RESCALING CLIMATE-INDUCED MIGRATION

EXPLORING PATHWAYS FOR AN UNCERTAIN FUTURE

P5 WENDY VAN DER HORST | APRIL 13TH 2021

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SECOND MENTOR: DR ALEXANDER WANDL | ENVIRONMENTAL TECHNOLOGY AND DESIGN

TU Delft BK Bouwkunde
Department of Urbanism

Complex Cities

Rescale
verb

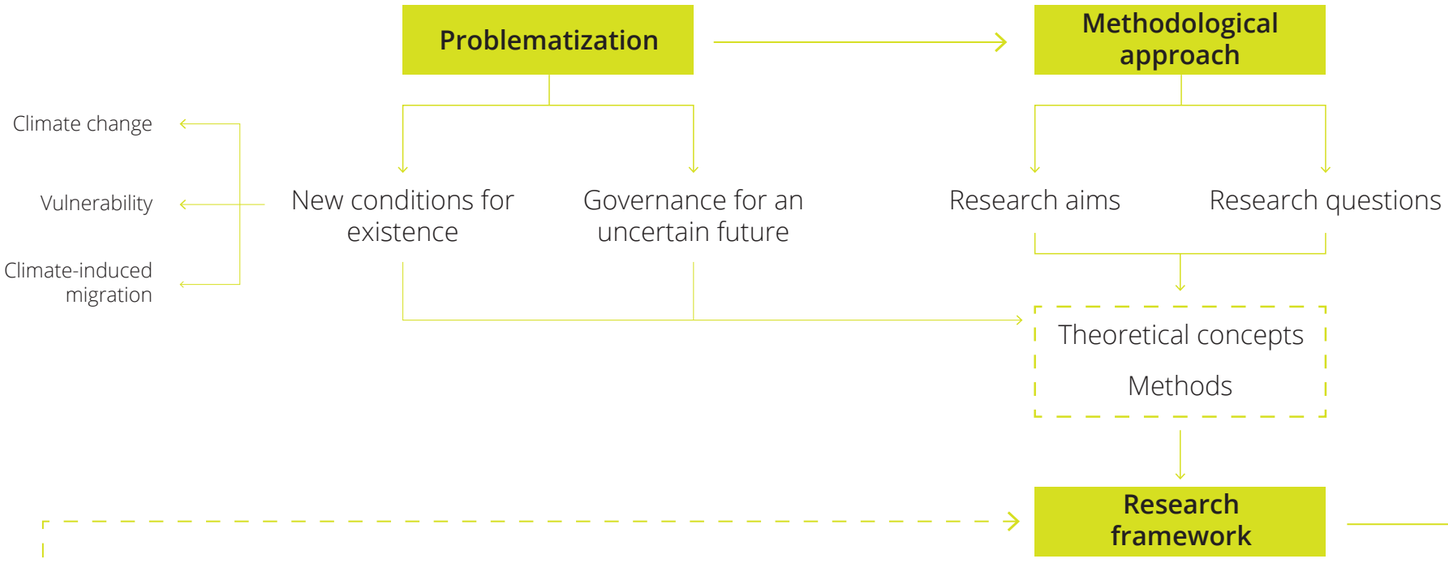
to change the scale of (something)

RESCALING CLIMATE-INDUCED MIGRATION

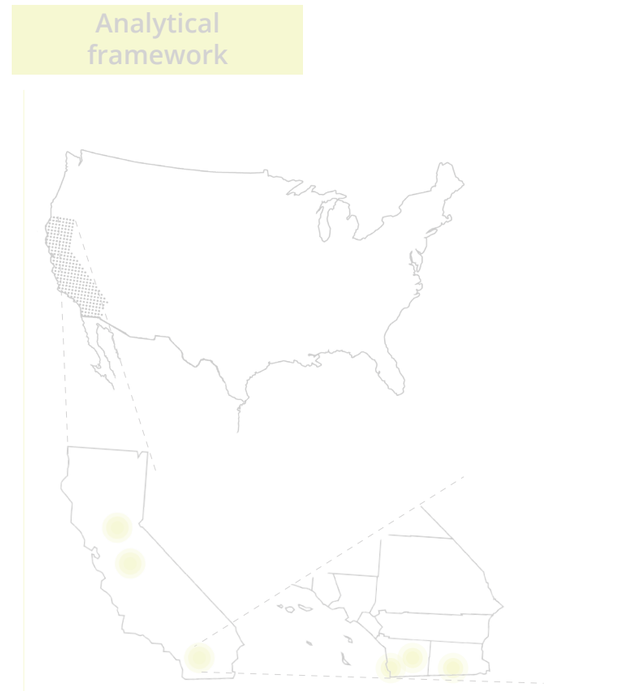
Climate-induced migration
noun

the movement of people or persons who, predominantly for reasons of climate change adversely affecting their lives, decide or are forced to leave their place of habitual residence

1 / Contextualize



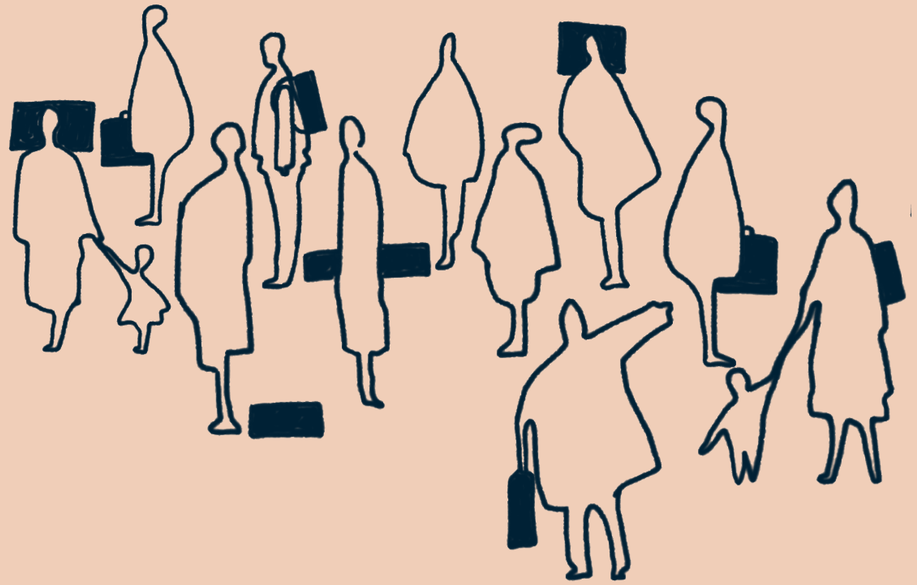
2 / Analyze and identify



3 / Design and evaluate

PART 1 | CONTEXTUALISE

*What is the **problem**?*



www.theguardian.com

Has the great climate change migration already begun? | Vital Signs | The Guardian

Nieuw-Zeeland geeft gezin uit Tuvalu verblijfsvergunning vanwege stijging zeespiegel

Eerste klimaatvluchtelingen erkend

Van onze verslaggeefster
Sterre Lindhout

AMSTERDAM Leden van een gezin uit Tuvalu, deel van het tropische eilandenrijk Polynesië, hebben onlangs op klimatologische gr... den een verblijfsverg... Nieuw-Zeela...

rikaanse fondsen gericht op de effecten van klimaatverandering. De bewoners van de Salomonseilanden ... pen met voedseltekort... toch al schaa...

Vluchten voor de zee

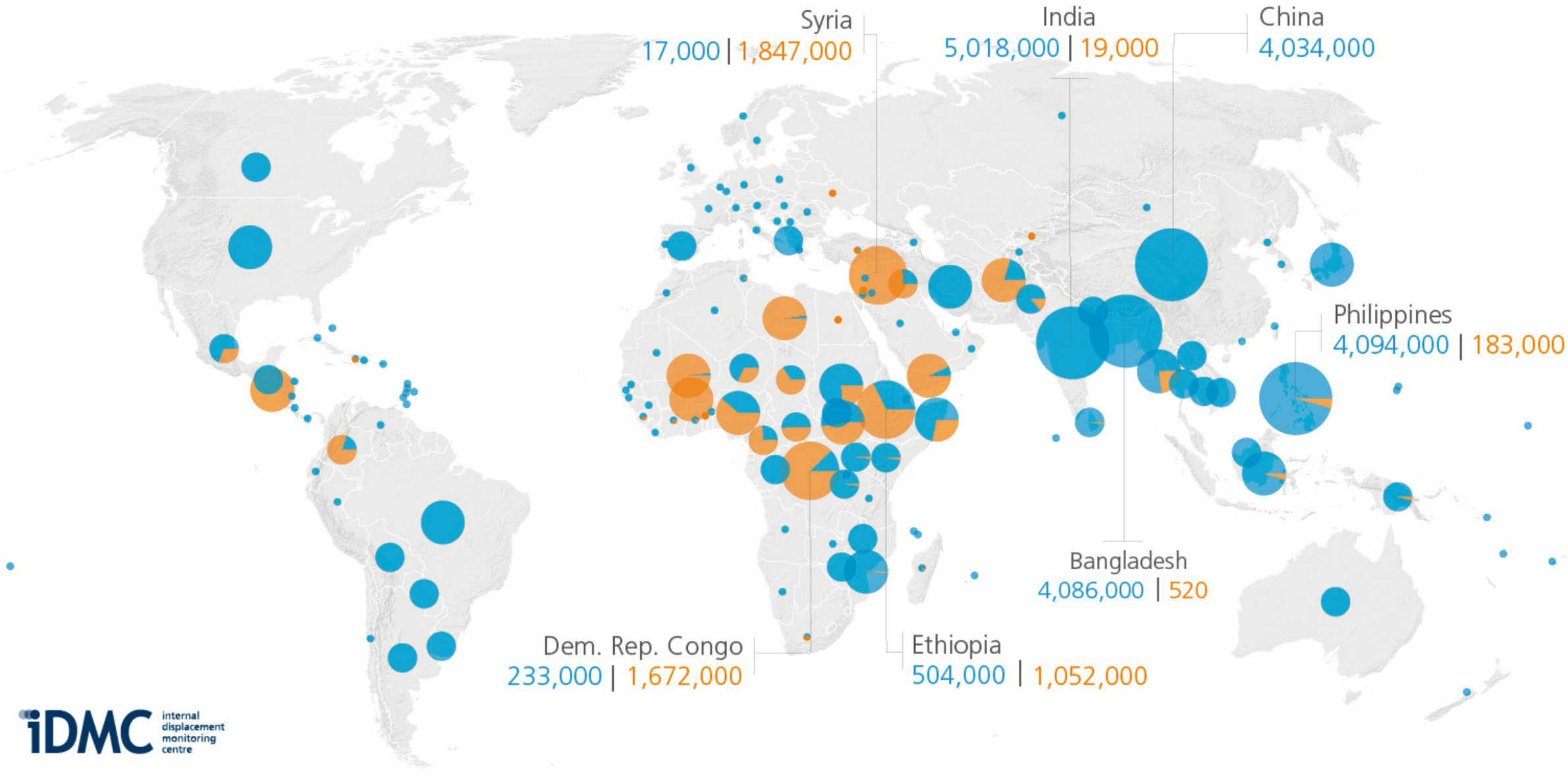
VS en Australië zitten niet te wachten op stroom klimaatmigranten

Michael Gerrard hoogleraar van de ...

manitaire gronden', waarvan klimaatproblematiek er een was, maar de aanwezigheid van familieleden en de geringe kans op werk in het thuisland werden meegerekend. Die aanvraag werd goedgekeurd.

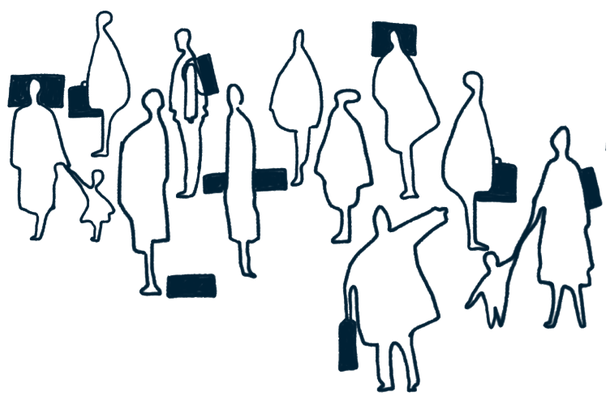
'Er komt een tijd dat regeringsleiders en internationale organisaties zoals de VN met elkaar om de tafel moeten om hier een juridisch kader voor te scheppen', zegt Gerard. 'Maar overheden van de meest voor de hand liggende gastlanden voor klimaatvluchtelingen – de VS en Australië – zitten niet te wachten op een stroom immigranten. En de problematiek is nog niet urgent genoeg om ze te dwingen.' Daarom houden ze het voorlopig bij

DISPLACEMENT DUE TO GEOPHYSICAL DISASTERS IN 2019



Source: IDMC, 2019

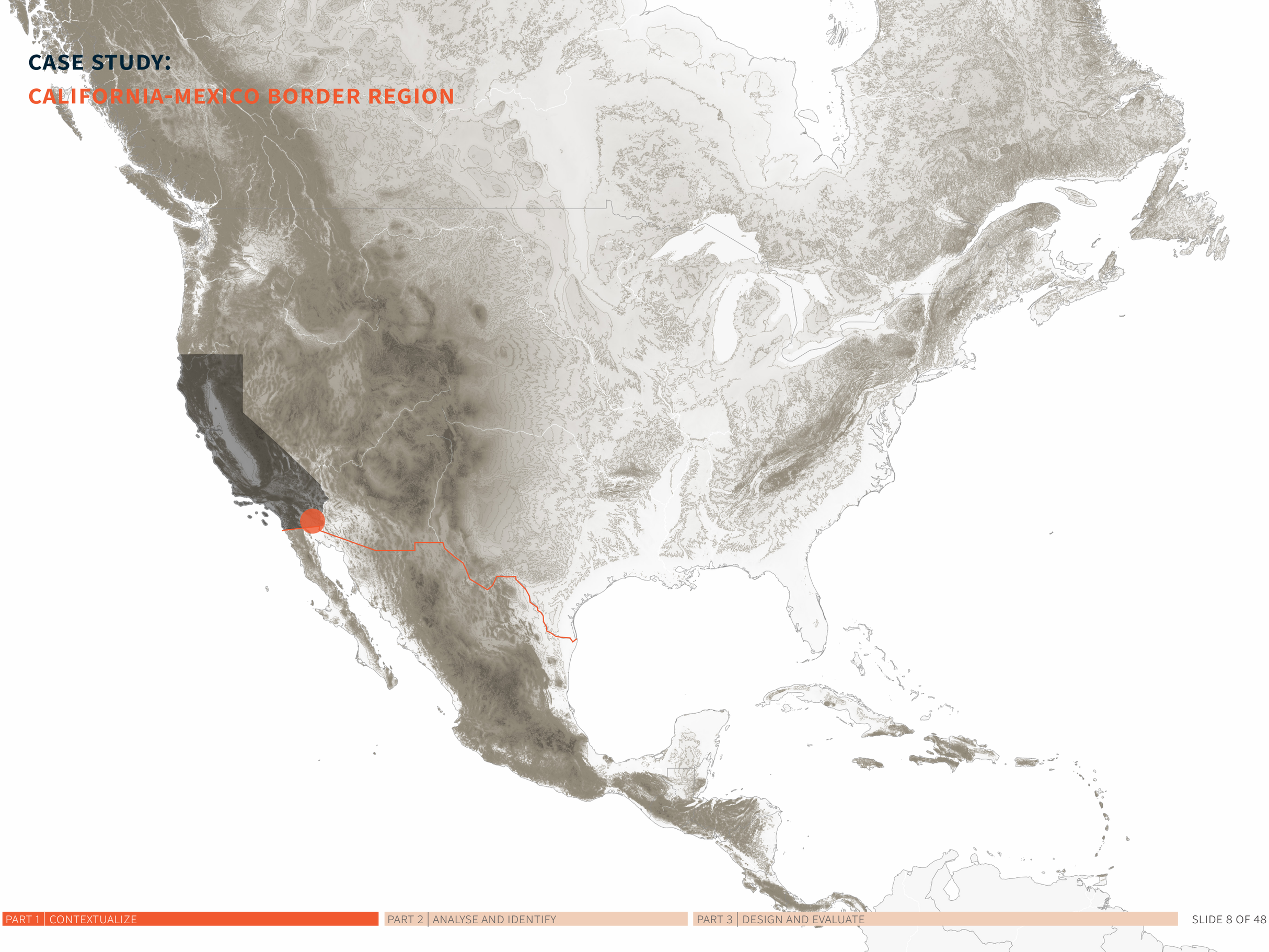
INITIAL QUESTION



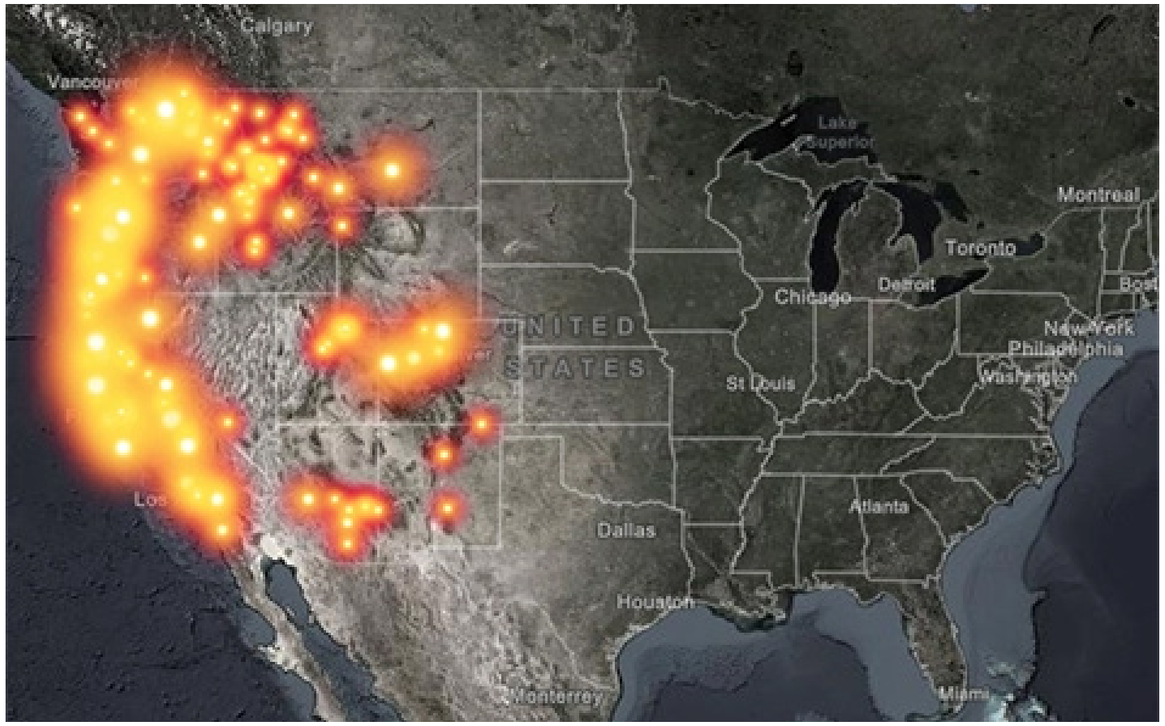
How can urban planners
***anticipate** for migration as*
a result of climate change?

CASE STUDY:

CALIFORNIA-MEXICO BORDER REGION



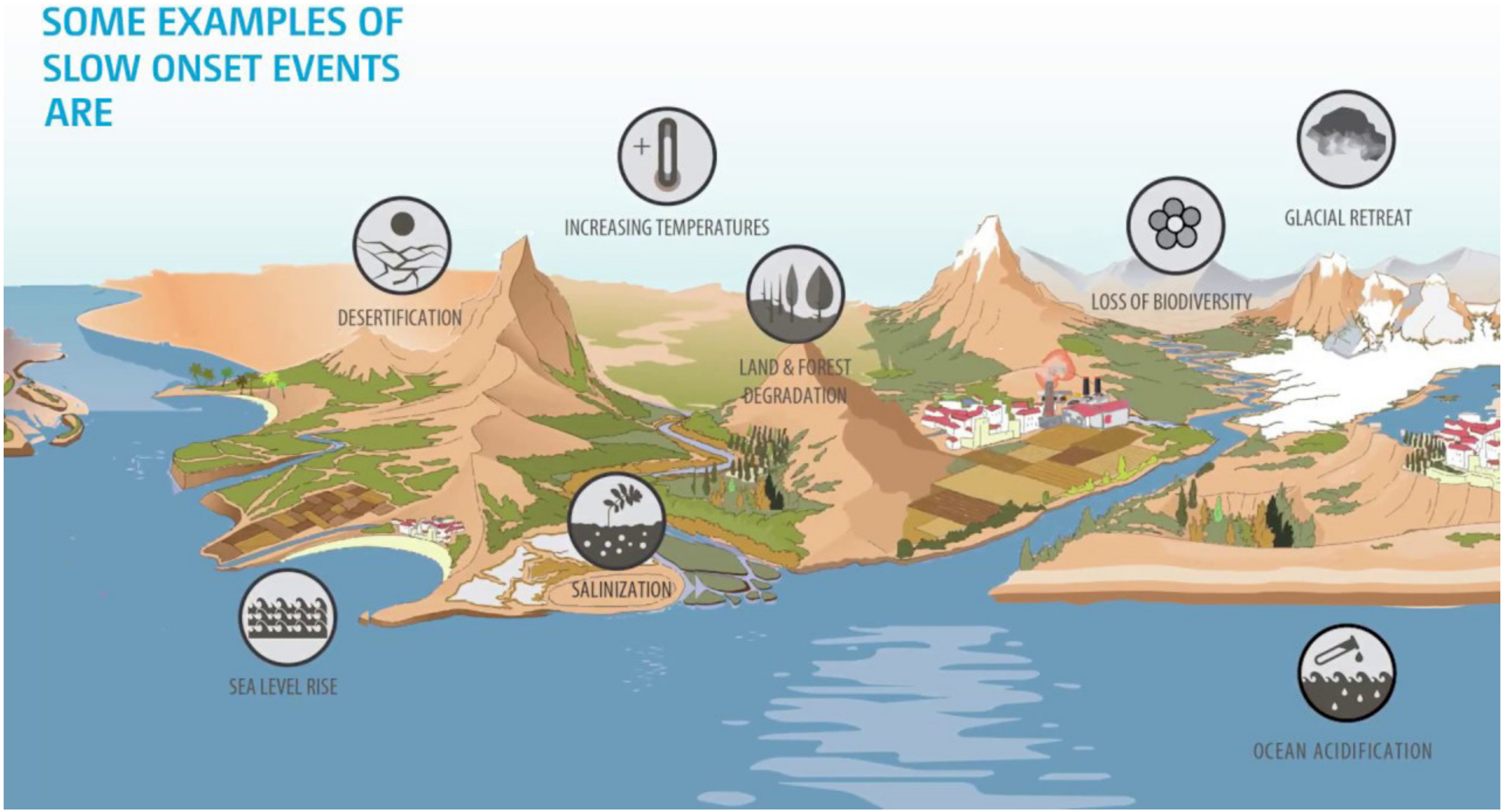
CURRENT CLIMATE-INDUCED MIGRATION IN CALIFORNIA: THREAT OF WILDFIRES



CURRENT CLIMATE-INDUCED MIGRATION IN CALIFORNIA: INTERNATIONAL REFUGEES

HYPOTHESIS: CLIMATE-INDUCED MIGRATION WILL EXACERBATE

TWO PROCESSES: DISASTER EVENTS + SLOW-ONSET EVENTS

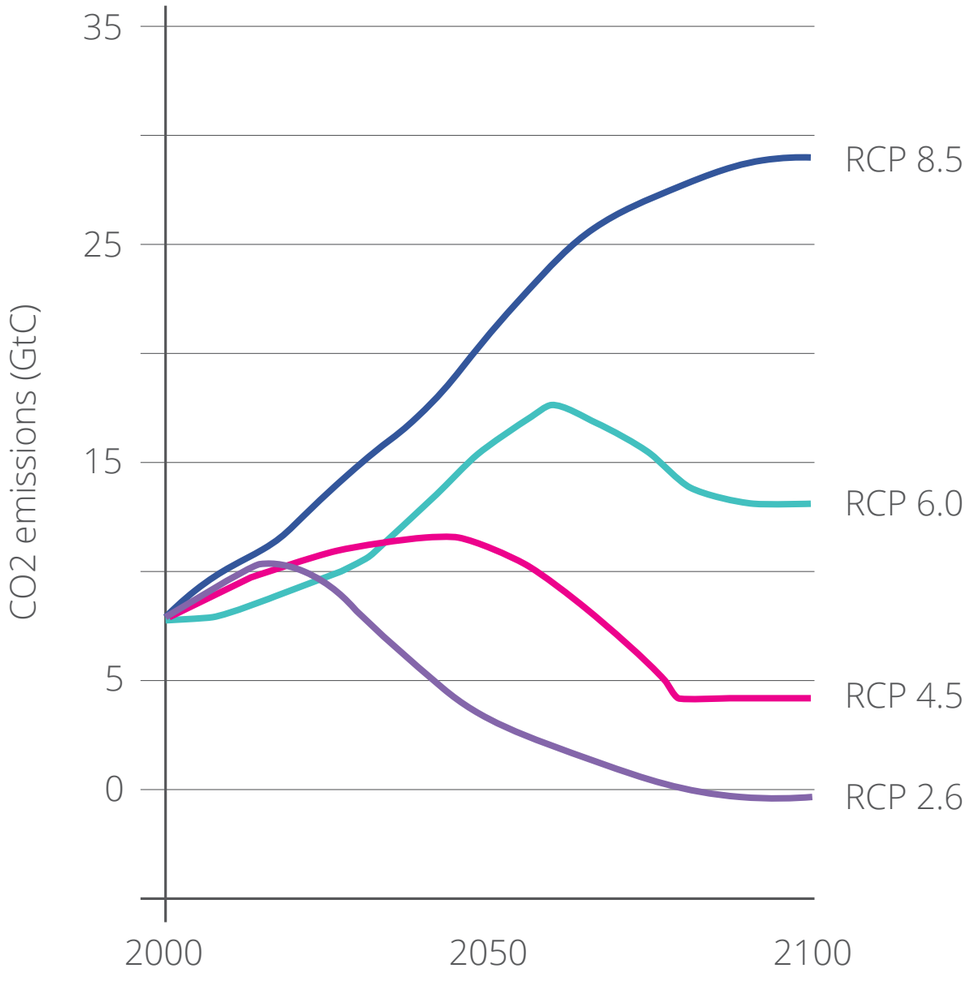


Source: UNFCCC (2018)

WHEN WILL WHAT HAPPEN?

THE FUTURE IS DEEPLY UNCERTAIN

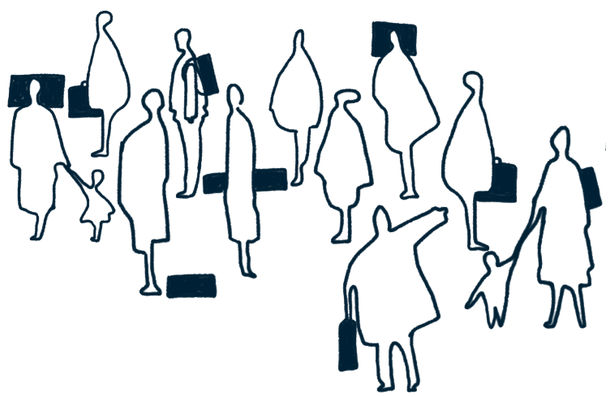
Possible climate change progression pathways



Source: author, based on IPCC (2014)

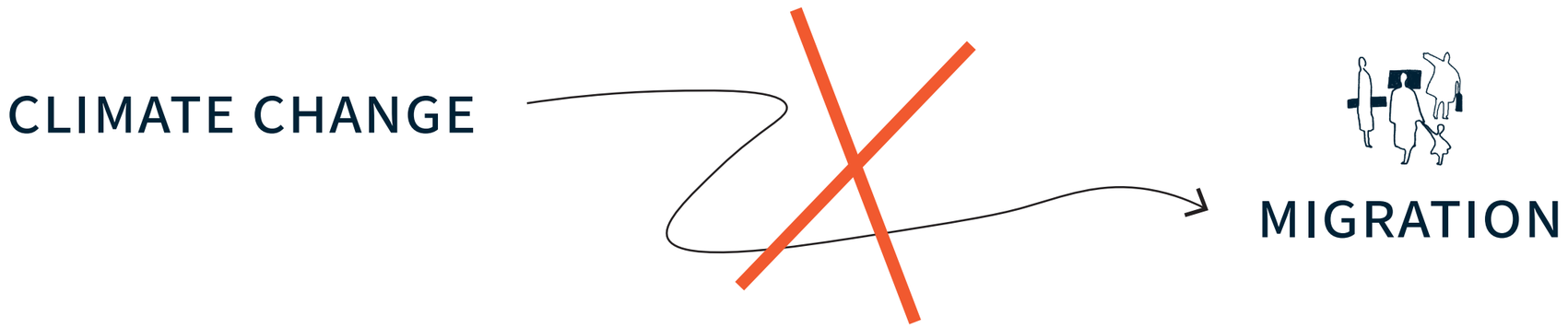
PREPAREDNESS,
INSTEAD OF DISASTER MANAGEMENT

RESEARCH QUESTION



How can a scale- and temporal sensitive
planning approach *act towards*
preparedness *in order to respond to the*
threat of climate-induced migration under conditions of
slow-onset climate change uncertainty *in*
the California-Mexico border region?

HOW TO RESEARCH THIS?



HOW TO RESEARCH THIS?

CLIMATE CHANGE

MIGRATION

CLIMATE CHANGE

VULNERABILITIES

HOW TO RESEARCH THIS?

CLIMATE CHANGE

MIGRATION

CLIMATE CHANGE

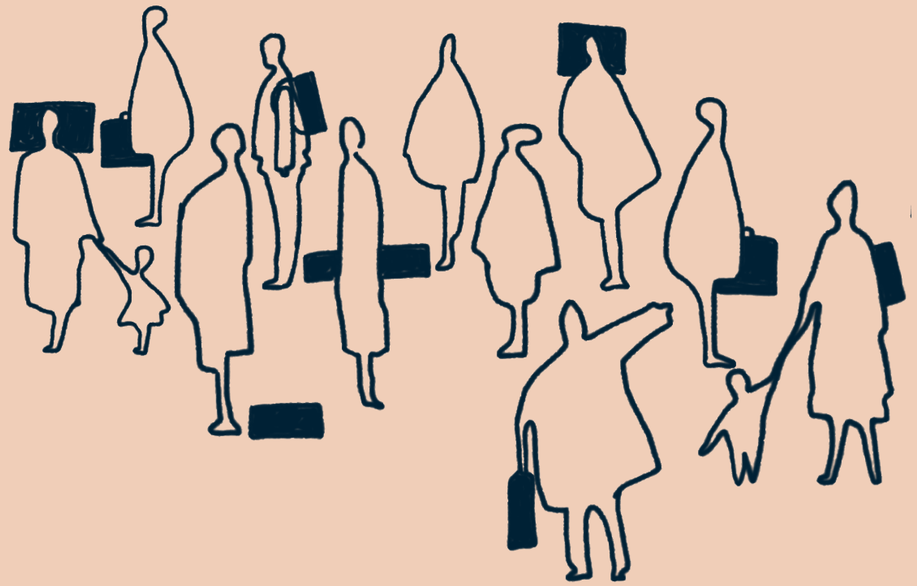
PLANNING: **TARGET**

VULNERABILITIES

diminish painful part of

PART 2 | ANALYSE AND IDENTIFY

*What are the main **vulnerabilities** in the California-Mexico border region?*



1 / Contextualize

Problematization

Climate change

Vulnerability

Climate-induced migration

New conditions for existence

Governance for an uncertain future

Methodological approach

Research aims

Research questions

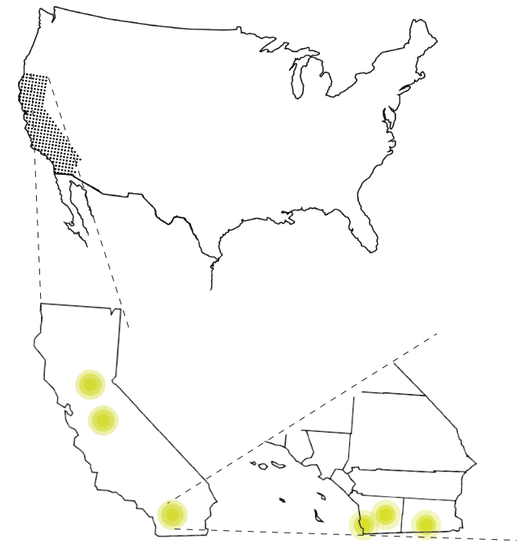
Theoretical concepts

Methods

Research framework

2 / Analyze and identify

Analytical framework



Vulnerability hotspots:
locational vulnerability + social vulnerability

Potentials

Vision

Actions

3 / Design and evaluate

Design scenarios

Pathways tube map

Discuss and evaluate

VULNERABILITIES

Los Angeles

Salton Sea

Arizona

Colorado River

San Diego

Calexico

Border US - MEX

Mexicali

Tijuana

Pacific Ocean

N

0 25 50 100 km

POTENTIALS

2 hour drive

Salton Sea

Colorado River

1 hour drive

San Diego

USA

MEX

Mexicali

Pacific Flyway

Active geothermal plants

Geothermal potential area

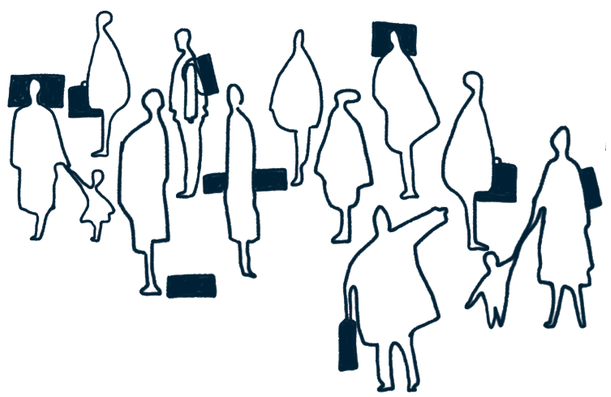
Conservation Department of Fish and Wildlife owned and operated lands

Sonoran Desert ecoregion

Tourism heatmap

0 12,5 25 50 km

TEMPORAL AND SPATIAL VARIABILITY



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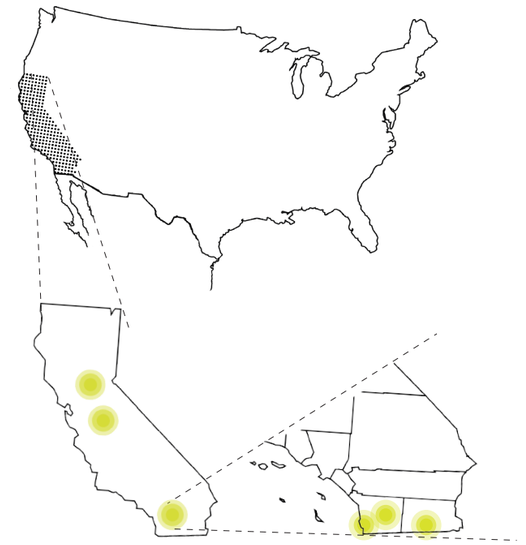

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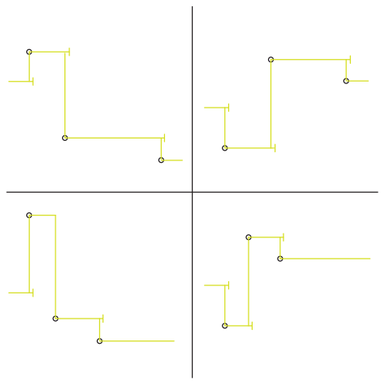
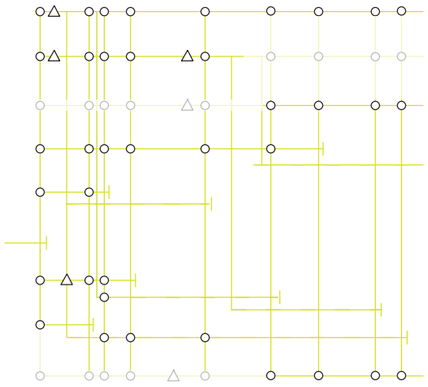
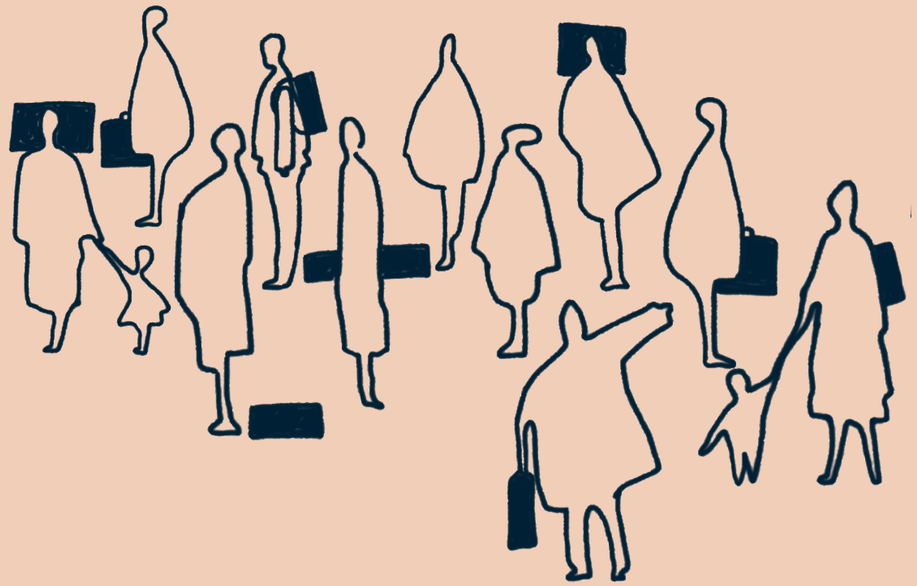




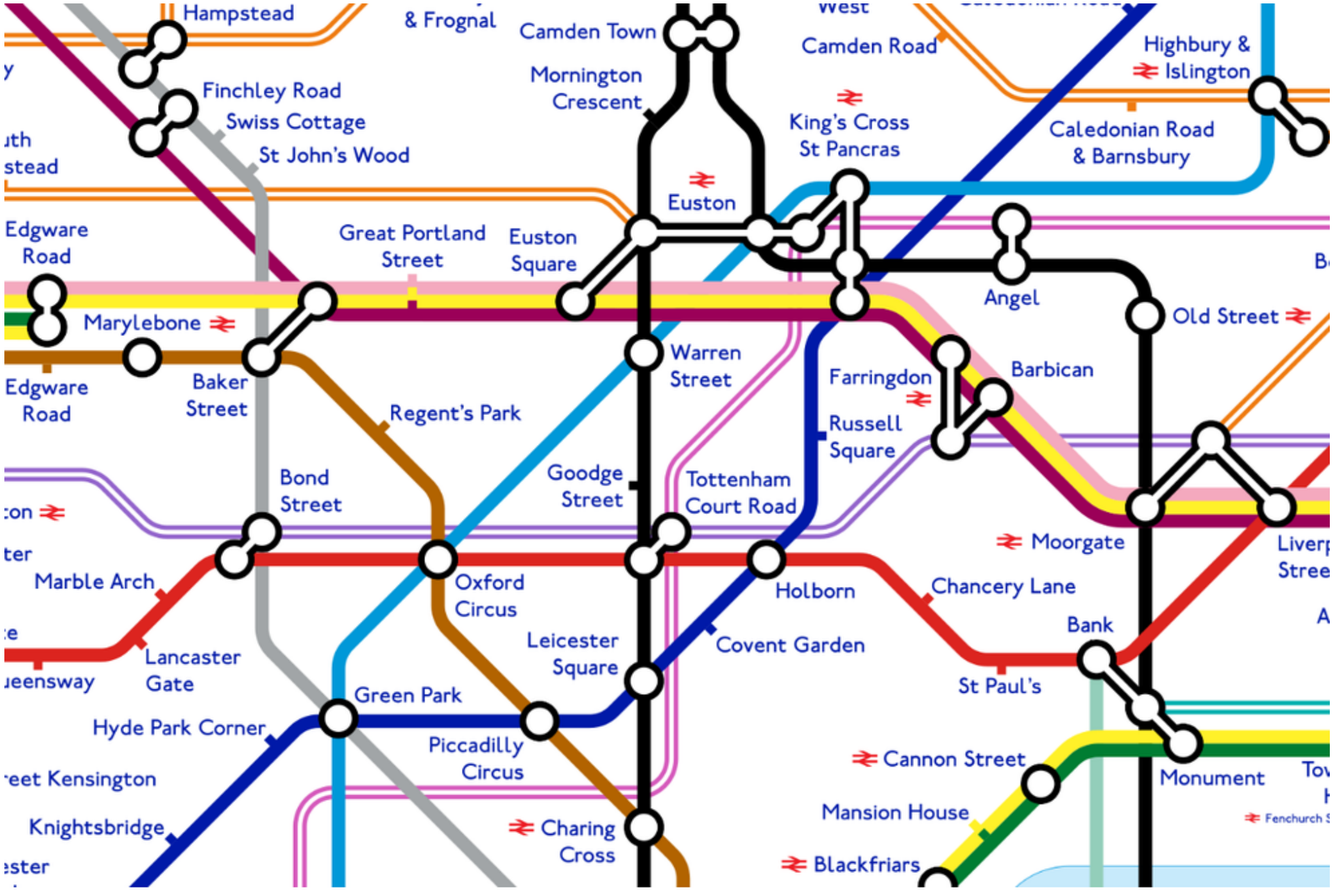
Discuss and evaluate

PART 3 | DESIGN AND EVALUATE

*What **planning approach** can act towards preparedness in the context of climate change uncertainty?*



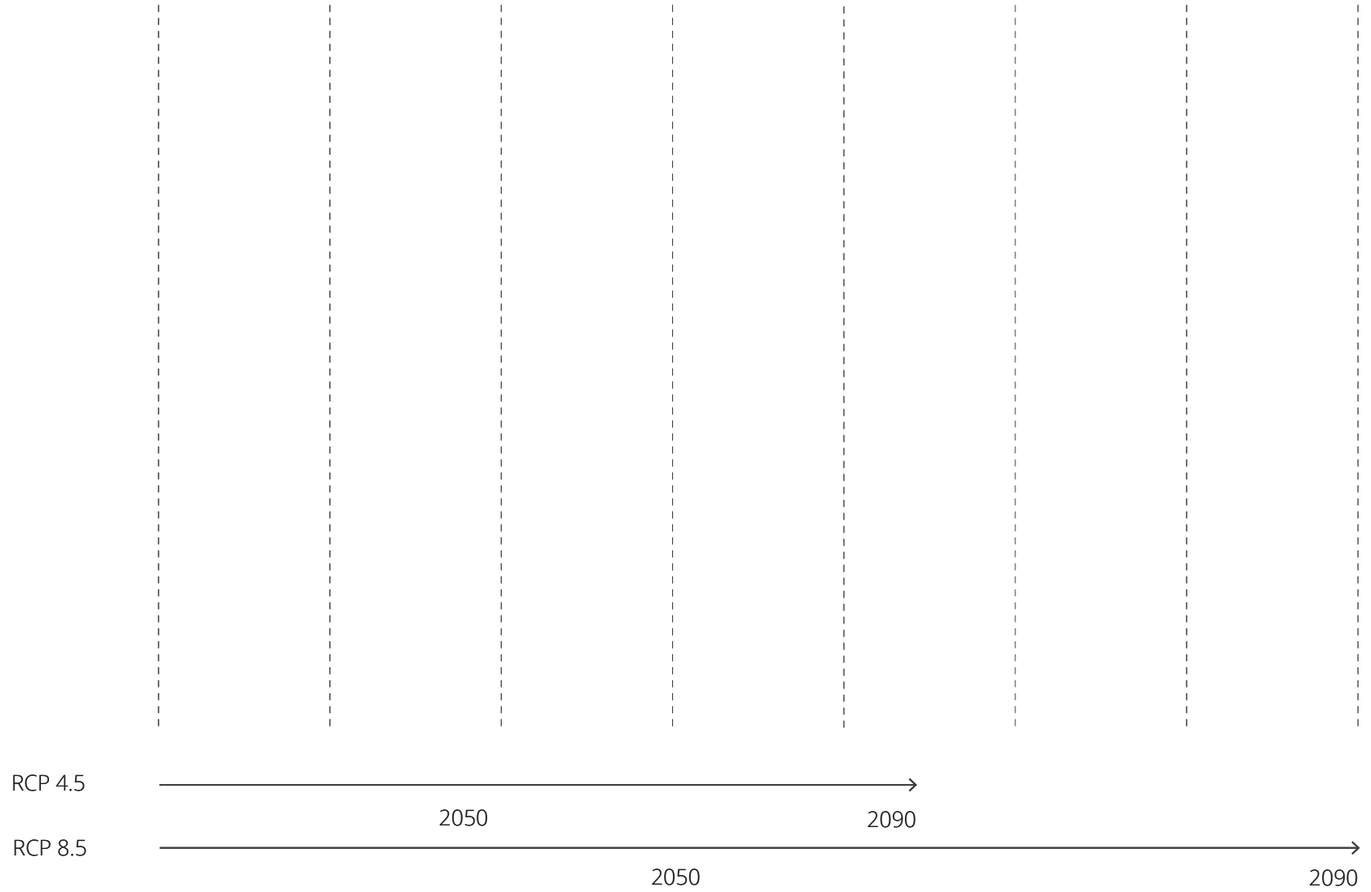
DYNAMIC ADAPTIVE POLICY PATHWAYS (DAPP)



Adaptive: as the context changes, you can change to a more suitable line as you go

EXPLANATION (1 OF 5)

HOW DOES THE TUBE MAP WORK?

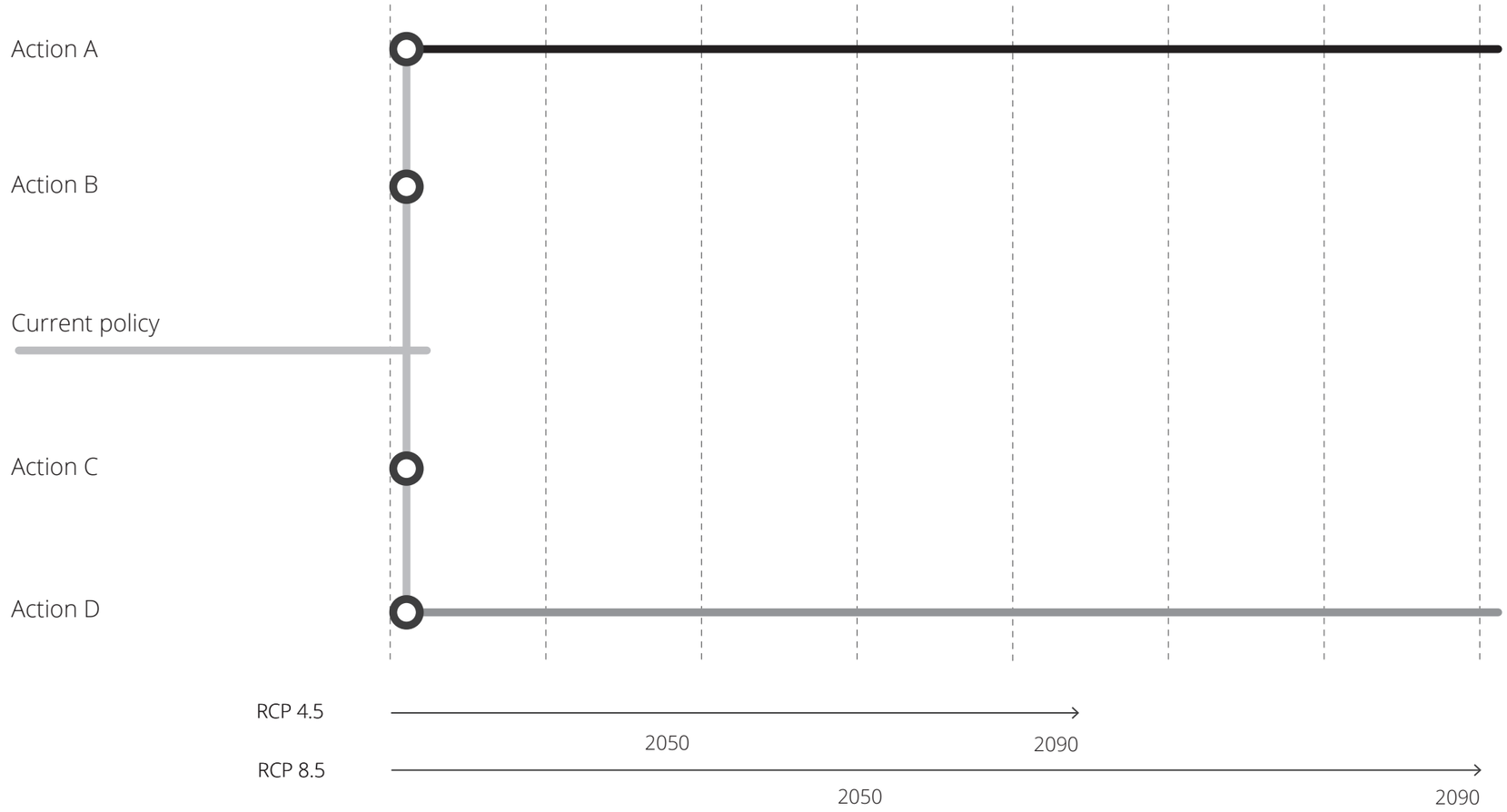


DAPP signage used:

- Station
- Adaptation Tipping Point (ATP)
- Action
- Extended action due to synergy with other action
- Decision anchor

EXPLANATION (2 OF 5)

HOW DOES THE TUBE MAP WORK?



DAPP signage used:

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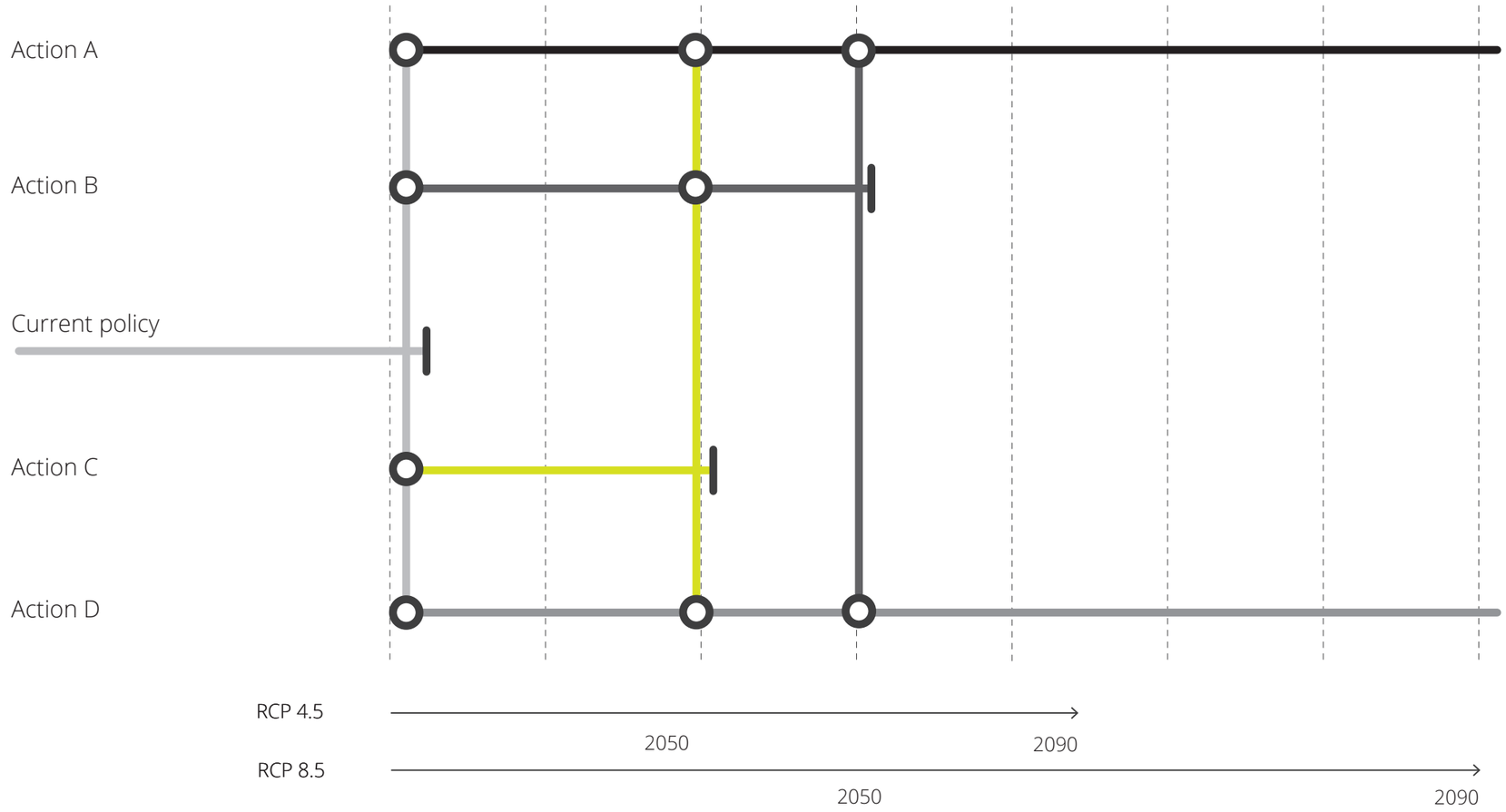
EXPLANATION (3 OF 5)

HOW DOES THE TUBE MAP WORK?



DAPP signage used:

- Station
- Adaptation Tipping Point (ATP)
- Action
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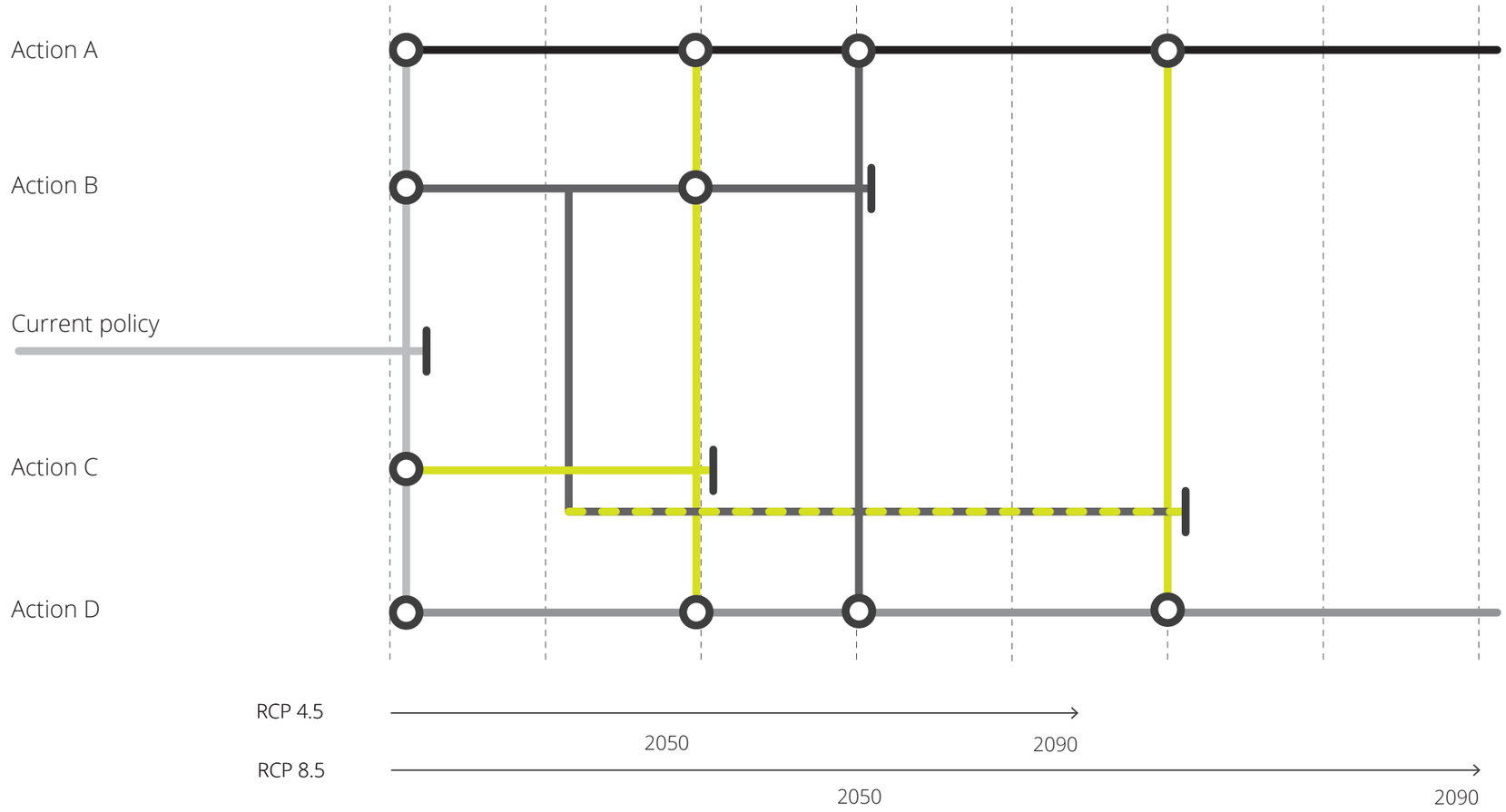
- Decision anchor

EXPLANATION (4 OF 5)

HOW DOES THE TUBE MAP WORK?



DAPP signage used:

- Station
- Adaptation Tipping Point (ATP)
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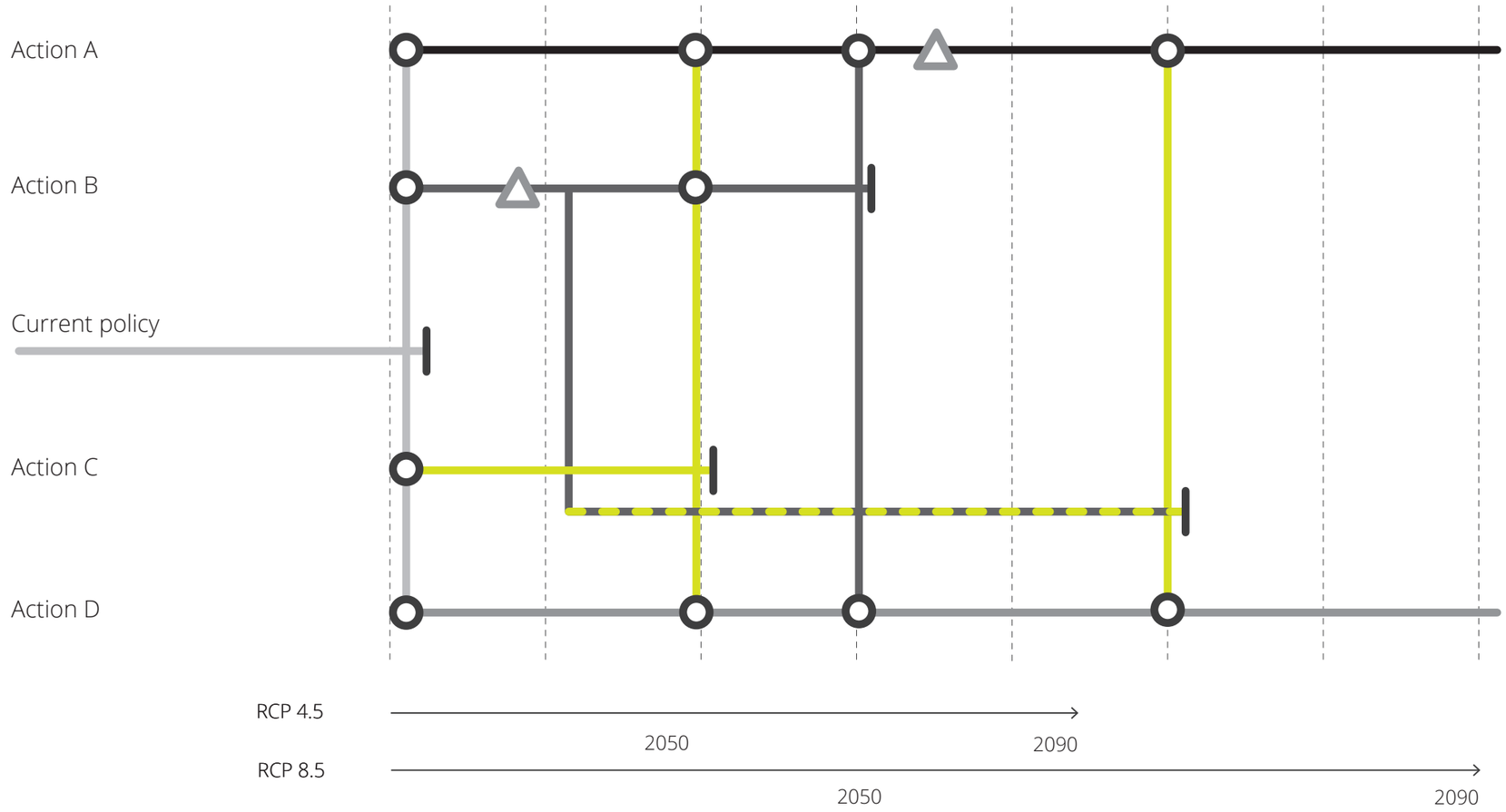
EXPLANATION (5 OF 5)

HOW DOES THE TUBE MAP WORK?



DAPP signage used:

- Station
- Adaptation Tipping Point (ATP)
- Action
- Extended action due to synergy with other action
- Decision anchor

GOAL, BASED ON IDENTIFIED VULNERABILITIES:

[1] INCREASE EMPLOYMENT OPPORTUNITIES

[2] MITIGATE POLLUTION

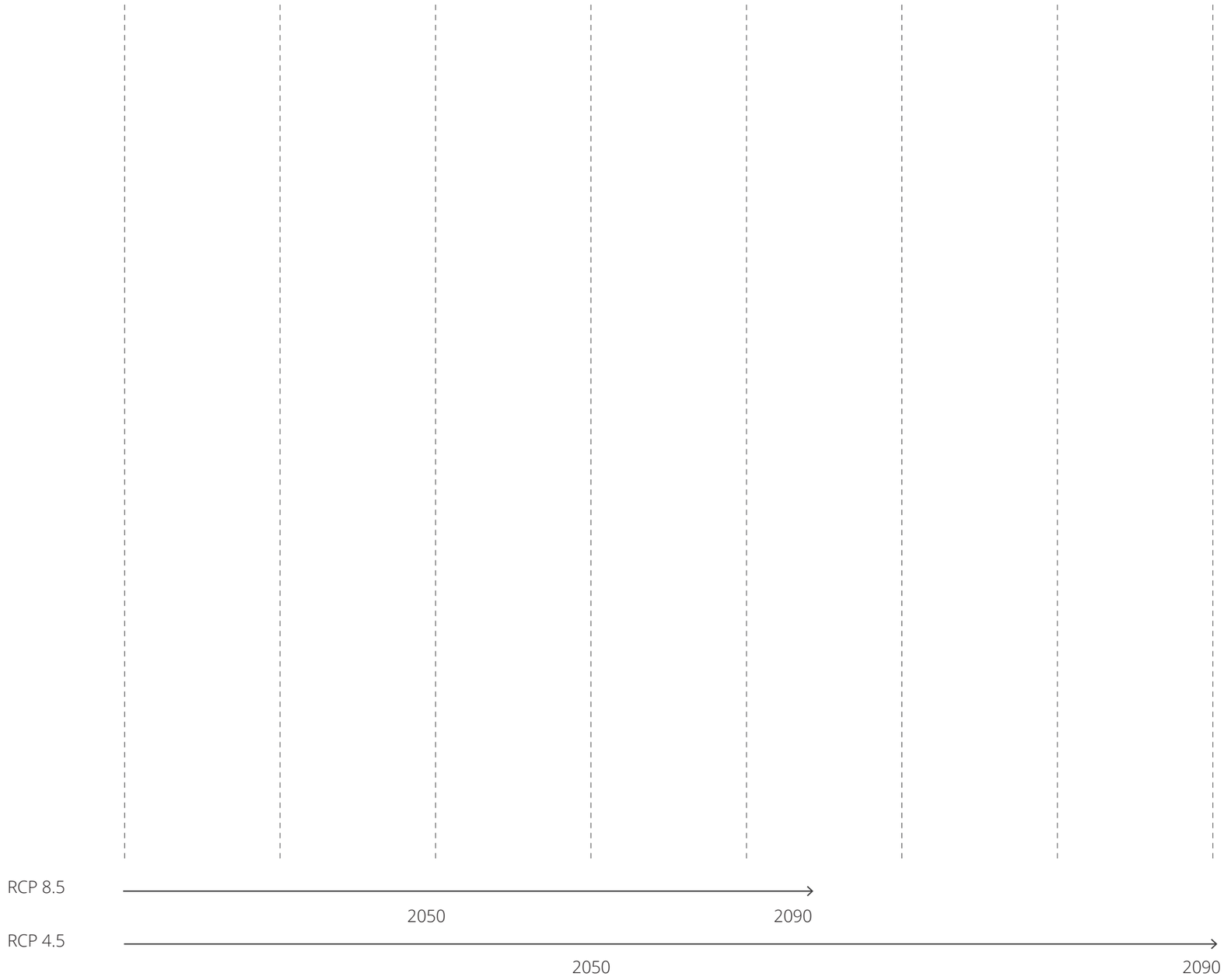
[3] BE SENSITIVE TO SCALE AND TEMPORAL VARIABILITY

LIST OF ACTIONS
THAT WORK TOWARDS THE GOAL

Regional strategies based on previously defined actions	Sub-actions	
[A] Planned relocation *Robust action*	[1.2] Cross-border governance [1.4] Fund for regional public health demands	
[B] Ecotourism	[1.2] Cross-border governance [1.4] Subsidize and tax industries [3.2] Waste treatment and recycling plants [3.3] Create a series of wetlands	[3.6] Harvesting and recycling of (rain)water [3.7] Salton Sea dust suppression
[C] Migrant integration trajectory	[1.2] Cross-border governance [1.3] Local food production [2.1] Adaptive housing policy [2.2] Monitor vacancy stock	[2.3] Stimulate integration services [2.4] Invest in public transport [3.2] Waste treatment and recycling plants [3.6] Harvesting and recycling of (rain)water
[D] Future-proof agriculture	[1.1] Indoor farming [3.2] Waste treatment and recycling plants [3.5] Crop rotation and drought-resistant crops [3.6] Harvesting and recycling of (rain)water	[3.7] Salton Sea dust suppression
[E] Integrate agriculture, urban life and education	[1.3] Local food production [1.5] Fund for regional public health demands [2.1] Adaptive housing policy [3.2] Waste treatment and recycling plants	[3.4] Industrial zoning [3.6] Harvesting and recycling of (rain)water [3.7] Salton Sea dust suppression
[F] Energy economy *Robust action*	[2.5] Invest in renewable energy production	

Goal: development should simultaneously address the current lack of employment, increase public health by addressing pollution, and be sensitive to the variability of climate and migration flows.

employment component [1] + waste treatment component [2] + variability component [3]



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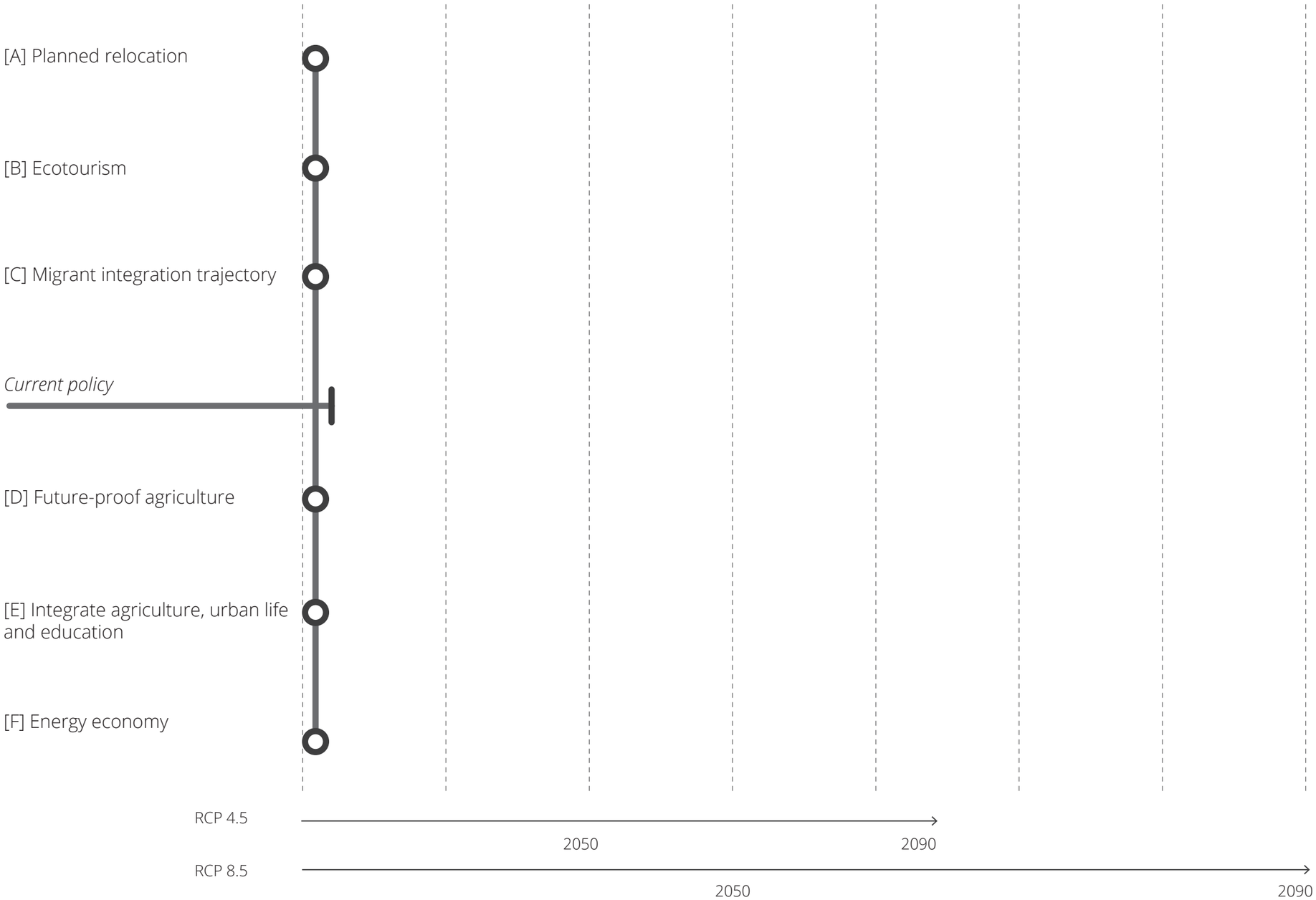

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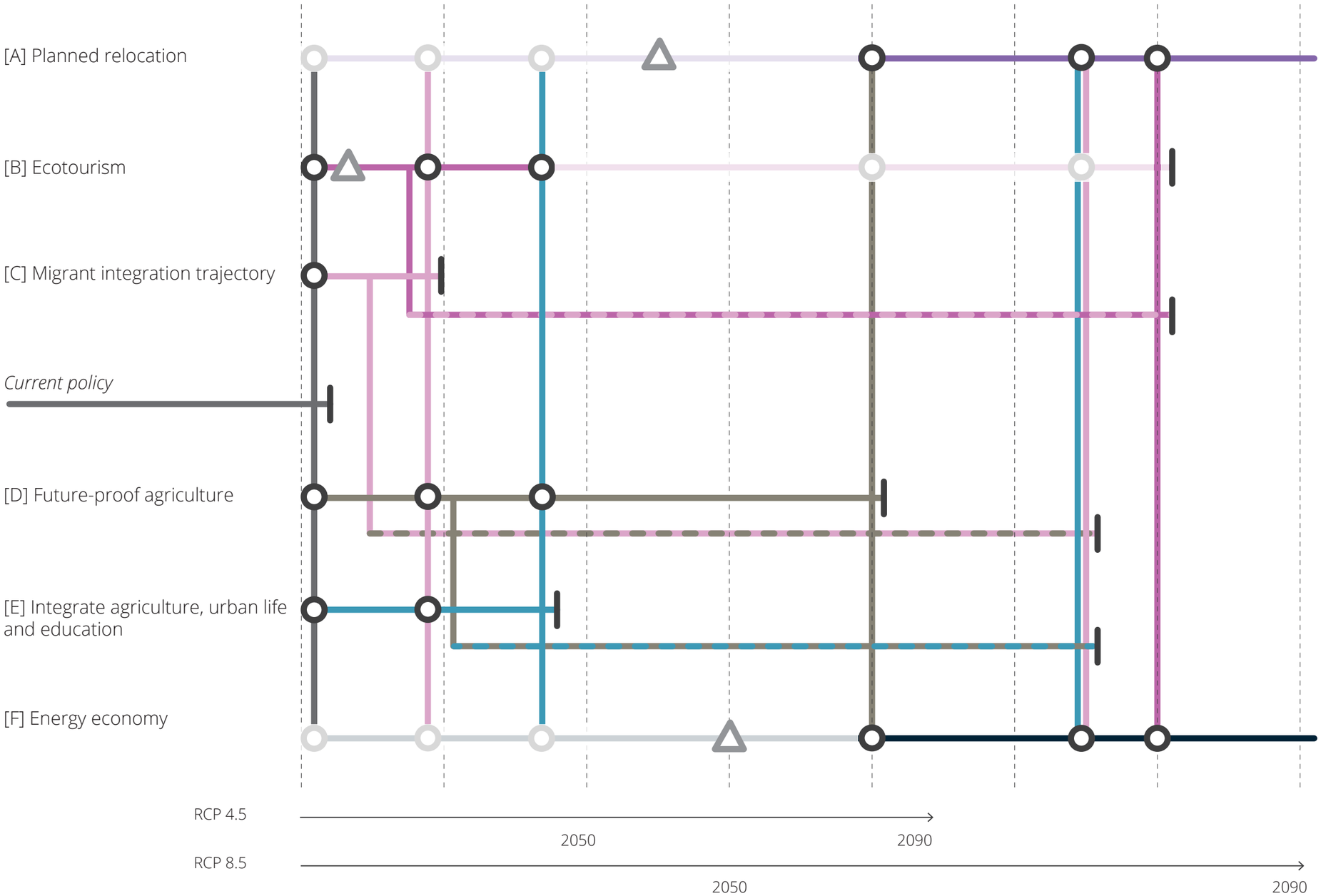

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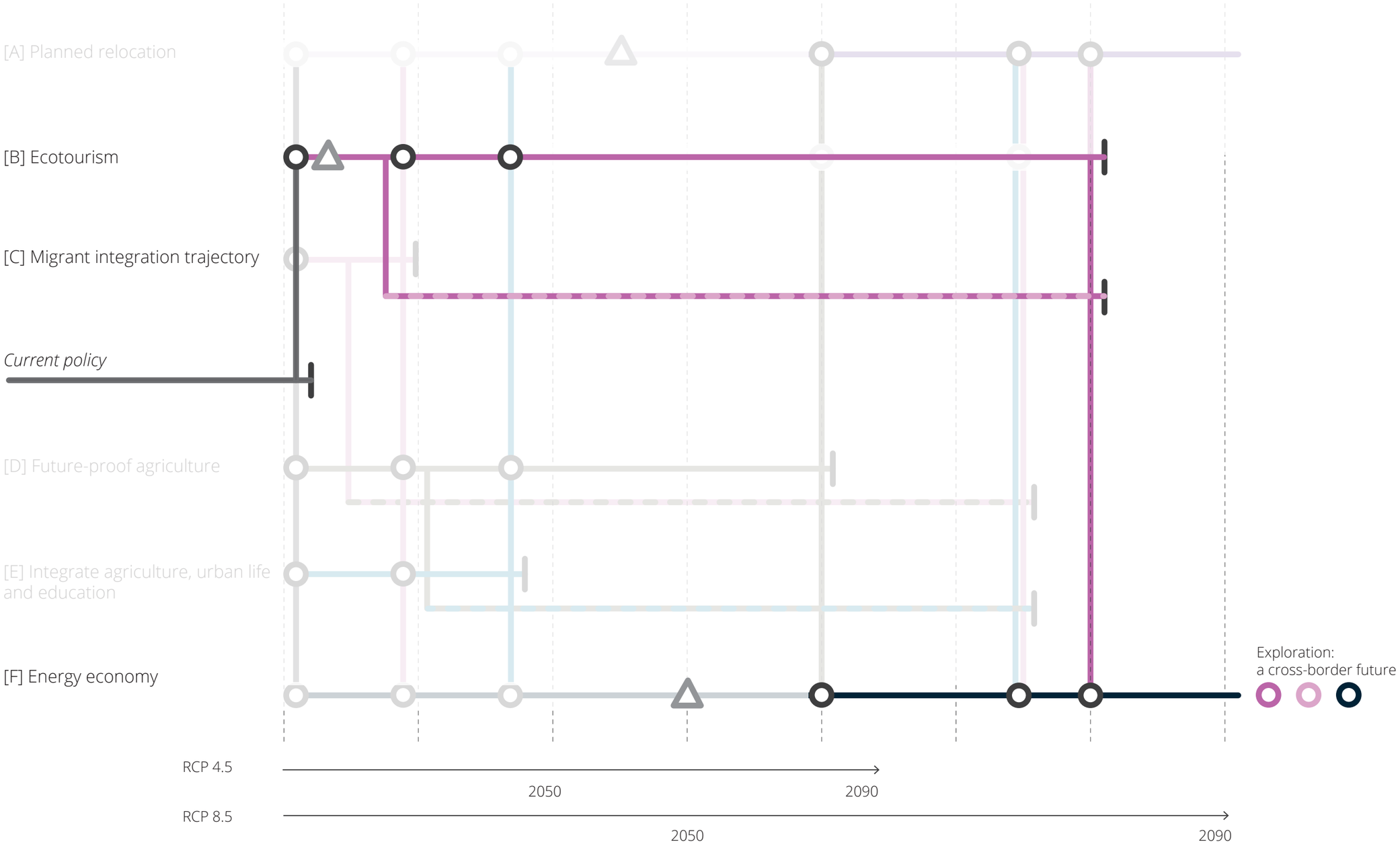


Exploration 2:
a cross-border future

[B] Ecotourism

Dust suppression Salton Sea

Wetlands creation

Waste treatment + recycling

Cross-border governance

Subsidize and tax industries

Harvesting (rain) water

[C] Migrant integration trajectory

Local food production

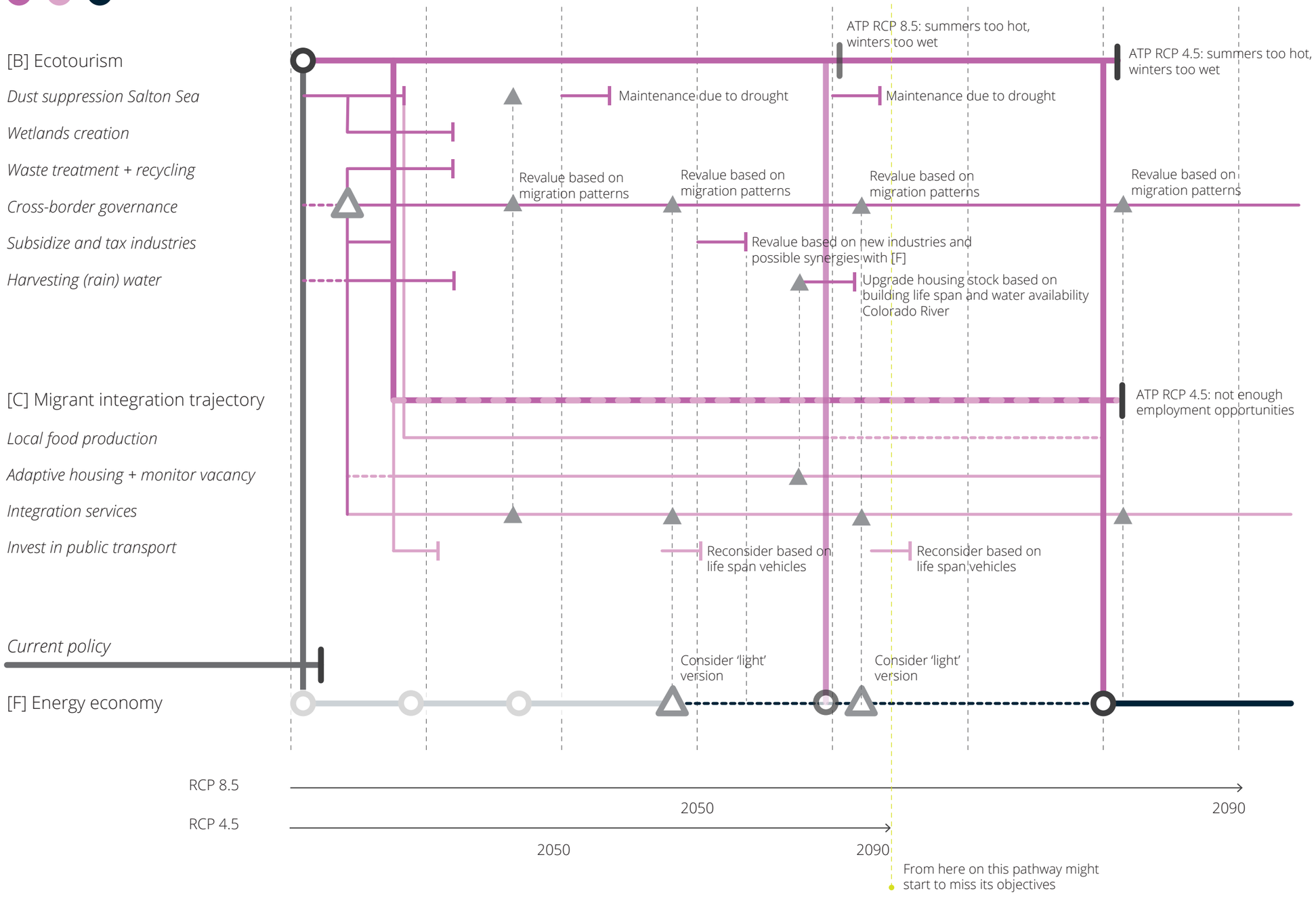
Adaptive housing + monitor vacancy

Integration services

Invest in public transport

Current policy

[F] Energy economy



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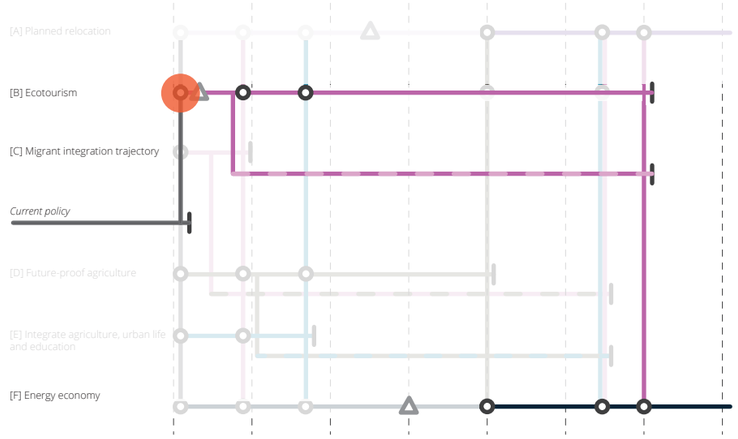
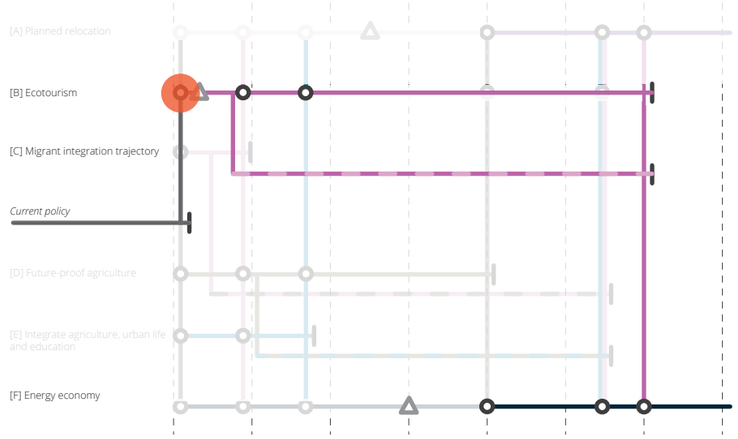
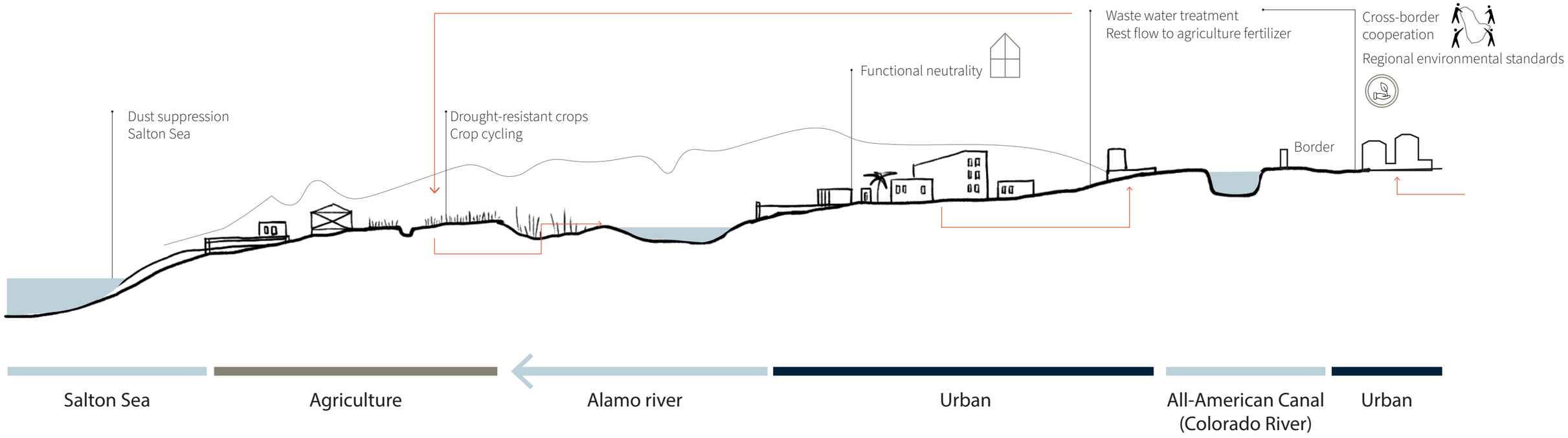


Exploration:
a cross-border future

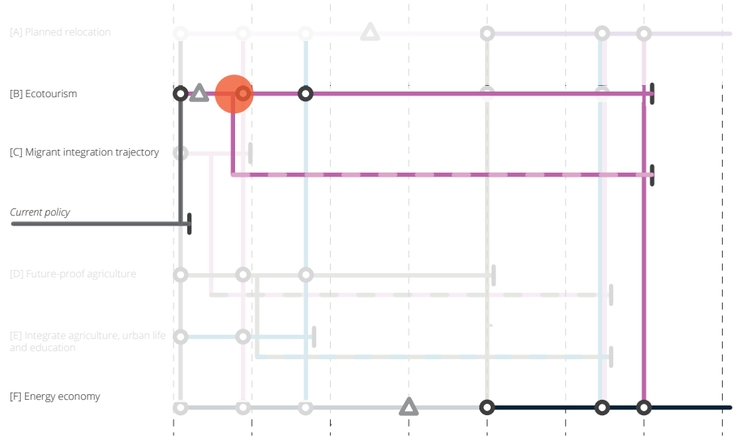
SYNERGY LINE IS ACTIVATED WHEN POLLUTION IS REDUCED

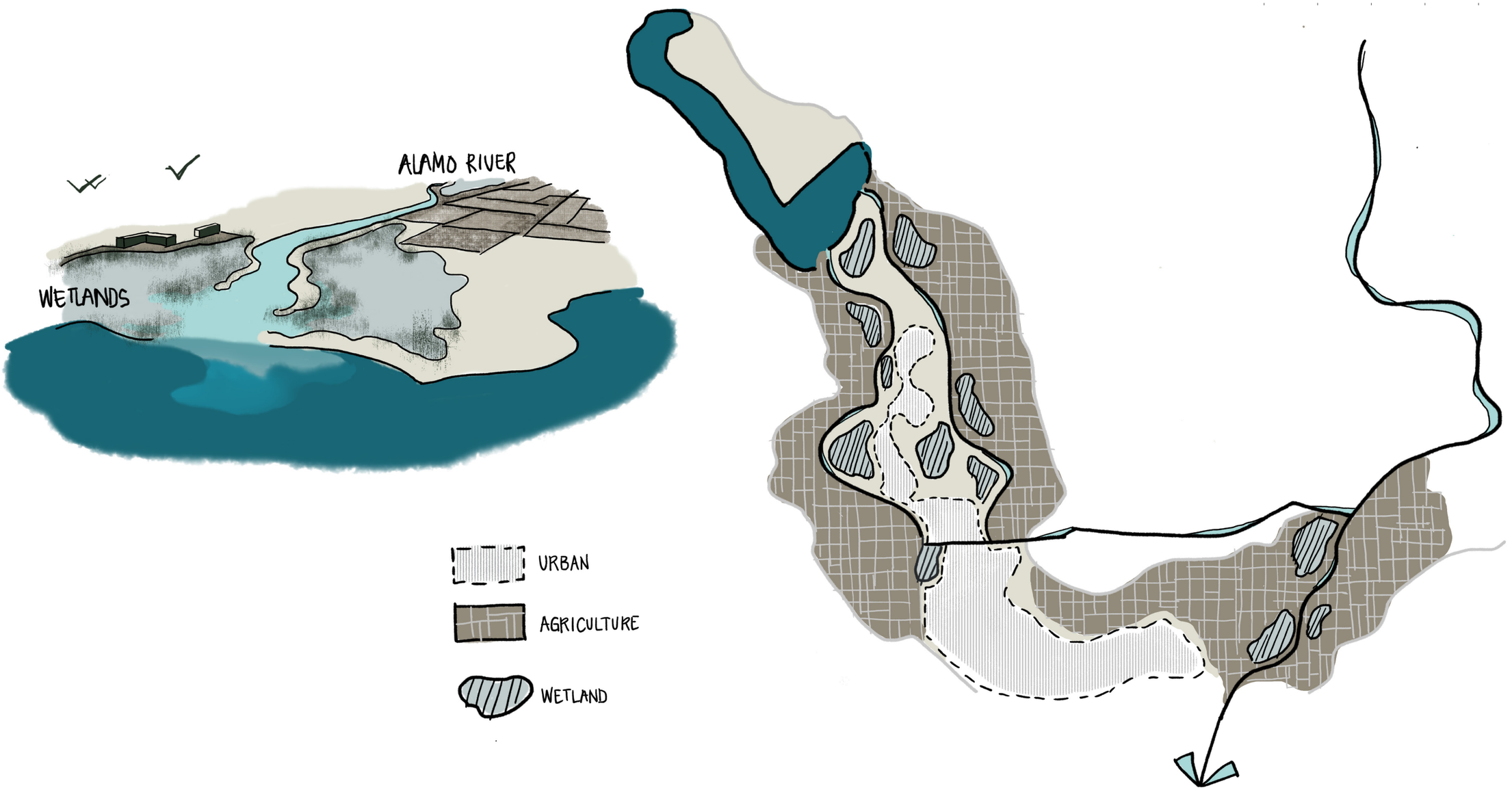




Exploration:
a cross-border future

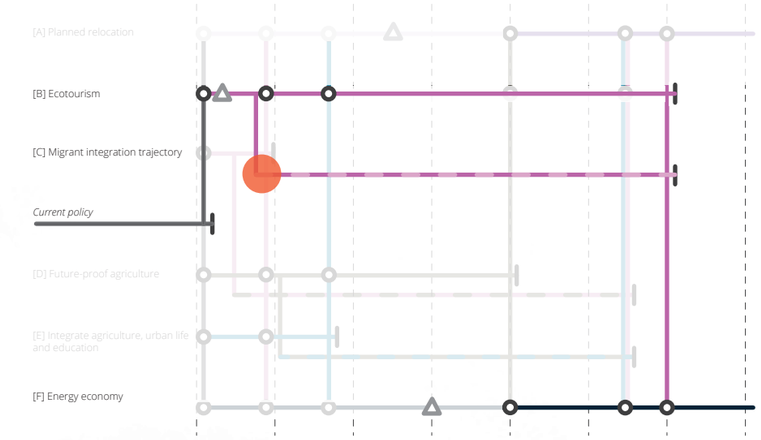
SOME AGRICULTURE MAKES WAY FOR SYSTEM OF WETLANDS





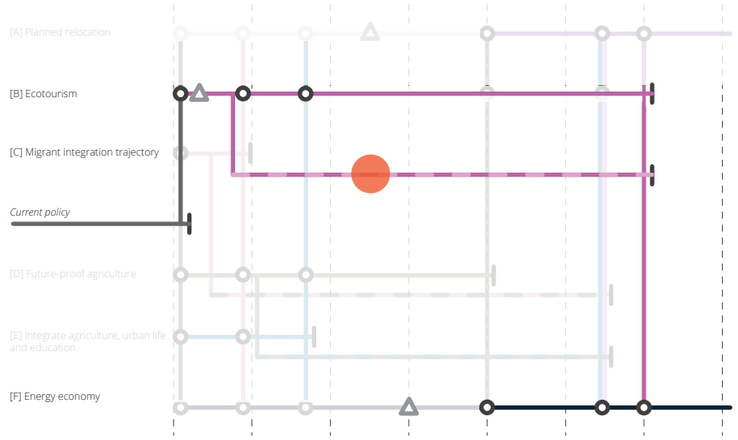
Exploration:
a cross-border future

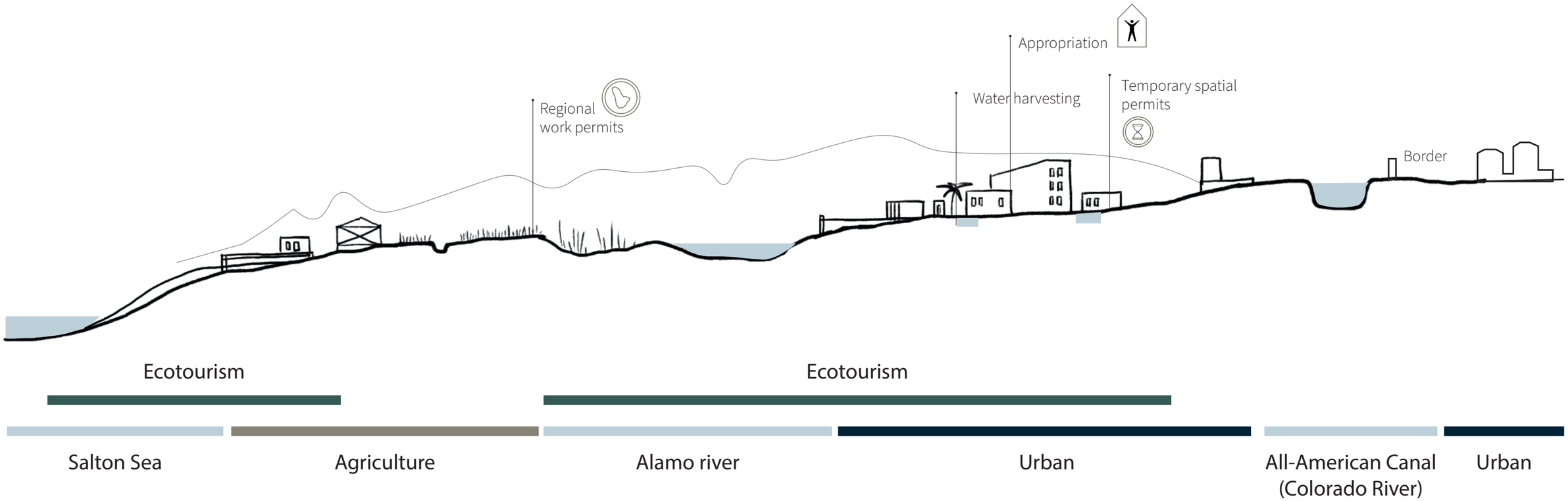
ECOTOURISM AND AGRICULTURE WORK SIDE BY SIDE



Exploration:
a cross-border future

FOCUS ON IMPLEMENTING FLEXIBILITY INSTRUMENTS TO FACILITATE MIGRANT INTEGRATION





Exploration:
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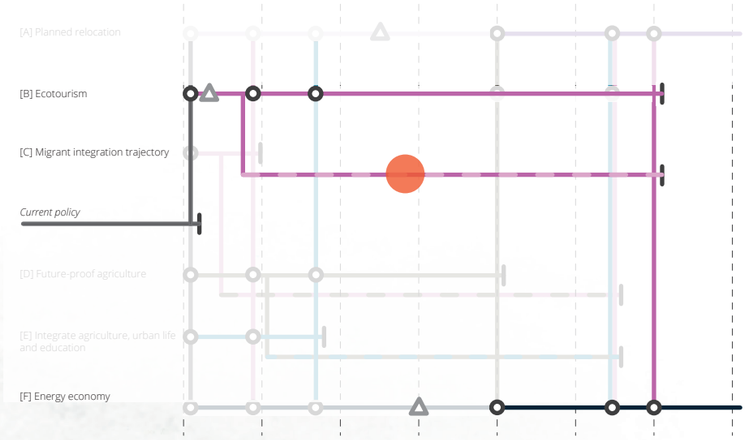
ADAPTIVE HOUSING FOR TEMPORARY MIGRANTS



Exploration:
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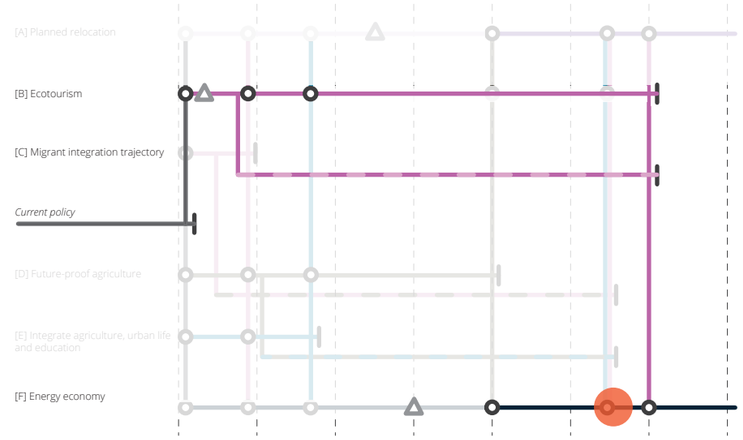
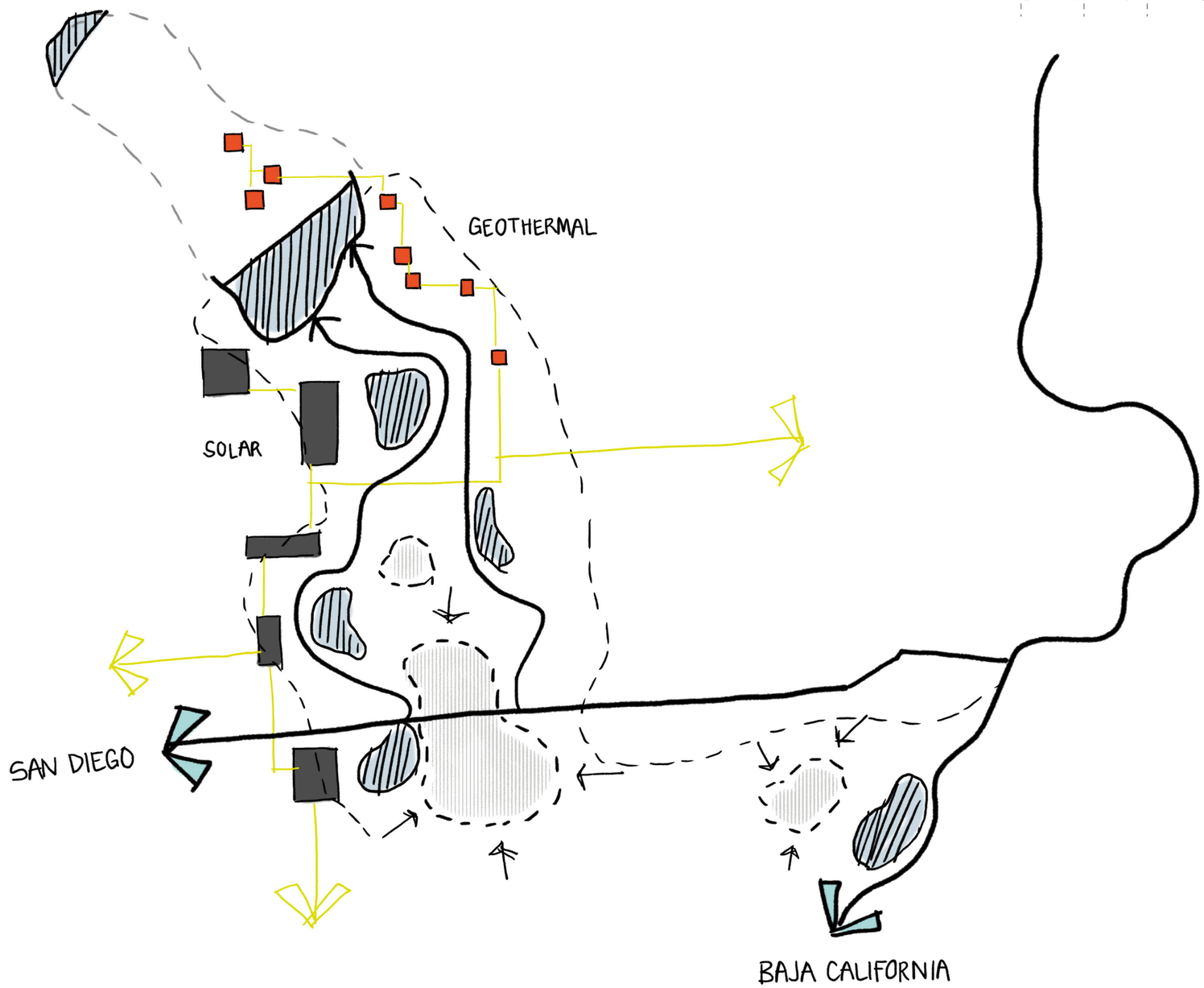
EMPLOYMENT IN ENERGY PRODUCTION ALONGSIDE ECOTOURISM





CHALLENGES:

[1] GOAL SETTING, IMPLEMENTATION

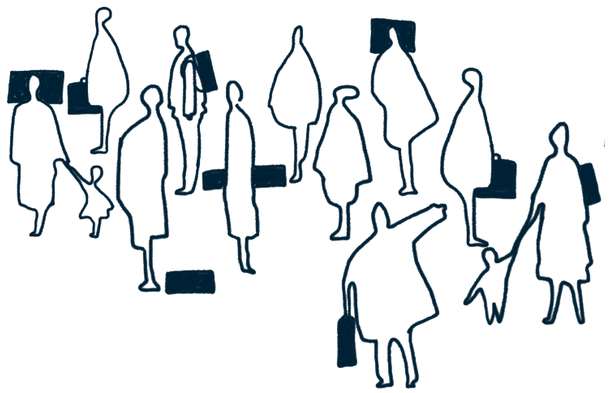
[2] VALUES AND OBJECTIVITY

VALUE:

[1] LONG-TERM PLANNING, RECOGNIZING UNCERTAINTY

[2] ENGAGING STAKEHOLDERS

BACK TO THE RESEARCH QUESTION



How can a scale- and temporal sensitive
planning approach *act towards*
preparedness *in order to respond to the*
threat of climate-induced migration under conditions of
slow-onset climate change uncertainty *in*
the California-Mexico border region?

[1] BY **UNDERSTANDING INTERDEPENDENCIES** AND CASCADING EFFECTS OF ACTIONS (SCALE AND TIME)

[2] BY TIMELY ADOPTING **INSTRUMENTS** THAT WORK TOWARDS **FLEXIBILITY**

[3] BY **UNDERSTANDING AND MONITORING** WHAT IMPACTS **CRITICAL SERVICES** AND PRIORITIZING THEM

[4] BY BEING ABLE TO ADDRESS THE RIGHT **SCALE**

THANK YOU FOR LISTENING!

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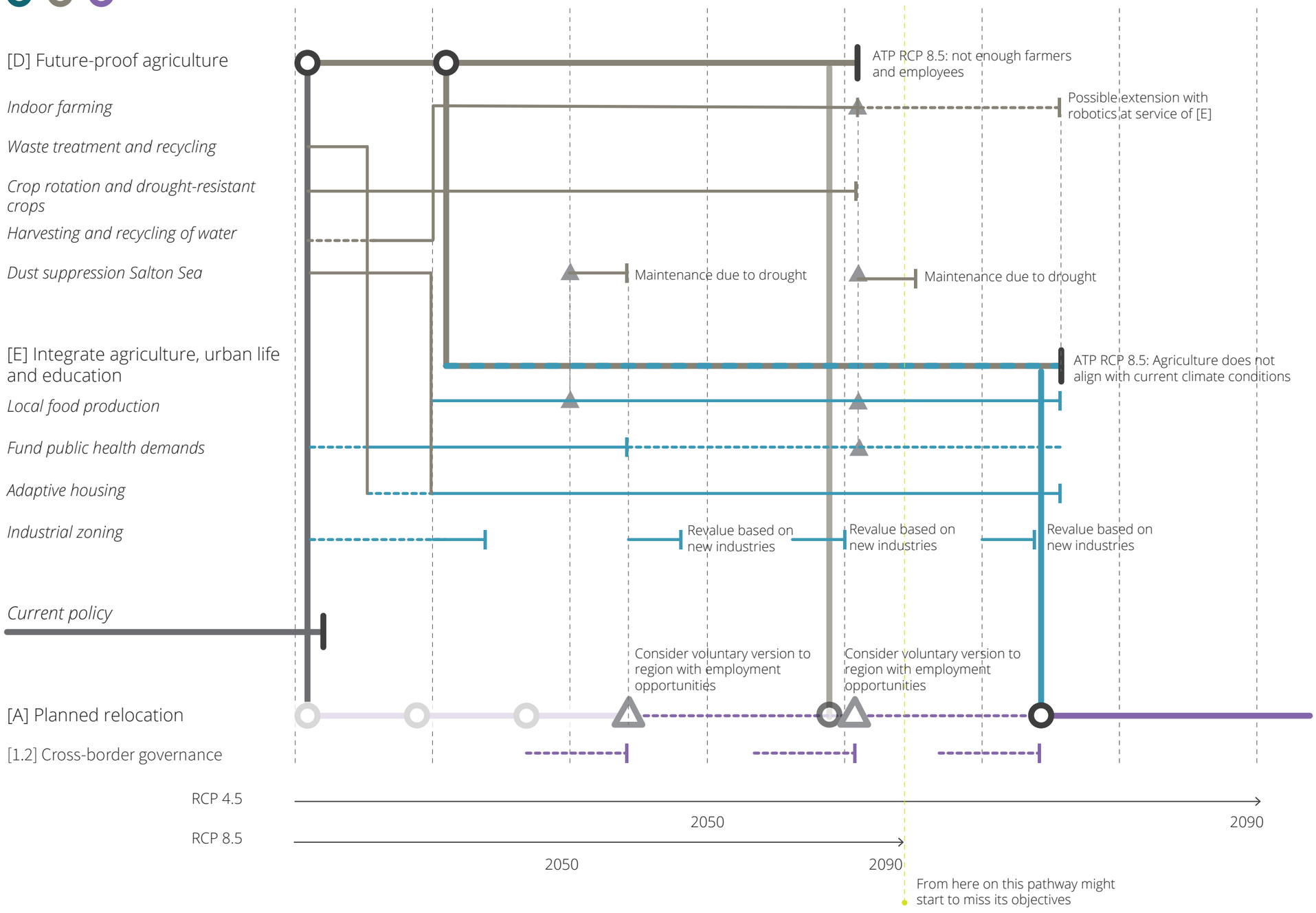
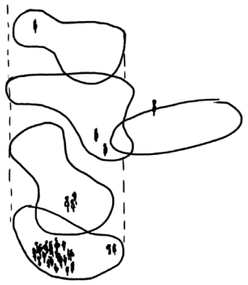
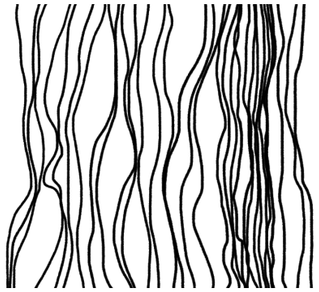
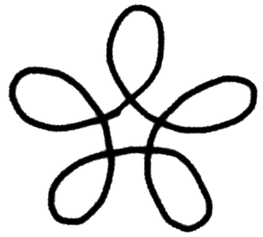
Exploration 1:
rescaling agriculture









[1] Value-led rescaling of development

[1.1] Indoor farming
Smaller local footprint with non-context dependent production

[1.2] Cross-border governance
equal standards for policy, monitoring, enforcement

[1.3] Local food production playgrounds
to make fresh produce accessible and create flexibility if local market demands more food

[1.4] Subsidize and tax industries
based on regional values and regionally defined capacity

[1.5] Create fund for regional public health needs
based on demand, such as pollution filters or heat reduction measures

[2] Compress and expand

[2.1] Adaptive housing policy
that allows for flexibility in housing choice as well as security in tenure

[2.2] Monitor vacancy stock
that allows for quick redevelopment to educational facilities or housing facilities

[2.3] Stimulate in integration services to combat unemployment
children's education, education for entrepreneurship, language services, psychological services, leisure activities

[2.4] Invest in public transport network
to increase accessibility of the region for population without vehicle ownership

[2.5] Invest in renewable energy production
to take advantage of solar and geothermal opportunities

[3] Restoring Ecosystem Services

[3.1] Stimulate ecotourism
to reduce unemployment and boost service sector

[3.2] Establish waste treatment and recycling infrastructure
combining waste flows and reuse residual product

[3.3]Create a series of wetlands along the rivers
to filter water, expand river absorptive capacity and attract wildlife

[3.4] Industrial zoning for safe neighbourhoods
capping industries with harmful emissions

[3.5] Crop rotation and drought-resistant crops
to prevent soil erosion and future-proof agricultural produce

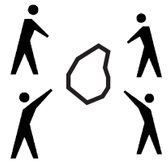
[3.6] Harvesting and recycling of (rain)-water
to create smaller dependency on Colorado River

[3.7] Dust suppression Salton Sea
to prevent toxic air release

Action addresses:

- Water-conscious
- Unemployment relieve
- Pollution reduction
- Variability-conscious

[1] Value-led rescaling of development



Acting locally

Making use of the energy and lived expertise of local community

Cross-border regional coordination

Taking decisions at regional level helps to create synergis-tic cohesion

Value-led co-creation

Form of collaboration where participants define a shared set of values for development

Improvisation, serendipity

Taking action without a prior plan and finding out on the way how it should be done

Appropriation

Users can modify existing structures to make it more convenient for them or express their identity

[2] Compress and expand

Functional neutrality

Creating structures that enable multiple functions

Rescaling infrastructure

Adjusting the size so it matches the environment or programme

Temporary spatial permits

Permit enables use of space for limited period

Local / regional work permits

Permit enables employment in the region for limited period

Authorities facilitate initatives

Licensing authority helps to make initiative possible

[3] Restoring Ecosystem Services

Pre-cycling

Anticipating the recycling of materials or sources

Enhancing energy neutral processes

Buildings, networks and structures are enhanced to lenghten and future-proof their lifespan

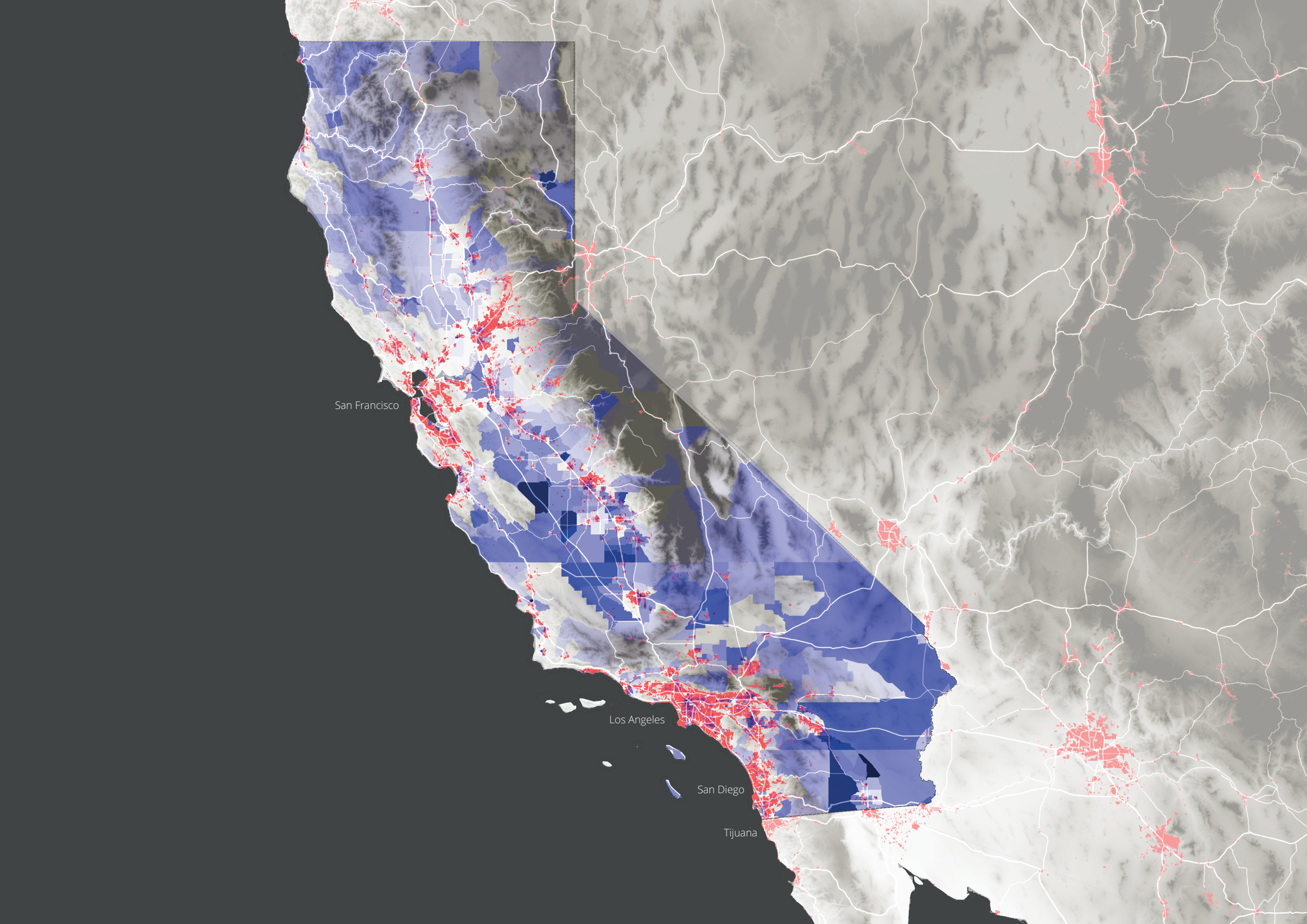
Subsidizing and taxing to create cleaner industry

Regional environmental standards and enforcement

Nature-based solutions

Creating space for natural restorative processes

- Spatial instrument
- Organisational instrument
- Legal instrument
- Financial instrument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San Diego
Tijuana

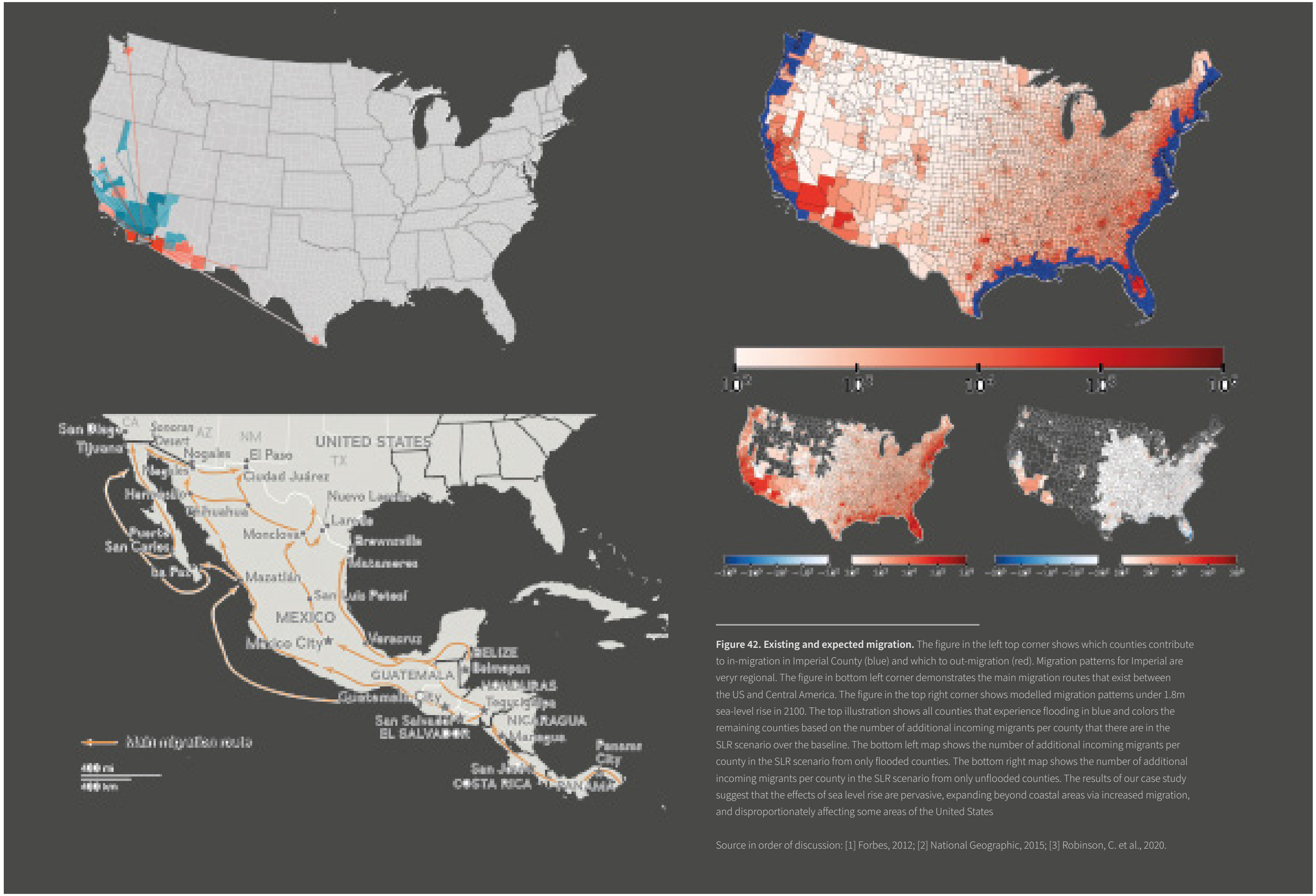
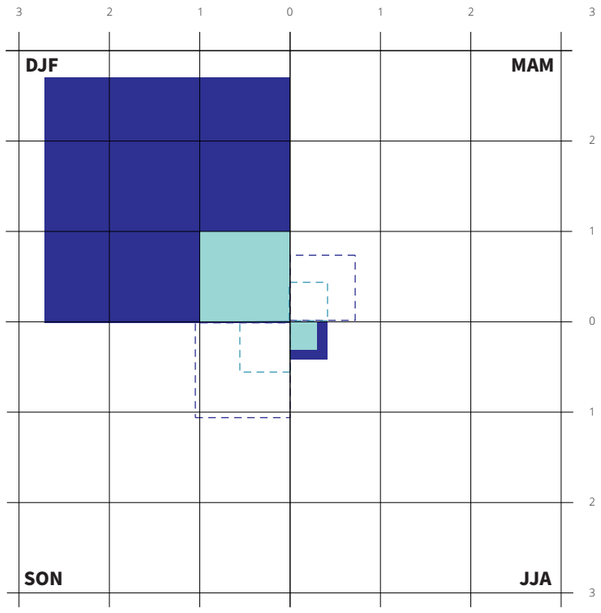


Figure 42. Existing and expected migration. The figure in the left top corner shows which counties contribute to in-migration in Imperial County (blue) and which to out-migration (red). Migration patterns for Imperial are veryr regional. The figure in bottom left corner demonstrates the main migration routes that exist between the US and Central America. The figure in the top right corner shows modelled migration patterns under 1.8m sea-level rise in 2100. The top illustration shows all counties that experience flooding in blue and colors the remaining counties based on the number of additional incoming migrants per county that there are in the SLR scenario over the baseline. The bottom left map shows the number of additional incoming migrants per county in the SLR scenario from only flooded counties. The bottom right map shows the number of additional incoming migrants per county in the SLR scenario from only unflooded counties. The results of our case study suggest that the effects of sea level rise are pervasive, expanding beyond coastal areas via increased migration, and disproportionately affecting some areas of the United States

Source in order of discussion: [1] Forbes, 2012; [2] National Geographic, 2015; [3] Robinson, C. et al., 2020.

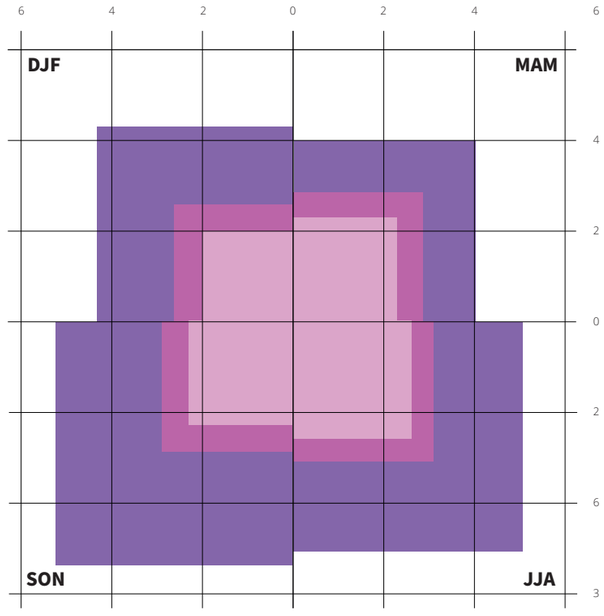


Change in precipitation (+ cm/month) for RCP 4.5 2040 - 2100 and RCP 8.5 2040-2069

Change in precipitation (- cm/month) for RCP 4.5 2040 - 2100 and RCP 8.5 2040-2069

Change in precipitation (+ cm/month) for RCP 8.5 2070-2100

Change in precipitation (- cm/month) for RCP 8.5 2070-2100



Change in max. temperature (°C/month) for RCP 4.5 2040-2069

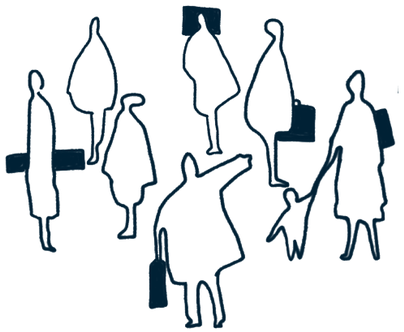
Change in max. temperature (°C/month) for RCP 4.5 2070-2100 and RCP 8.5 2040-2069

Change in max. temperature (°C/month) for RCP 4.5 2070-2100

TYPES OF MIGRATION

Migration

Voluntary migration



Involuntary migration
(displacement)

Non-migration

Voluntary non-migration

Involuntary non-migration
(trapped population)

TYPES OF MIGRATION

Migration

Voluntary migration

Involuntary migration
(displacement)

Non-migration

Voluntary non-migration

Involuntary non-migration
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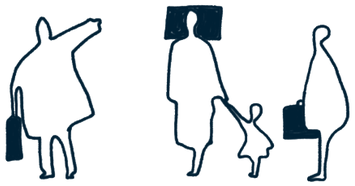
TYPES OF MIGRATION



Short-term migration

Seasonal migration

Permanent migration or relocation