8
composite_risk	30.9

CITY	Tarpon Springs
ZIP	34688
RISK_SCORE	34.8
VULNERABILITY_SCORE	36.3
READINESS_SCORE	44.7
composite_risk	26.4



What makes a climate haven?

Housing and resources
- Zoning that promotes density and prevents sprawl
- Land use that encourages circularity of food, water, energy

Equitable economics
- Decent wages and strong safety nets
- Recruiting workers to fill labor shortages

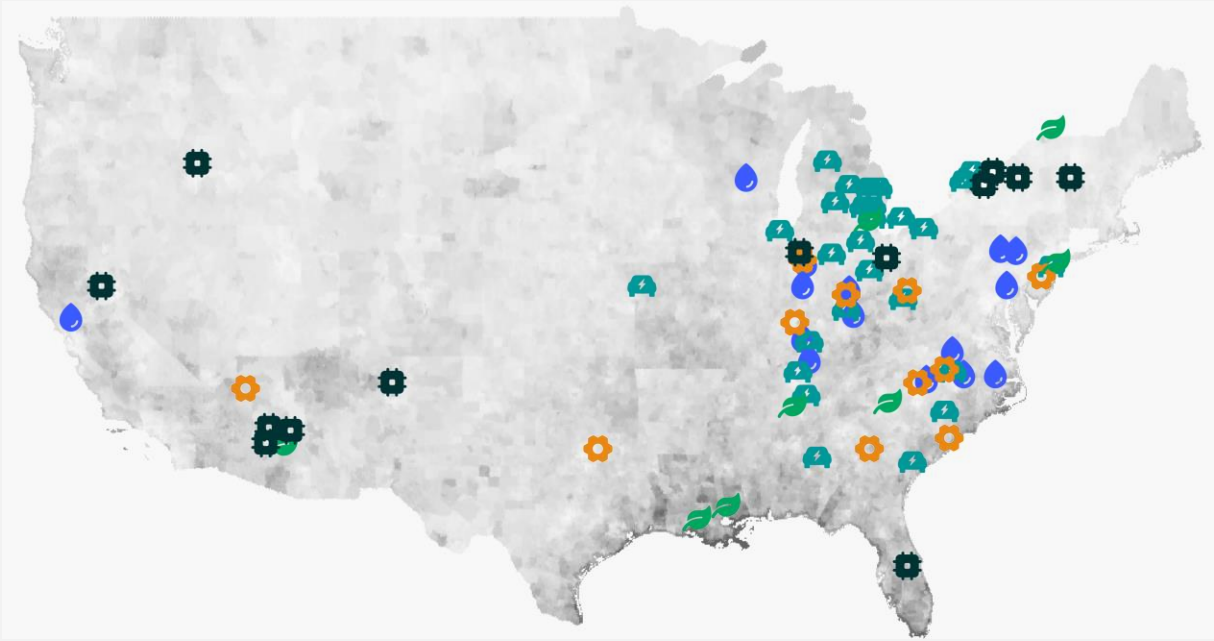
Social cohesion
- Regenerative downtown cores
- Community building programs

Green infrastructure
- Robust multi-modal public transport
- Walkability with tree canopies
- Permeable pavement

Data-driven governance
- Forecasting housing and infrastructure demand
- Anticipating and adapting to climate risks

Aligning the Industrial Renaissance to Climate Resilience

Locations and sectors of top 25 companies by frequency of earmarked capital for infra and energy (2024)



Technology: Semiconductors and industrial machinery
- Data centers and semiconductor fabs
- Tech hubs and office space
- Logistics and warehousing

Clean Energy: Solar and electric utilities
- Land for solar and wind farms
- Battery storage facilities
- Cleantech manufacturing plants

Automotive: EVs, batteries, auto parts and manufacturing
- Industrial and assembly plants
- Showrooms and retail spaces

Healthcare: Biomanufacturing and diagnostics
- Biotech and life sciences campuses
- Medical office buildings and research facilities

Basic Materials: Steel and chemicals
- Logistics and industrial hubs
- Employee and workforce housing

Source: AlphaGeo research

“Go North, Young Man!"

The Century Initiative: Canada's pathway to "100 Million"

World's highest annual population increase as a percentage of its existing population

Where to put everyone?

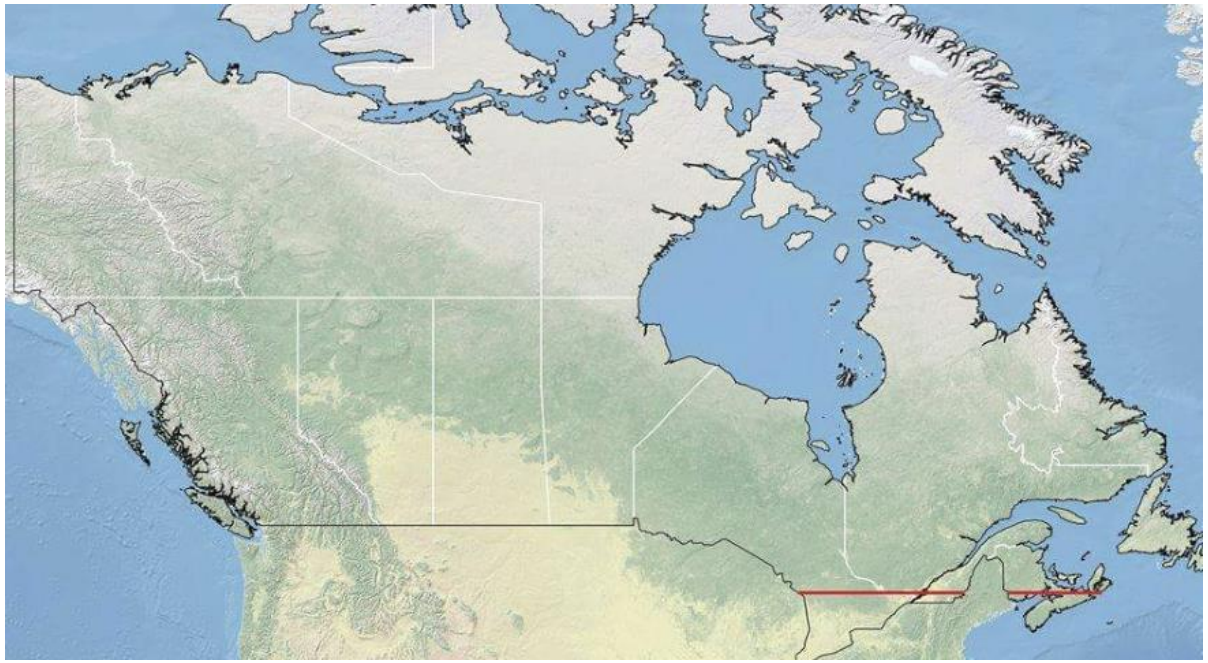
Massive urban sprawl in Toronto and Ottawa has spurred new federal priorities for infrastructure/housing:

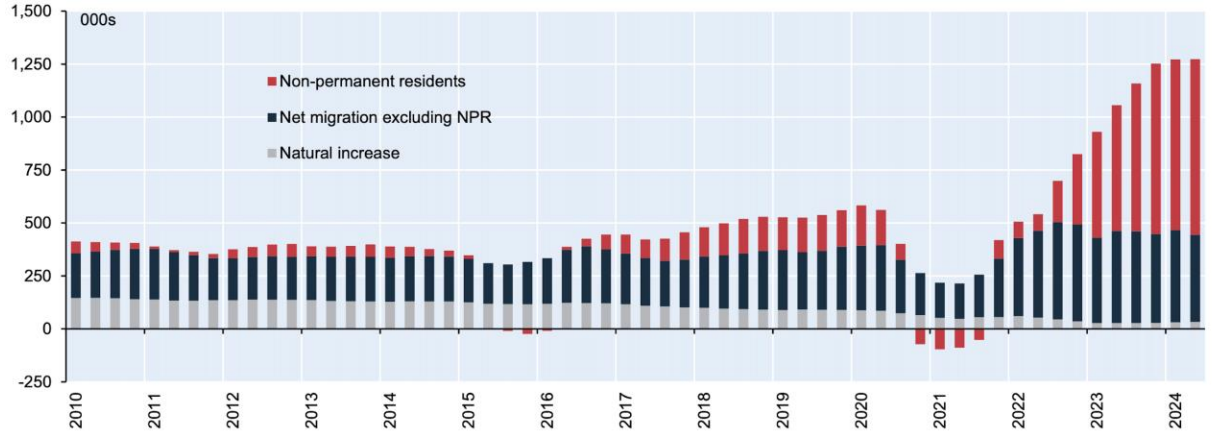
- 2024 budget commits to 4M new homes by 2032
- Subsidies for municipalities and developers to fast-track new homebuilding
- Expanded budget for water infrastructure

Getting on the map: Have you heard of….

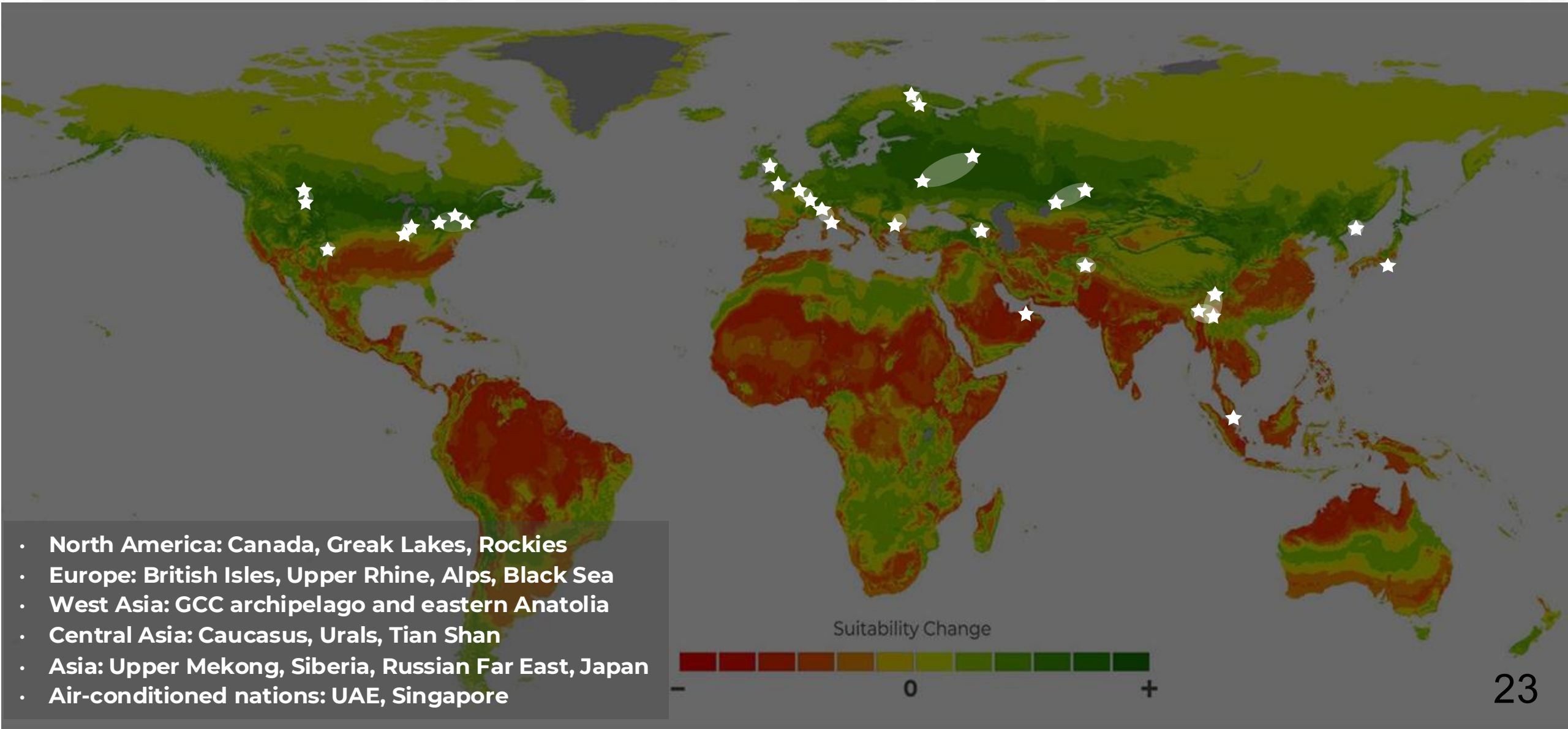
Growth across all provinces: Charlottetown, Moncton, Woodstock, Halifax, Whitehorse, Oshawa, Kelowna, Kitchener, Winkler, Barrie, Chilliwack, Summerside, London, Fredericton

Keeping it green
$54B since 2020 in public transit, community resilience, flood mapping, wildfire control, disaster assistance



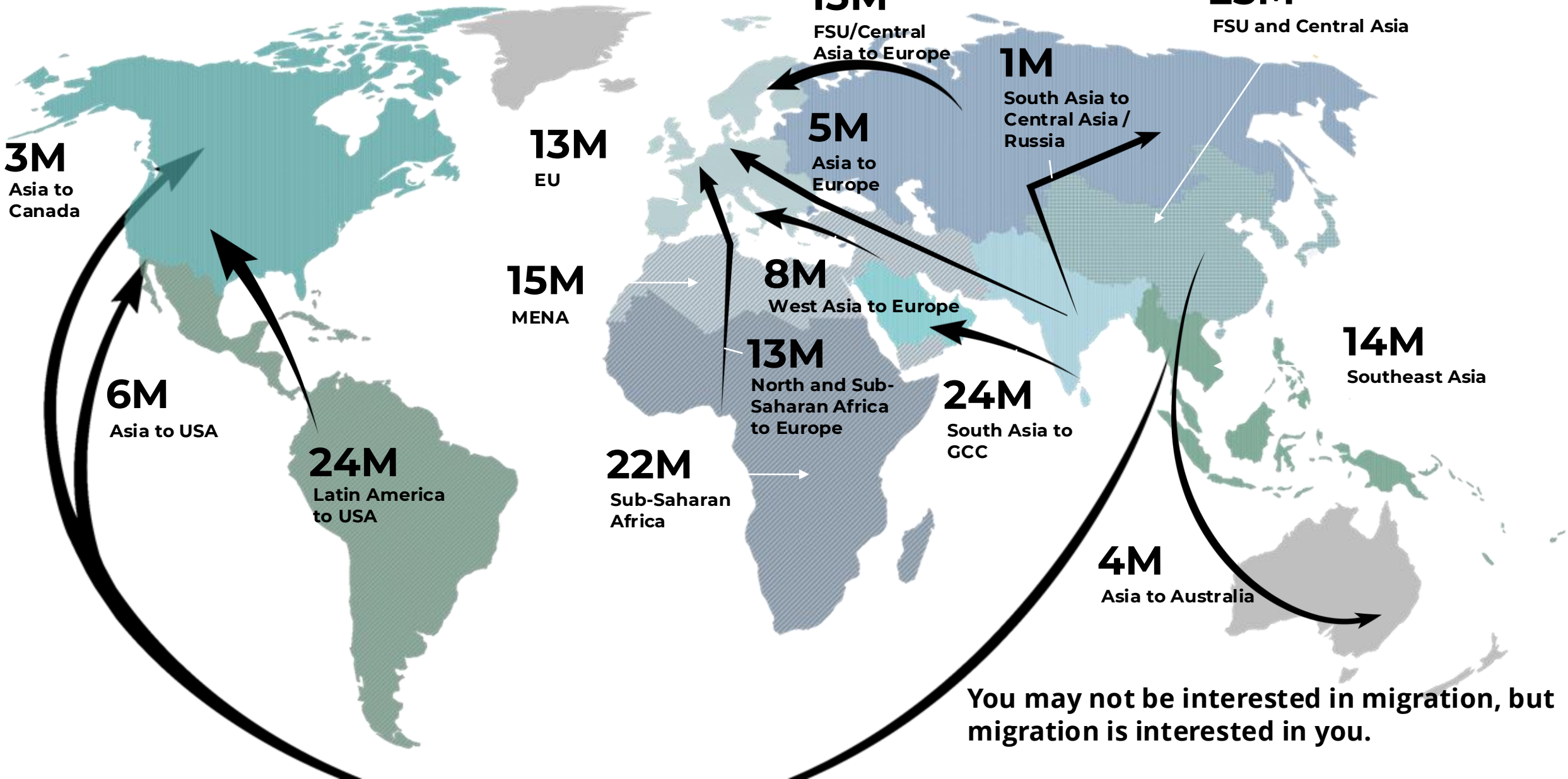


Anticipating new civilizational centers arising amidst climate volatility



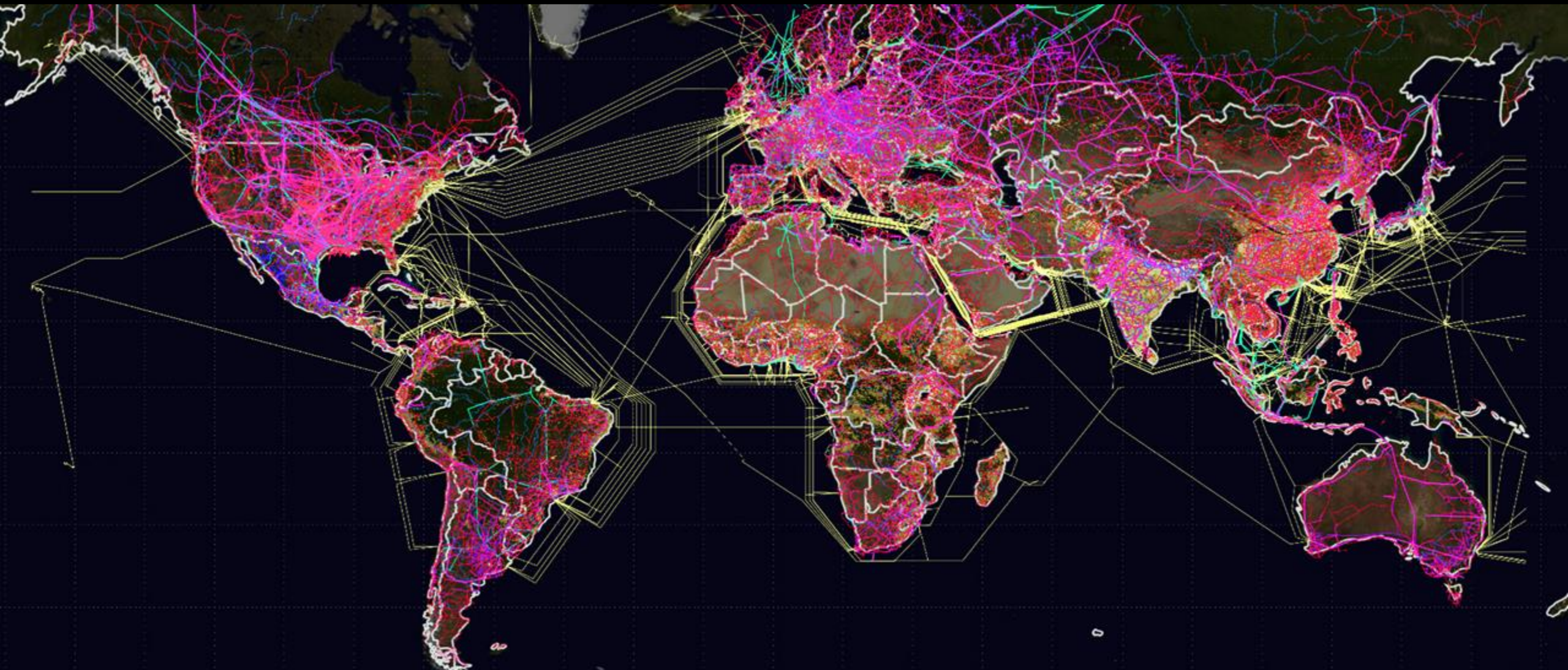
- North America: Canada, Greak Lakes, Rockies
- Europe: British Isles, Upper Rhine, Alps, Black Sea
- West Asia: GCC archipelago and eastern Anatolia
- Central Asia: Caucasus, Urals, Tian Shan
- Asia: Upper Mekong, Siberia, Russian Far East, Japan
- Air-conditioned nations: UAE, Singapore

People on the move like never before …



You may not be interested in migration, but migration is interested in you.

Competition within connectivity: Perpetual optimization as progress



AlphaGeo

Invest in resilience

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parag@alphageo.ai