

Integrating ecosystem services into urban planning

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Natural Capital Singapore
April 2021







*Where and when
does nature
provide what
benefits to whom?*

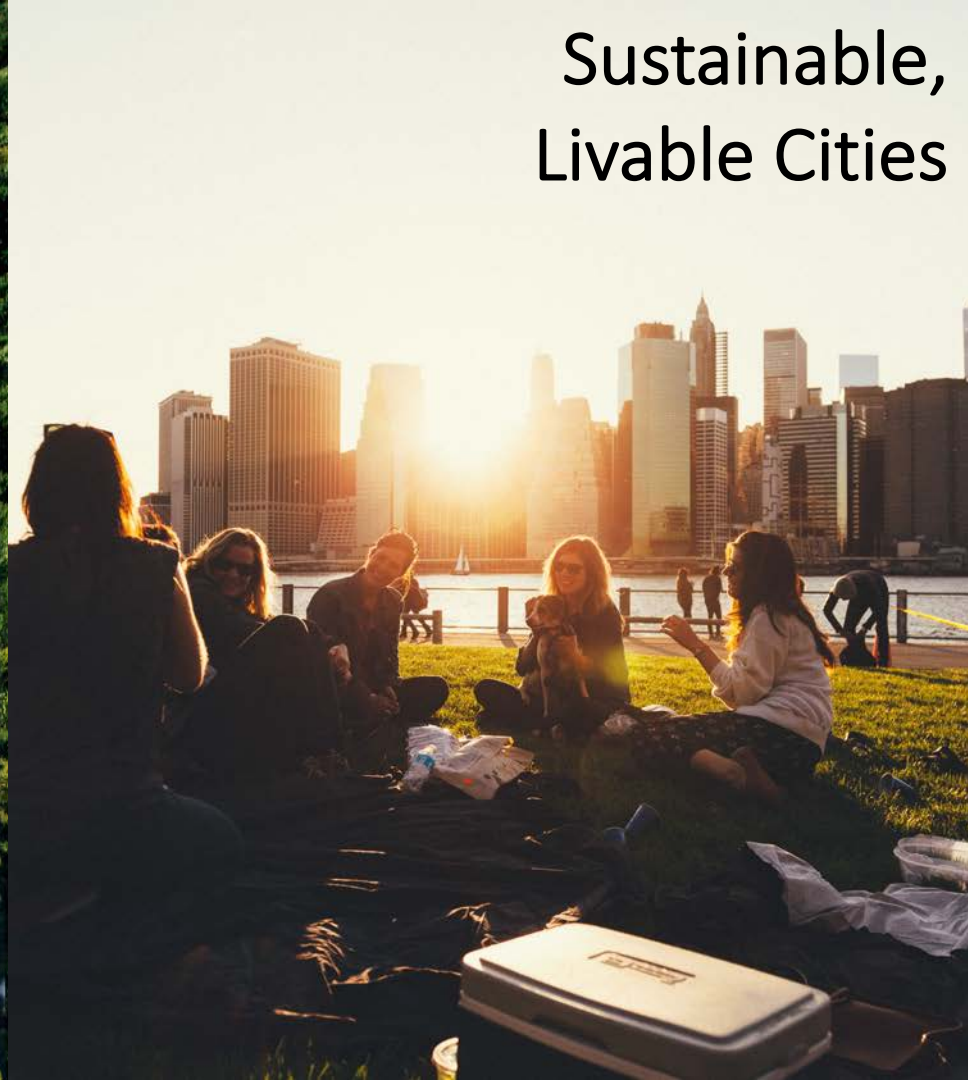
*How can we use
that understanding
to inform decisions?*



Sustainable
Development



Sustainable,
Livable Cities



Our Sustainable, Livable Cities Program

Vision: Integrate biodiversity and nature's contributions to people in city planning, conservation, and development to improve outcomes for both people and the planet



Urban challenges

- Inequity
- Air pollution
- Urban heat islands
- Flooding
- Energy consumption
- Water & food security
- Changing climate
- Biodiversity protection
- Pandemic recovery
- Mental and physical health
- ...



natural
capital
PROJECT

Stanford
University

Pioneering science, technology, and partnerships
that enable people and nature to thrive.

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship



Stockholm
University

INSTITUTE ON THE
ENVIRONMENT

UNIVERSITY OF MINNESOTA

Driven to DiscoverSM



The Nature
Conservancy 





Science



Access to nature and health: 2 pathways

Impact of Nature Experience on Mental Health

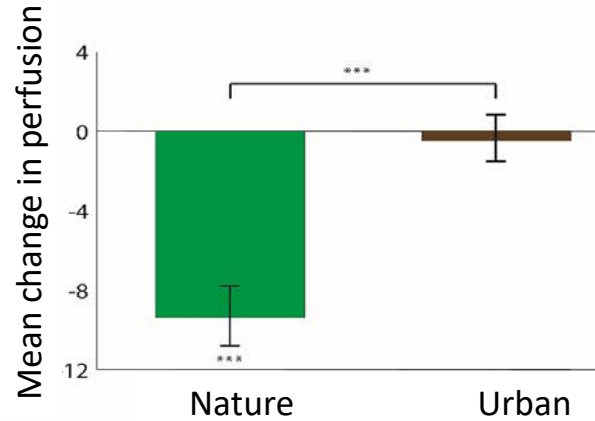
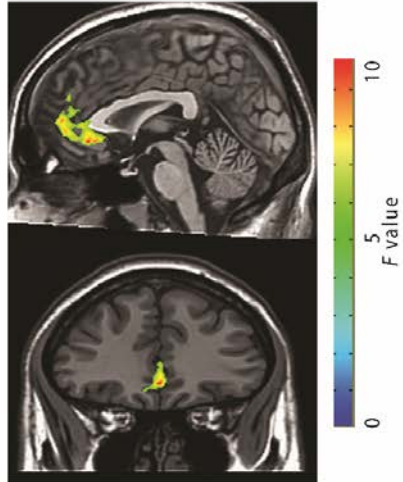
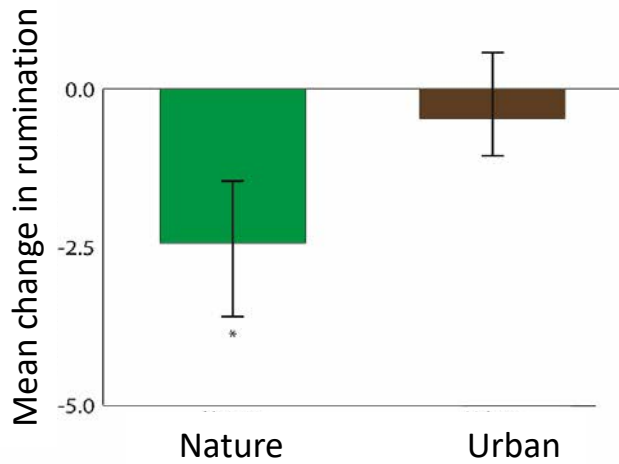
$$(7+1)/2 = 4$$

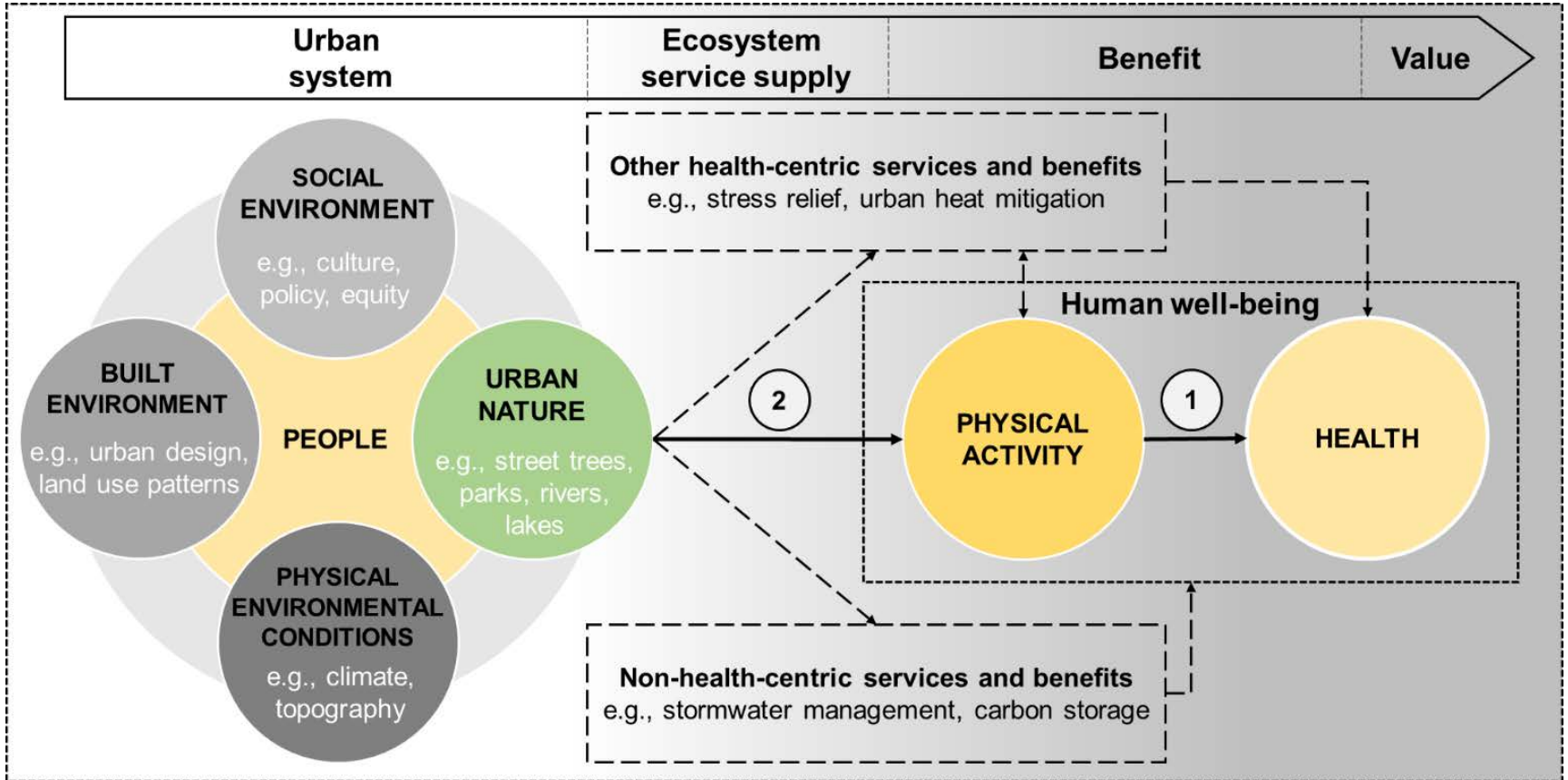


$$(7+1)/2 = 4$$

Bratman et al. 2015 PNAS

Changes in rumination and brain activity with nature exposure







Technology

The Natural Capital Platform

Harnessing global environmental data to provide decision makers with actionable information for planning, finance, and conservation decisions.

Changes in ecosystem → Changes in ecosystem services and their values

InVEST

integrated valuation of
ecosystem services
and tradeoffs



Pollination



Coastal flood
protection &
erosion control



Stormwater
retention



Visitation,
Scenic quality



Urban cooling



Climate change
mitigation



Flood risk
mitigation



Mental &
Physical health,
Biodiversity

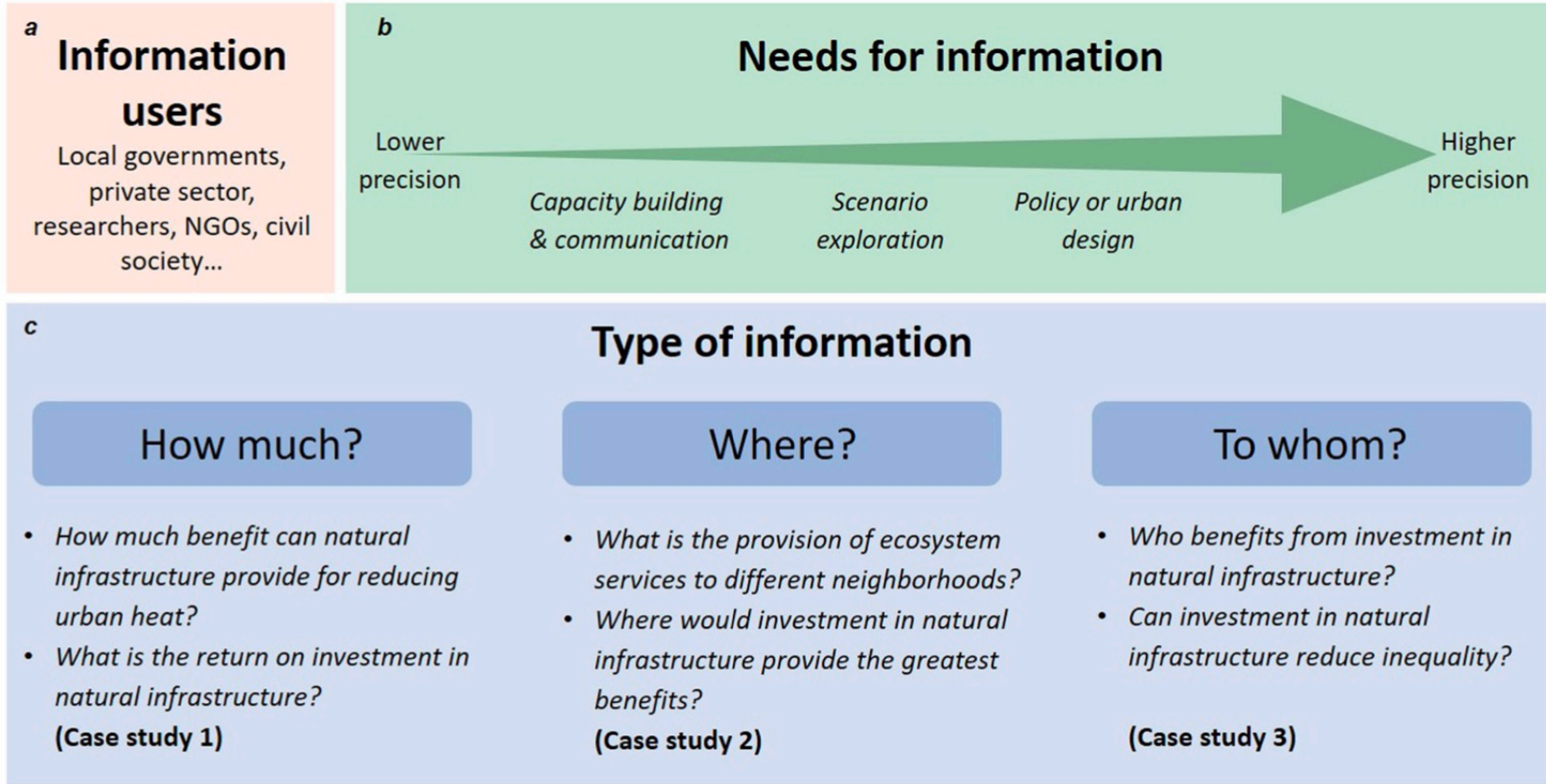


Access to
green space



Air purification,
Food
production





<https://naturalcapitalproject.stanford.edu/>

Stanford University



NATURAL CAPITAL PROJECT

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Training and Events

We offer a wide range of courses to help you learn to use our approaches and tools. Starting with basic concepts and building to project-specific, in-depth support, we hope to help you use ecosystem services to inform decisions. We also offer tailored workshops ranging from remote hackathons to seminars. Contact us below for more information.

Natural Capital Project's Online Course



Natural Capital Conversations



Tradeoff! Training Games

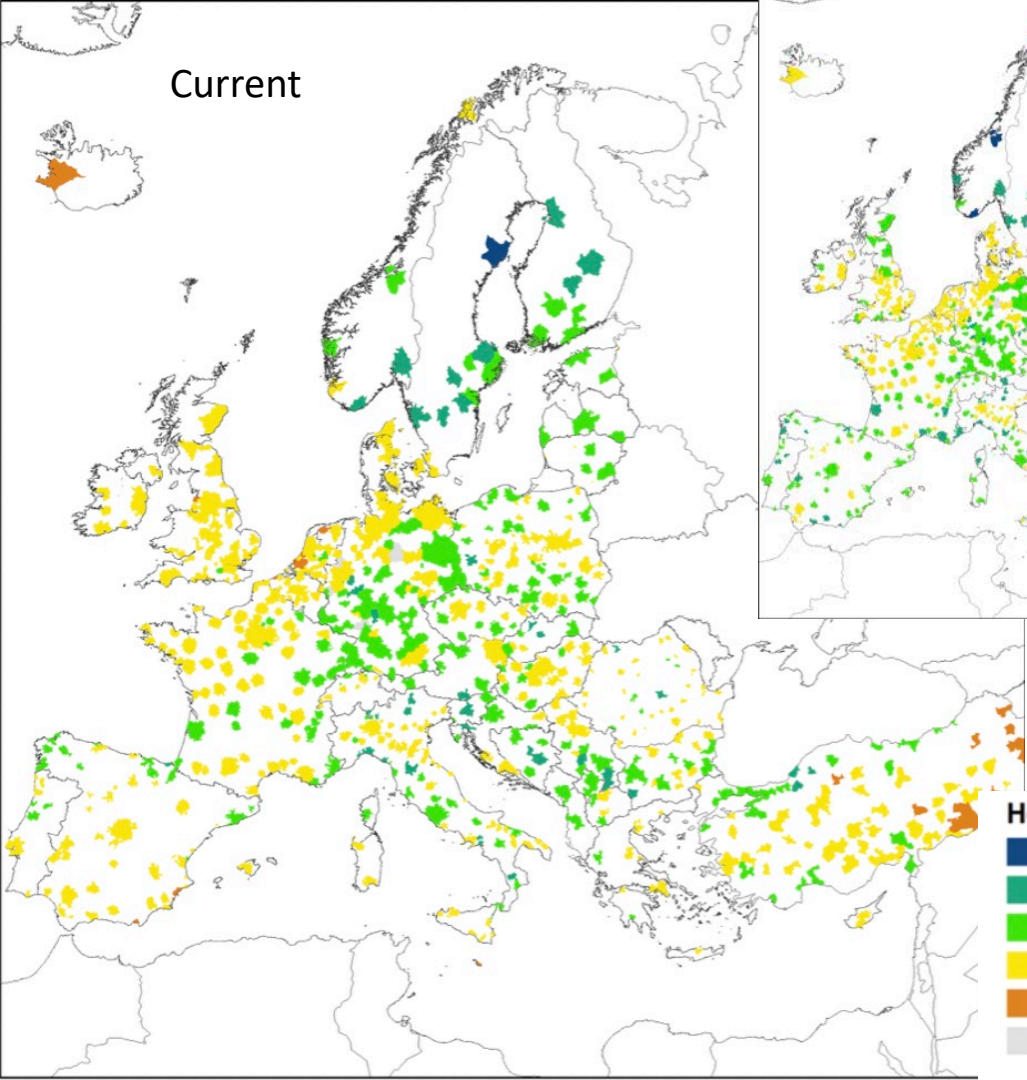




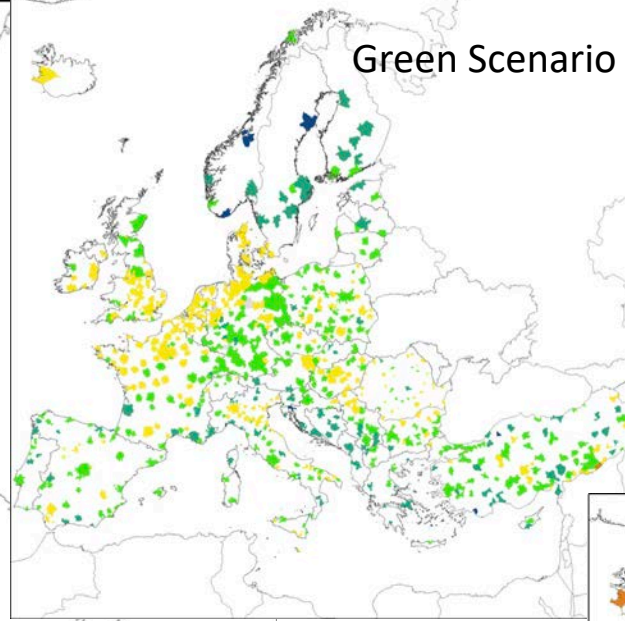
Assessment of 775 European Cities

Source: PBL Netherlands Environmental Assessment Agency

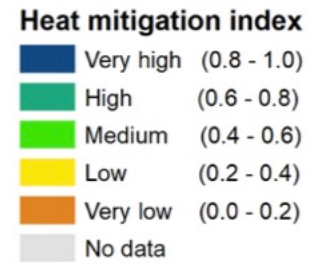
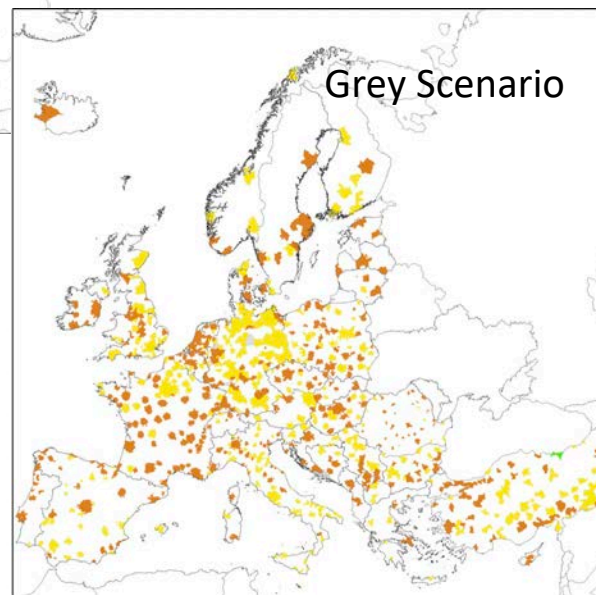
Current



Green Scenario



Grey Scenario





Partnership



- Development Planning
- Livable Cities
- Securing Freshwater
- Private Sector Standards
- Resilient Coastal Communities

3 stories

- Urban climate adaptation planning
- Urban development planning
- Urban land-use planning and equity



1. Urban Climate Adaptation Planning



- Development Planning
- Livable Cities
- Securing Freshwater
- Private Sector Standards
- Resilient Coastal Communities



Adapt to rising seas in an urban area

- Where and when can nature-based solutions help?
- What co-benefits to they provide?

SAN MATEO COUNTY

Yosemite -
Visitation (28)

Colma -
San Bruno (27)

San
Mateo (26)

Belmont -
Redwood (25)

San
Francisquito (24)

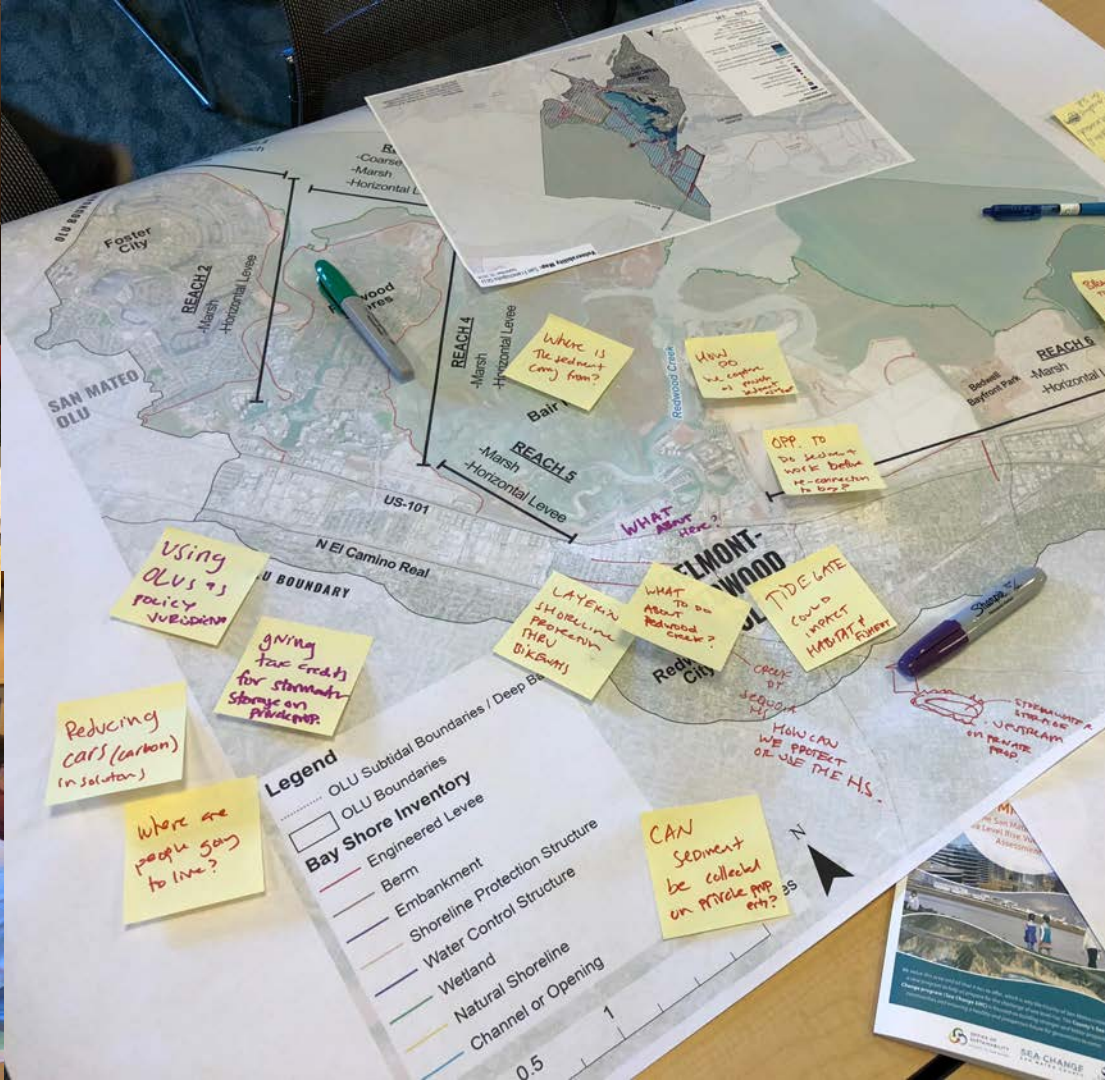
natural
capital
PROJECT

Stanford
WOODS
INSTITUTE for the
ENVIRONMENT

SEA CHANGE
SAN MATEO COUNTY

SFEI | AQUATIC
SCIENCE
CENTER
SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

Population: 770K
8 cities



Three Scenarios

1. What we might have done – armored the whole shoreline – serves as a baseline or comparison point



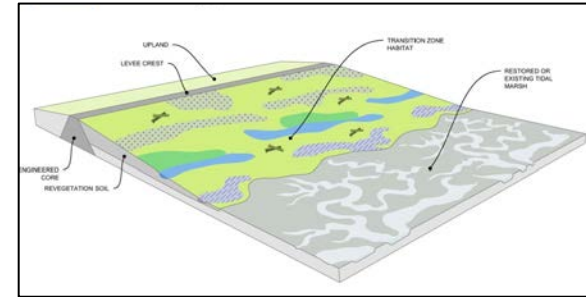
Alameda Point Runway Wetland -
alamedapointenviro.com

2. What we have done – protect existing marshes and restore as much of the salt ponds to marsh as possible.



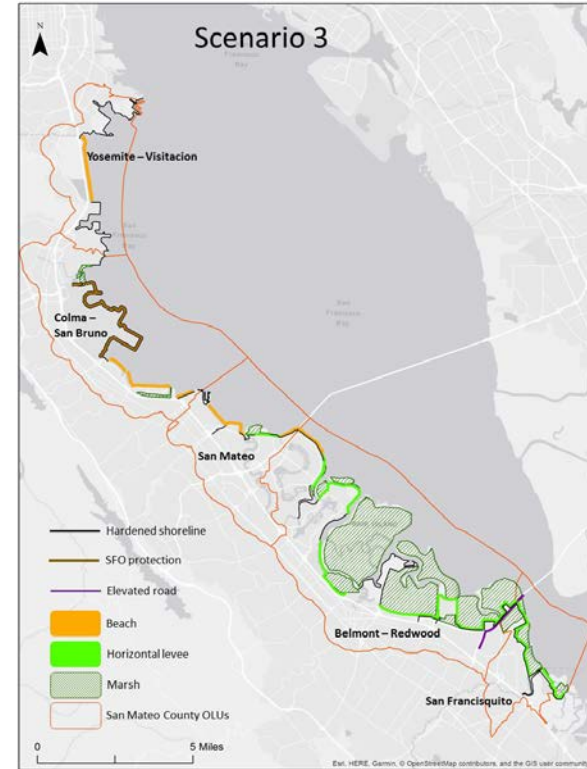
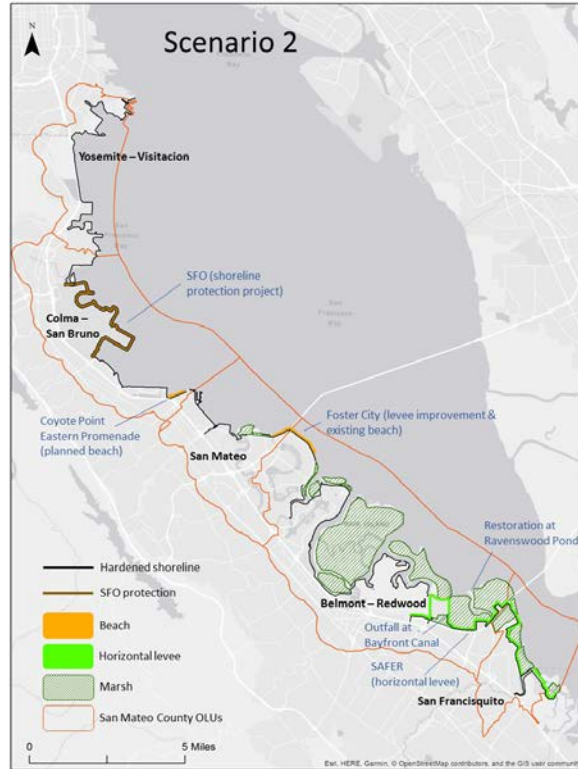
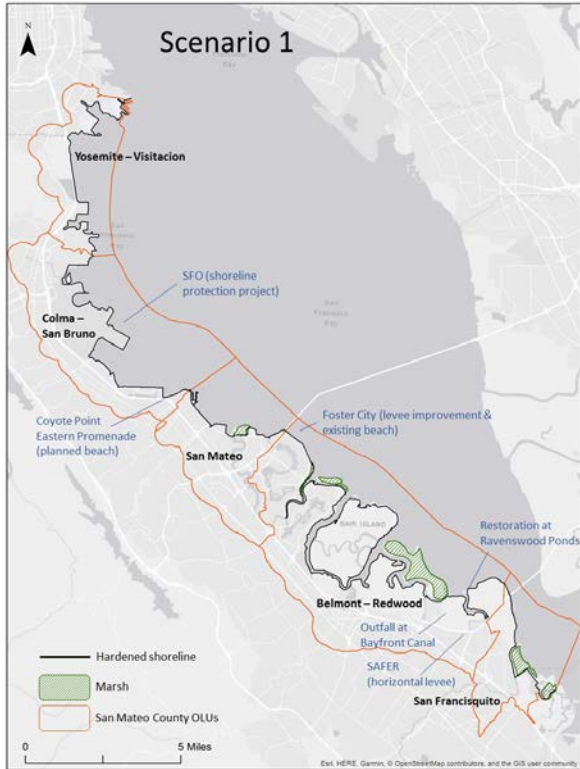
Outer Bair Island- alamedapointenviro.com -
Dicklyon

3. What we could do next – *add nature-based features* throughout to protect marshes and communities



Horizontal Levee –
HT Harvey & Associates

Three Scenarios



Compared to an Engineered Shoreline...

Benefits	Restoration	Restoration + Nature-based Adaptation
Marsh habitat	5.4x	6.9x
Beach	+0.5 km ²	+1.7 km ²
Recreation*	1.0x	1.0x
Runoff retention*	5.6x	6.8x
Carbon storage and sequestration*	5.1x	6.3x

* (used InVEST model)

- Creating maps of opportunities for nature-based solutions
- Articulating multiple benefits of nature-based solutions in particular places to inform decisions
- Informing adaptation toolkit for cities in the county



2. Urban Development Planning

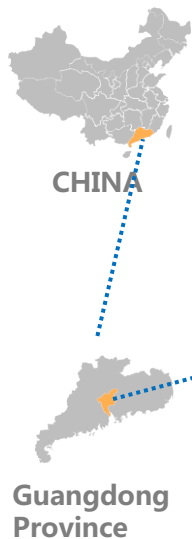


- Development Planning
- Livable Cities
- Securing Freshwater
- Private Sector Standards
- Resilient Coastal Communities

Location 区位

Haizhu Wetland with a total area of 11km², located in the Southeast of Haizhu District, is the first national wetland park in Guangzhou. It's known as the "Green Heart" of Guangzhou, serving as an important passage for migratory birds and critical ventilation corridor to adjust urban climate.

海珠湿地, 总面积11平方公里, 地处广州中央城区海珠区东南隅, 是广州第一个国家级湿地公园。海珠湿地被誉为广州“绿心”, 是候鸟迁徙的重要通道, 也是广州夏季主风廊的关键节点, 是中心城区的入风口和气候调节器。



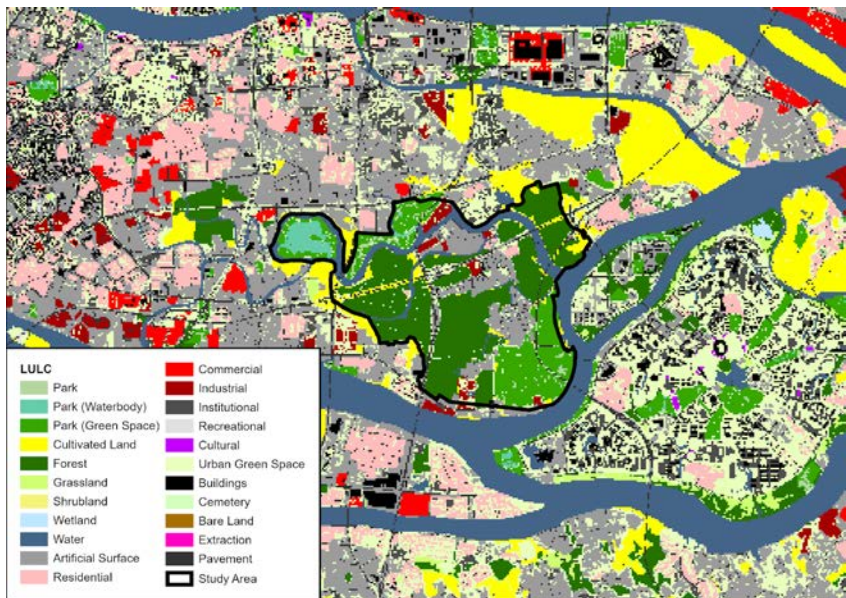
Wetland in downtown 特大城市城央湿地

Haizhu Wetland is the largest wetland located in downtown core of China's megacities. The park is highly accessible with a 3km distance from Zhujiang New Town CBD. Connected to major business districts and the Guangzhou college town.

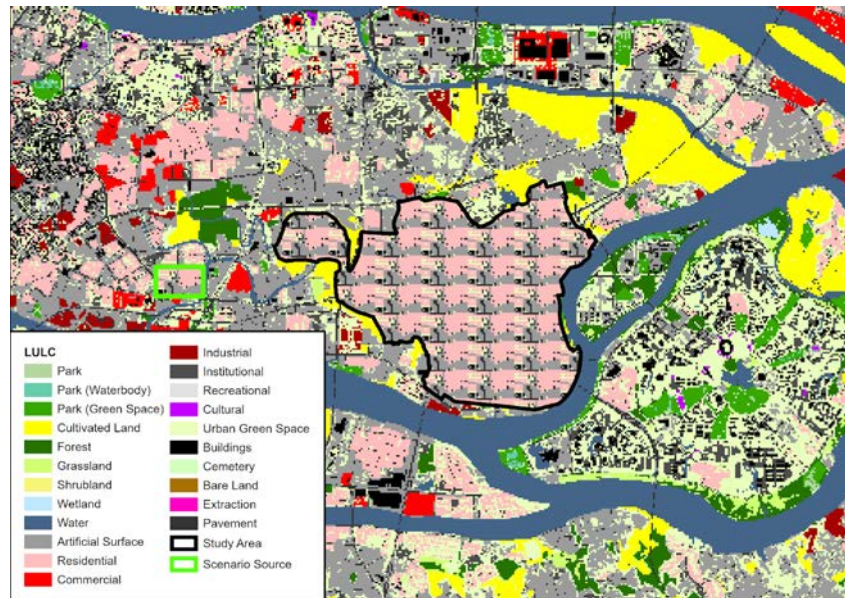
海珠湿地是我国特大城市中心最大的湿地公园。距珠江新城中央商务区仅3公里，交通便利。连接主要商业区和大学城。



Scenarios 情景设置



现状情景
Current Scenario

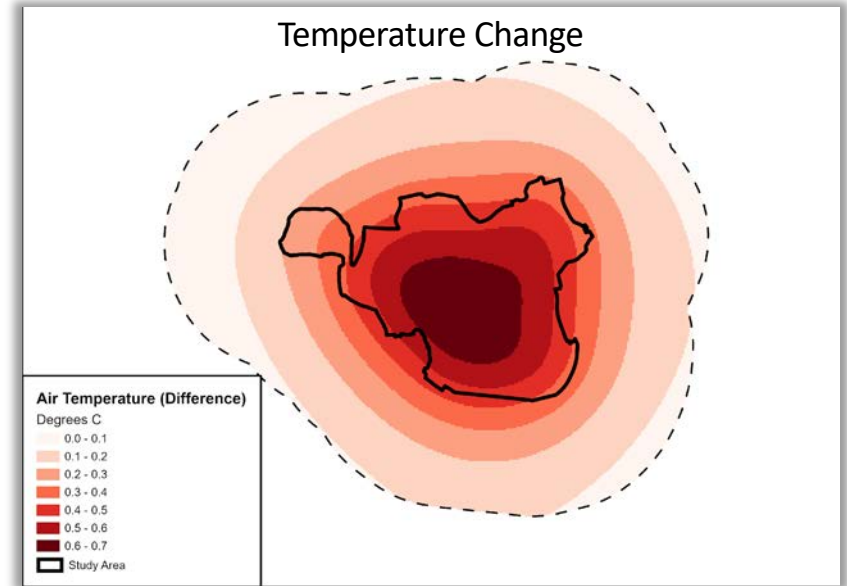
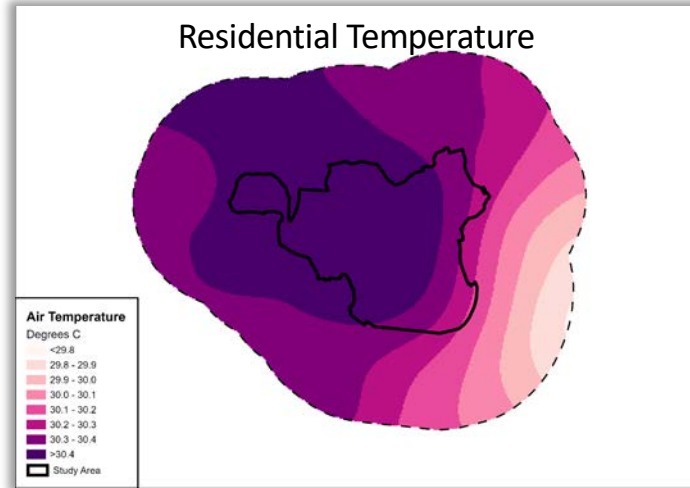
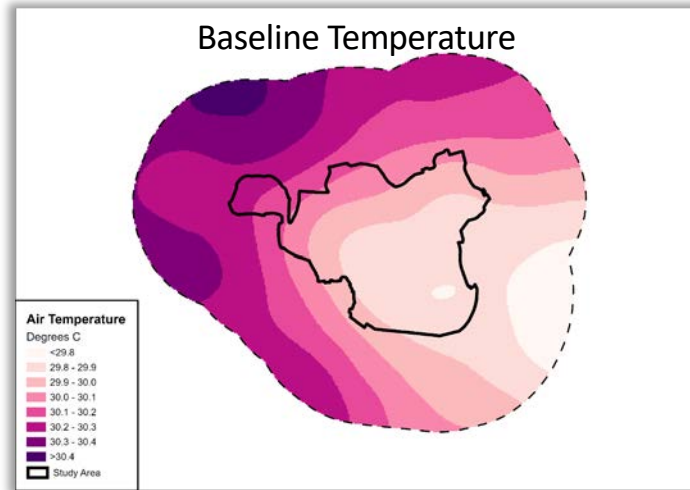


没有海珠湿地
No Wetland;
Residential
development

InVEST

integrated valuation of
ecosystem services
and tradeoffs

Urban Cooling





- Mental health
- Physical activity/health
- Climate regulation (Carbon storage and sequestration)
- Recreation

3. Urban Land-use Planning and Equity



- Development Planning
- Livable Cities
- Securing Freshwater
- Private Sector Standards
- Resilient Coastal Communities

Golf

Natural area

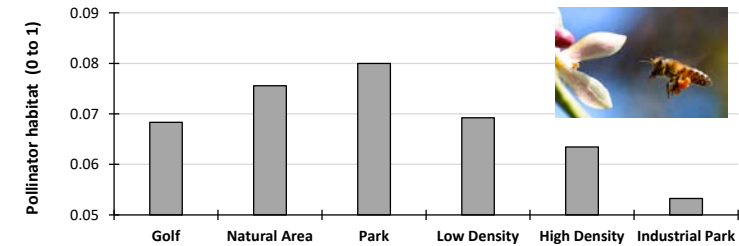
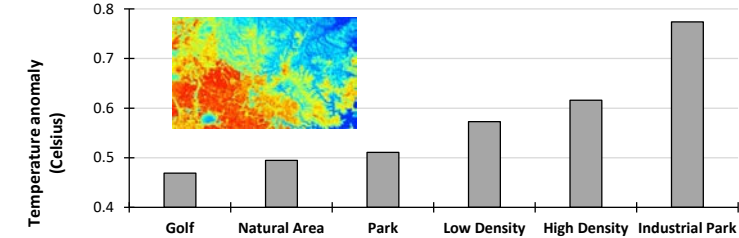
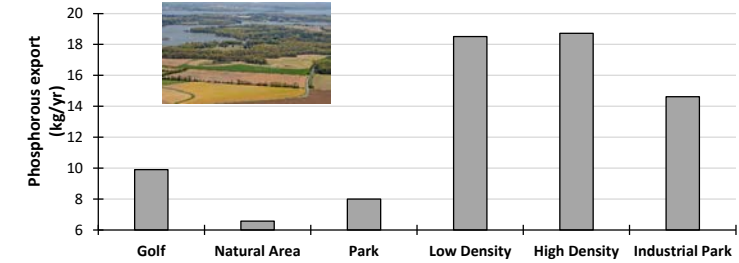
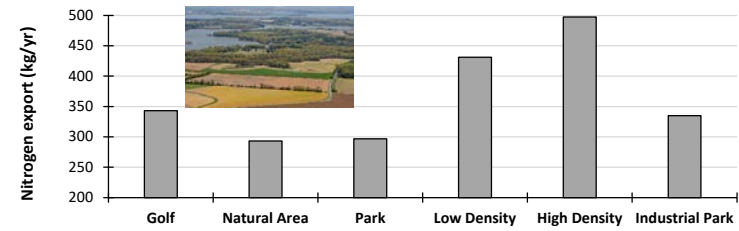
City park



Low-density residential

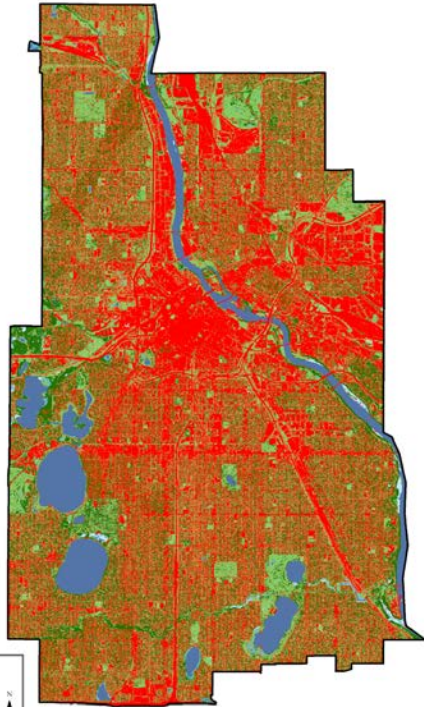
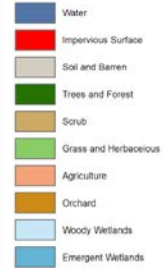
High density residential

Industrial park



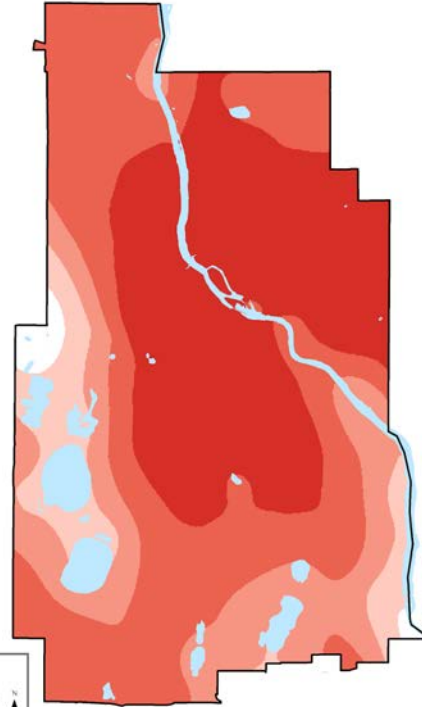
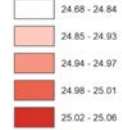
Distributional Equity Assessment

Land Cover



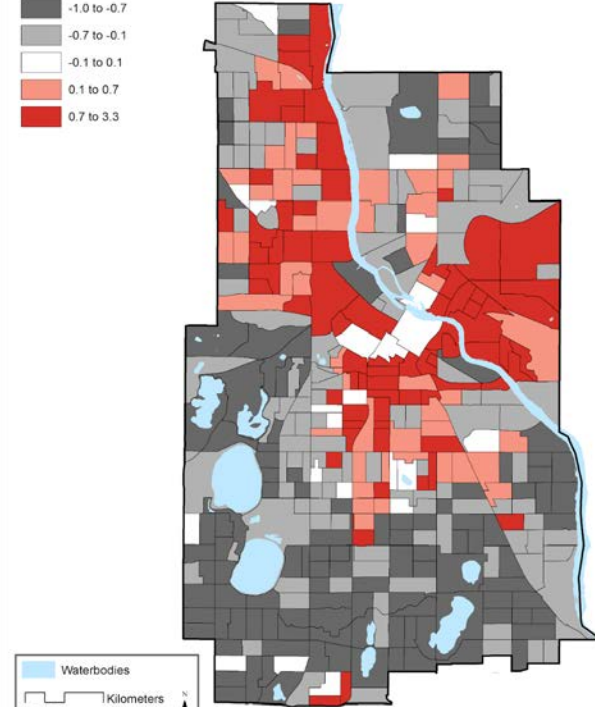
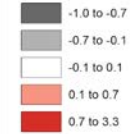
Urban Cooling Model

Air Temperature (deg C)

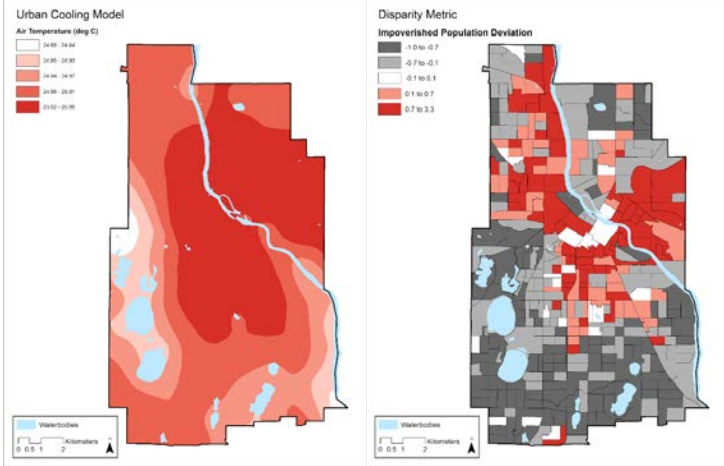
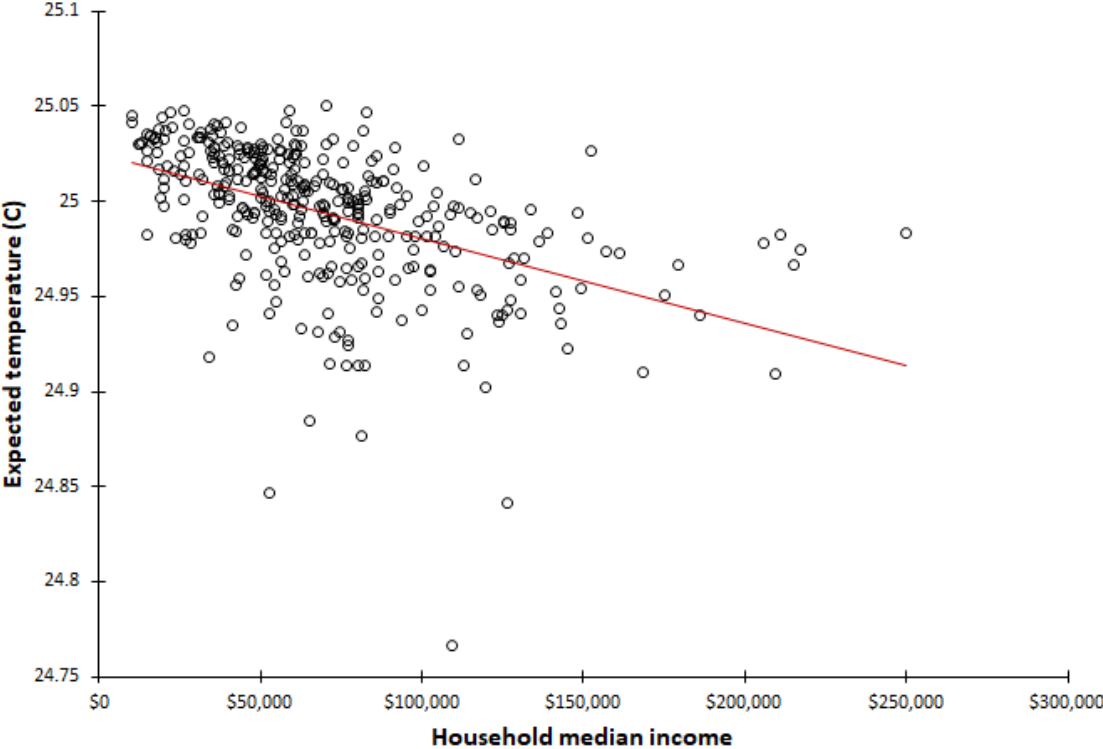


Disparity Metric

Impoverished Population Deviation



Distributional Equity Assessment





Partnering with the World Bank

Global Platform for Sustainable Cities
Policy Guidance on Urban Biodiversity and
Nature, launching at the UN Biodiversity
Conference in Kunming



Stanford University

science + technology + partnerships → scaling of approaches and tools to create a future where people and nature thrive.







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P R O J E C T



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