

# Climate Proof Cities

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ANAMIKA SHREEVASTAVA, PURDUE UNIVERSITY



# Introduction

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- Why Climate Proofing?
- Global Initiatives like C40
- Key question: “So what are cities doing towards climate proofing?”



# C40 CITIES

CLIMATE LEADERSHIP GROUP

## 80+ megacities

C40's global network consists of 80+ megacities, and chair Eduardo Paes is committed to include more cities.



## 10 years

2015 marked the 10-year anniversary of C40 Cities Climate Leadership Group.

## 600 million people

C40 represents more than 600 million urban citizens around the world, and this number is set to grow. By 2050, more than two-thirds of the world's population is expected to live in cities.



## 25%

The economies of C40 cities account for one-fourth of global GDP.

## 3 times more likely



When it comes to climate change, cities are 3 times more likely to take action if a goal or target has been established.

## 75%

75% of C40 cities are taking new, better or faster climate actions as a result of participating in C40 networks.

## 10,000 climate actions

Cities are taking concrete action to reduce greenhouse gas emissions and climate risks. As of 2015, C40 cities have together taken 10,000 climate actions.



## 16 networks

C40 has 16 networks in 6 initiative areas.

## 98%

C40 cities take climate change seriously: 98% of cities report that climate change presents risks to their city.

## 3 Gt of CO<sub>2</sub>e

C40 cities are taking action that reduces global greenhouse gas emissions - together, C40 cities have already committed to reducing emissions by 3 gigatons of CO<sub>2</sub>e by 2030.

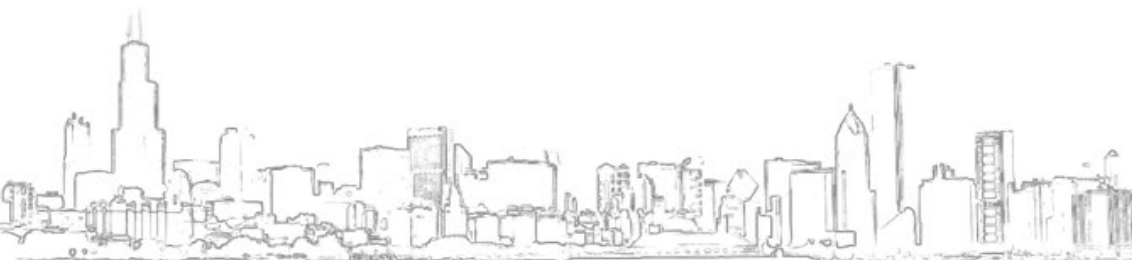


## 1.5°C

C40 cities are committed to helping implement the Paris Agreement & pursue efforts to limit temperature increase to 1.5°C. This ambitious target cannot be reached without urgent action in cities ahead of 2020.



Read more about our achievements at: [www.c40.org](http://www.c40.org)





Green Energy



Solid Waste



Adaptation Planning And  
Assesment



Adaptation Implementaton



Carbon Measurement And  
Planning



Building Energy



Finance And Economical  
Development



Smart Cities And Smart  
Community Engagement

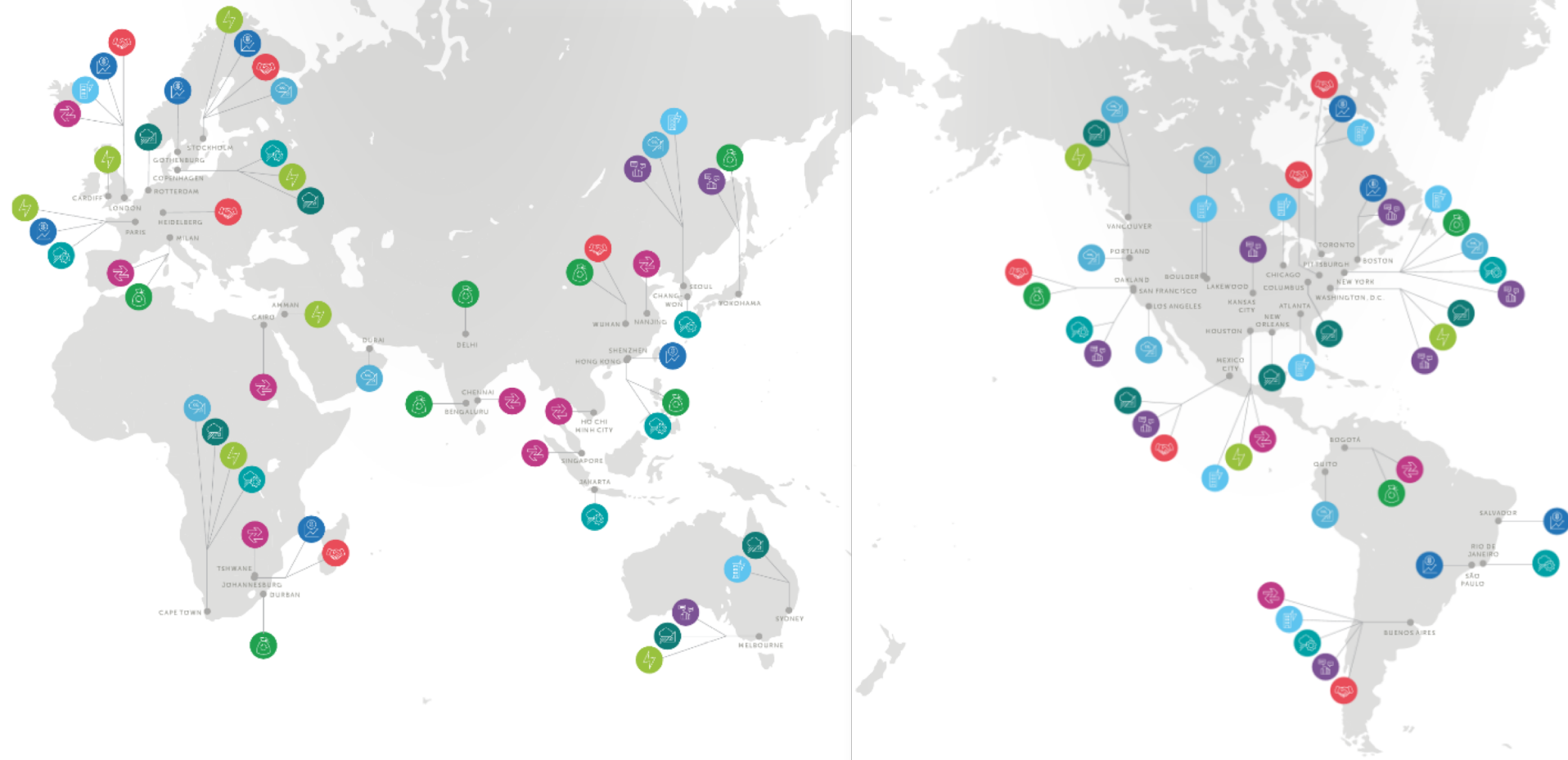


Transportation



Sustainable Communities

10 sectors, 56 cities, 100 success stories



10 sectors, 56 cities, 100 success stories

# Green Energy

- District level heating
- Renewable energy
- Urban Carbon Sink

**Washington DC: Investing in Wind Power**

Cape Town: Promoting Solar water heating

Copenhagen: Building world's biggest Biomass based district level heating system

Vancouver: Building District level heating systems on low carbon fuel sources

Melbourne: Teaming up to generate 100 GWh of renewable energy

Houston: Purchasing Green-e certified power

Amman: Installing solar charged Electric Vehicles network

**Stockholm: World's first Urban Carbon Sink with biochar.**

Cardiff: Investing in green energy to combat fuel poverty

Paris: Green Energy for all public street lighting

# Solid Waste

- Waste reduction
- Optimised waste collection
- Landfill to habitat

Yokohama: Engaging businesses and residents in waste reduction

**New York City: Reducing waste to landfill by 90%**

Bogota: Improving social equality for recyclers

Milan: Collecting residential food waste city wide

Wuhan: Improving living environment by converting landfills to gardens

Oakland: Encouraging curbside composting and recycling to reduce load on landfills

**Bangalore: GIS based model to track and optimize waste disposal routes**

Durban: Turning landfill into natural habitat by employing local communities

Hong kong: Reducing food waste by spreading awareness

Delhi: Turning waste into compost and fuel

# Adaptation Planning and Assessment

- Awareness
- Co-operation across scales
- City wide green infrastructure

Melbourne: Holistic City Adaptation plan by spreading awareness

Cape Town: Set back line protects the coast and guides development

Rotterdam: Building resilience and a better quality of life by increasing green spaces, roofs, and urban water spaces

**Vancouver: Changing building bylaws to for sea level rise**

**Copenhagen: Green and blue infrastructure to absorb excess water.**

New Orleans: Increasing co-operation across tiers of government to find gaps in the responsibility

Mexico City: Comprehensive program to spread CC Awareness

Sydney: Increasing co-operation across tiers of government

Washington DC: Improving collaboration to reduce flood risk

Columbus: Securing local river's water supply



# Adaptation Implementation

- Strengthen existing infrastructure
- Increasing capacity
- Engage communities

San Francisco: Mandatory on-site water treatment

Rio de Janeiro: Building under ground reservoirs and river diversion to prevent flooding

Copenhagen: Implementing green sewerage infrastructure

Cape town: Using plumbing to prevent domestic leakages

**Paris: Green roofs and spaces to reduce Urban Heat Island**

Buenos Aires: Building reservoirs to prevent floods in low-income communities

Changwon: Cleaning local water streams for biodiversity

New York City: Engaging communities in flood resilient planning

Jakarta: Providing Low cost housing to flood prone slum dwellers

Hong Kong: Robust drainage infrastructure such as diverting waterways, and underground water storage

# Carbon Measurement and planning

- Green jobs
- Renewable energy
- Data driven targets

New York City: Alleviating poverty by addressing waste and transportation sector problems

Seoul: Citizen led practices such as public transport use, energy efficiency and conservation practices

Vancouver: Green jobs and local food jobs

Portland: Tracking emissions from production to product

**Stockholm: becoming fossil fuel free by 2040**

Los Angeles: Plan to reduce 80% waste diversion, and 50% electricity to renewable resources

Quito: Designing policies tailored to measured carbon and water footprints

Cape town: Designing policies tailored to comprehensive energy reports

Lakewood, CO: Data driven achievable climate targets

Dubai: Green economic development, reducing oil dependence

# Building Energy Efficiency

- Retrofitting
- LED for street lights
- Green building bylaws

## London: Large scale building retrofitting

Seoul: Financial incentives to encourage retrofitting

New York City: Making the new and existing buildings energy efficient by 2025

## Houston: Replacing street lights with LEDs

Boulder: Collaborating with companies to help in energy regulations

Chicago: All scales building retrofit program

Buenos Aires: Replacing street lights with LEDs

Sydney: Targetting building emissions by upgrading water and energy systems

Toronto: Enforcing mandatory standards for sustainable buildings

Atlanta: Encouraging energy and water savings while creating jobs

# Financial and economic development

- Buy green bonds
- Pooling in funds
- Incentivize green projects

Johannesburg: Securing finances via green city bond schemes

Toronto: City owned agency (Toronto Atmospheric Fund) that funds green projects

Gothenburg: First city to issue green bonds

**Sao Paulo: Incentivizing density near public transit**

**Shenzhen: launching an emissions trading scheme**

Stockholm: Using revenues from congestion pricing schemes to fund metro expansion

Boston: Providing loans to retrofit projects from Deep Green Loan pool

London: Creating funds from private and public sector money

Paris: Launching first ever 'Climate bonds' i.e. green bonds which focus solely on city government

Salvador: Incentivizing sustainable buildings by property tax rebates

# Smart Community engagement

- Awareness
- Real time data monitoring
- Livable environment

Yokohama: Installing city wide energy smart grids

New York City: GreenNYC changing consumer behaviour by green campaigns

**Mexico city: Integrating bike share program with public transport**

Boston: Greenovate Boston uses digital media and monitoring systems to engage residents

Seoul: Helping citizens make informed decisions using Real time mobile based Data driven services

San Francisco: Educating citizens about health impacts of urban climate

**Buenos Aires: Launching water and weather monitoring system to help prepare for and prevent damaging floods**

Melbourne: Endorsing web based tools for building retrofit

Kansas city: Public private partnership to build smart connected city network

Washington DC: Encouraging peer-to-peer messaging targets

# Transportation

- Electric vehicle
- Public transit systems
- Walkability

London and Bogota: endorsing hybrid bus market across 24 cities

**Nanjing: World's fastest ushering of electric vehicles on the street**

Chennai: Encouraging walking and cycling by the streets

Tshwane: Installing rapid bus transit system

Milan: World's first free floating and integrated ride sharing system of bikes, scooters, and electric cars

Ho chi minh city: Changing public opinion of mass transit

**Houston: Increasing rail line connectivity**

Buenos Aires: Installing rapid bus transit system

Cairo: Replacing aging taxi fleet with cleaner vehicles

Singapore: Boosting public transport and limiting private cars

# Sustainable communities

- Revitalize brownfields
- Walkability
- Increase parks

Stockholm: Building on brownfield sites

Johannesburg: Creating affordable public transport and better transport corridors with equality in mind

Heidelberg: Minimizing buildings and vehicular emissions.

Buenos Aires: Improving safety for cyclists and pedestrians

Oakland: Enabling Bus Rapid Transit and affordable green housing

**Wuhan: Turning heavy industrial areas to ecological communities**

Toronto: Revitalizing contaminated urban brownfields

**London: Turning unused land into community gardens**

Pittsburgh: Launching Low Carbon Corridor program to reduce emissions

Mexico City: Promoting accessibility to existing parks

C40 cities

**C40 cities**  
6 views

All changes saved in Drive

Add layer Share Preview

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Smart cities and smart communi...

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Transportation

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**Sustainable Communities**

Individual styles

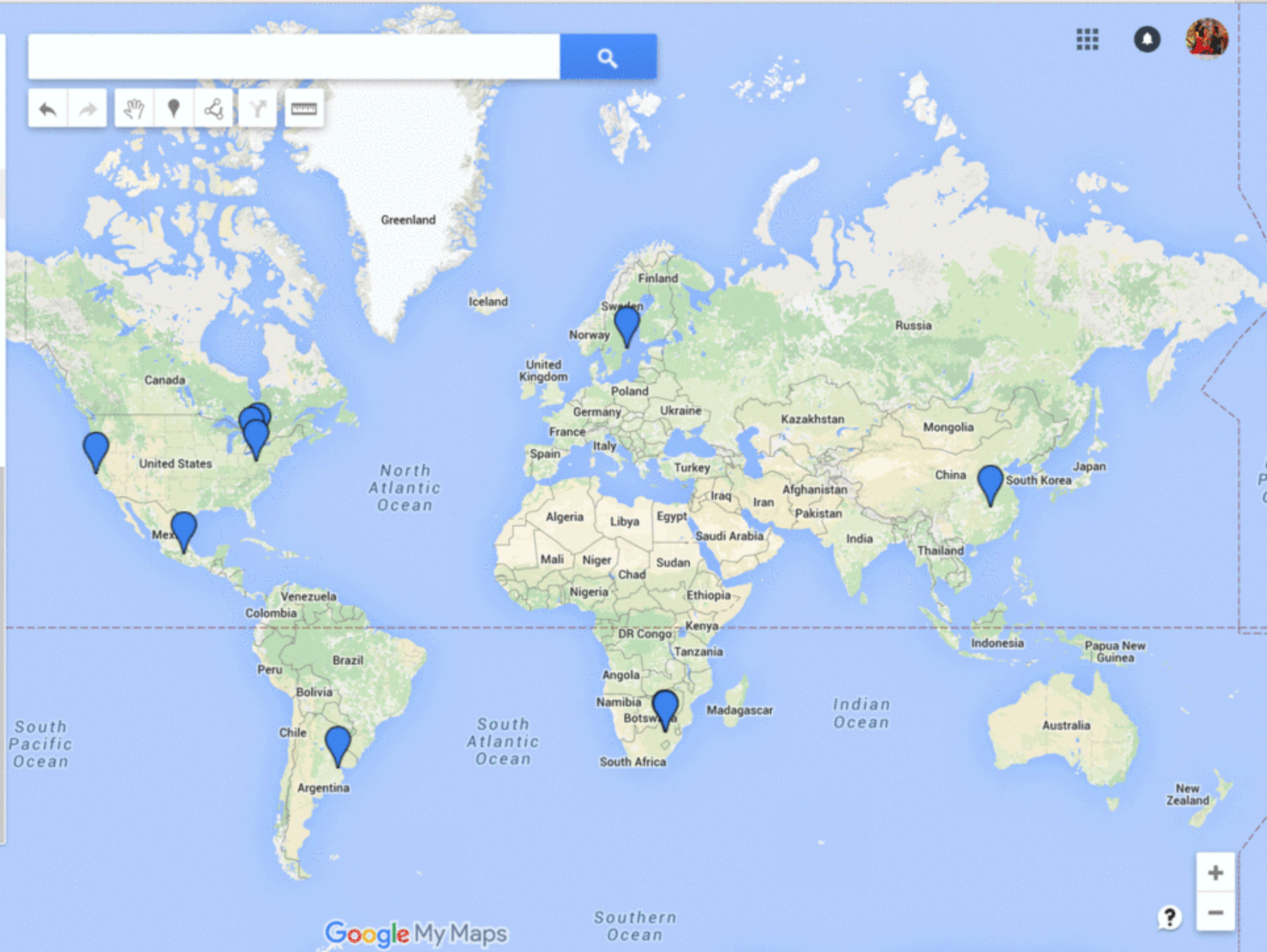
- Stockholm
- Johannesburg
- Heidelberg
- Buenos Aires
- Oakland
- Wuhan
- Toronto
- London
- Pittsburgh
- Mexico City

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Base map

Search bar with magnifying glass icon

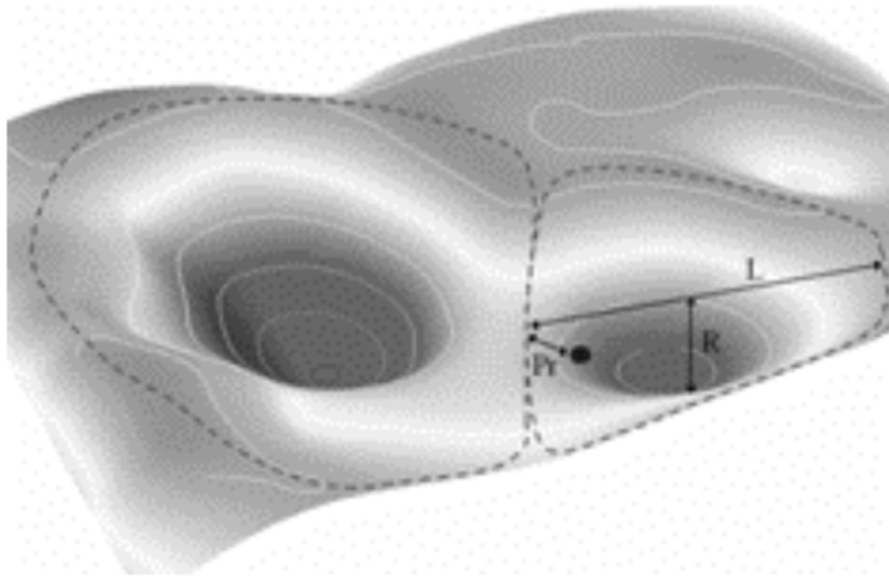
Map navigation toolbar: back, forward, pan, pegman, street view, compass, scale





# Concept of Resilience

**Fig. 1a.** Three-dimensional stability landscape with two basins of attraction showing, in one basin, the current position of the system and three aspects of resilience,  $L$  = latitude,  $R$  = resistance,  $Pr$  = precariousness.



1. **Latitude:** the maximum amount a system can be changed before losing its ability to recover (before crossing a threshold which, if breached, makes recovery difficult or impossible).
2. **Resistance:** the ease or difficulty of changing the system; how “resistant” it is to being changed.
3. **Precariousness:** how close the current state of the system is to a limit or “threshold.”
4. **Panarchy:** because of cross-scale interactions, the resilience of a system at a particular focal scale will depend on the influences from states and dynamics at scales above and below.

Source: Walker, et al. 2004



# Which aspect are they working on?

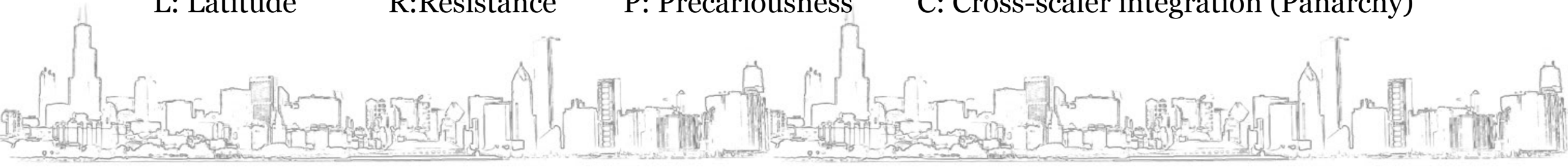
Case Study	Green Energy	Solid Waste	Adaptation Planning	Adaptation Implementation	Carbon Measurement	Building Energy	Finance and Economic Development	Smart Community Engagement	Transportation	Sustainable Communities
1	P	P	L	P	P	P	P	P	P	L
2	P	P	L	L	C	P	C	P	P	R
3	P	L	L	L	P	P	P	P	P	P
4	P	P	L	P	P	P	P	C	P	L
5	P	P	L	R	P	P	P	P	P	P
6	P	P	C	L	P	P	P	C	P	P
7	P	P	C	P	C	P	P	R	P	P
8	L	P	C	C	C	P	P	P	P	L
9	P	P	C	R	P	C	P	R	P	P
10	P	P	R	R	P	P	P	C	P	R

L: Latitude

R:Resistance

P: Precariousness

C: Cross-scaler integration (Panarchy)



# Bigger picture

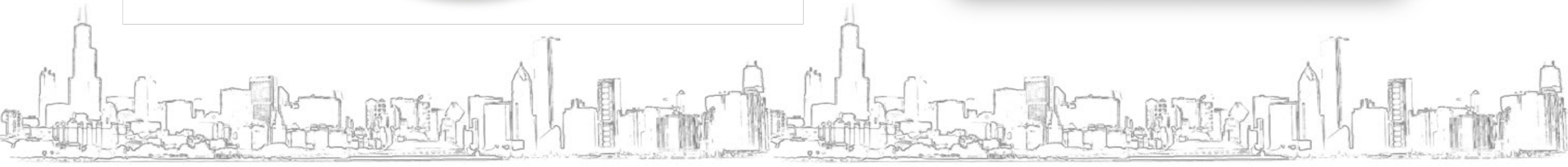
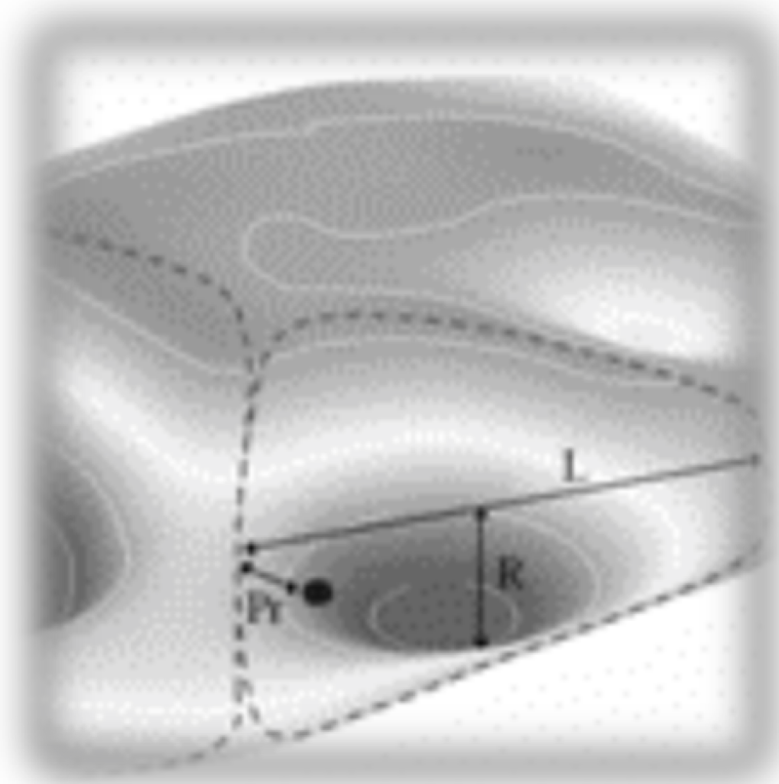
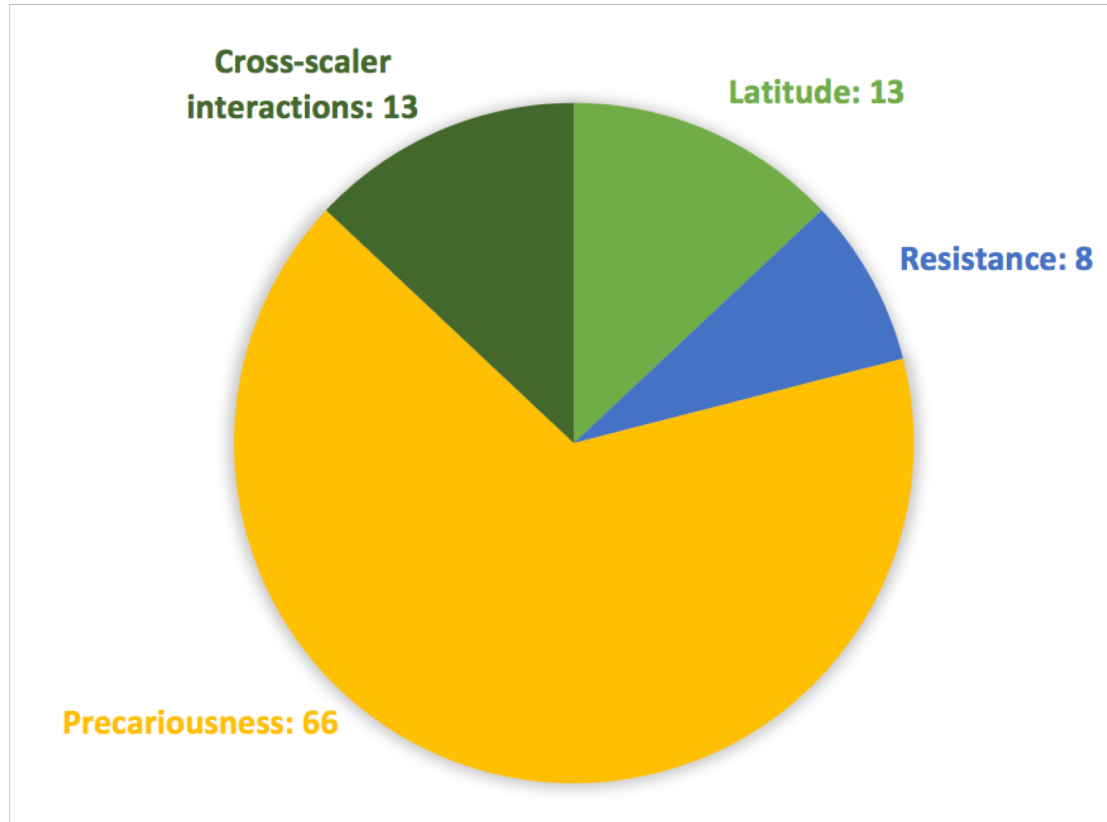
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- Is there a Master Algorithm?
  - Different cities, different problems
  - No one solution, but one goal!
- Stability basins give a holistic understanding of Urban Resilience
- An organised way of approaching the problem



# Sure! But what can we do about it?

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# Food for thought! 🤔

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- Should Precariousness be the natural first step?
- What if there's a moving threshold?
- What should the ideal stability basin topology look like?
- Are we in the wrong basin all together?  
...and perhaps transformation is a better way?

