

At the Forefront of Change



**5 WAYS LANDSCAPE ARCHITECTS
ARE RESPONDING TO CLIMATE IMPACTS**

Landscape Architects are...

Developing Regional Strategies with Robust Civic Engagement



CASE STUDIES:

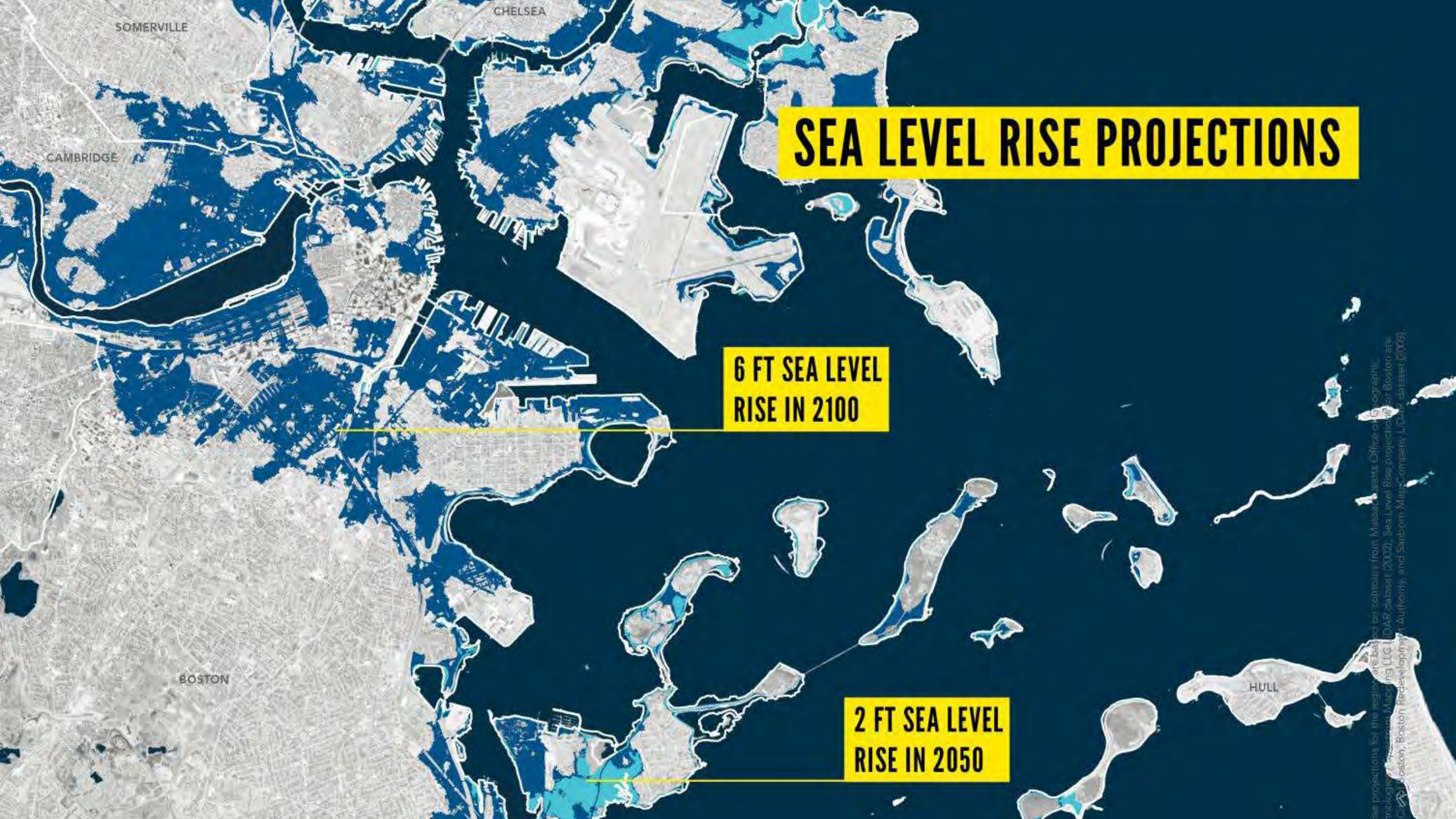
SEA CHANGE BOSTON + CLIMATE READY BOSTON



SEA

CHANGE

BOSTON



SEA LEVEL RISE PROJECTIONS

6 FT SEA LEVEL
RISE IN 2100

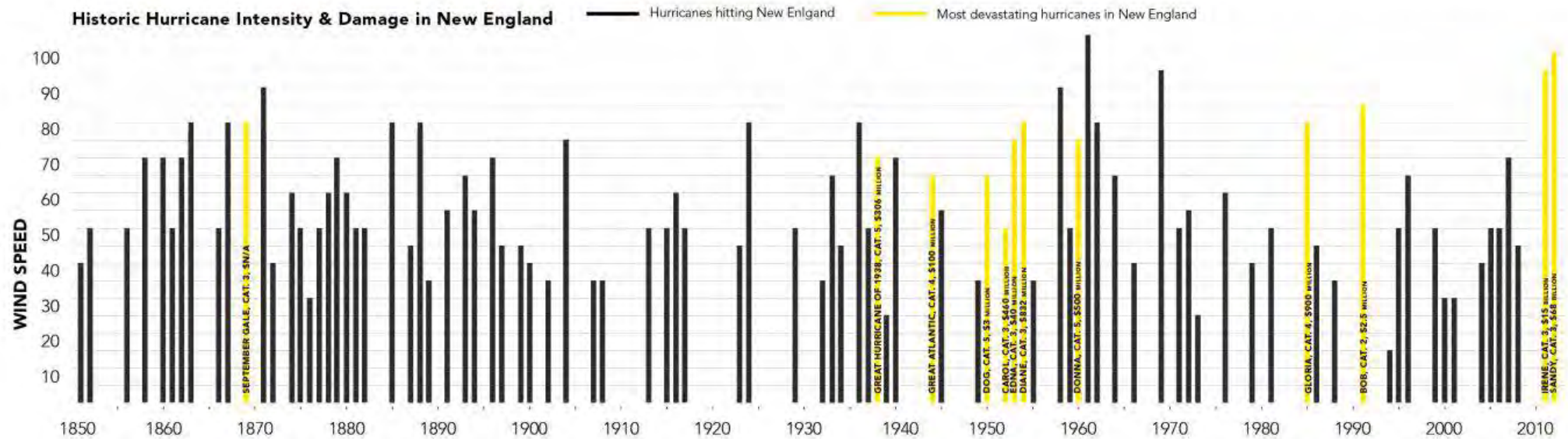
2 FT SEA LEVEL
RISE IN 2050

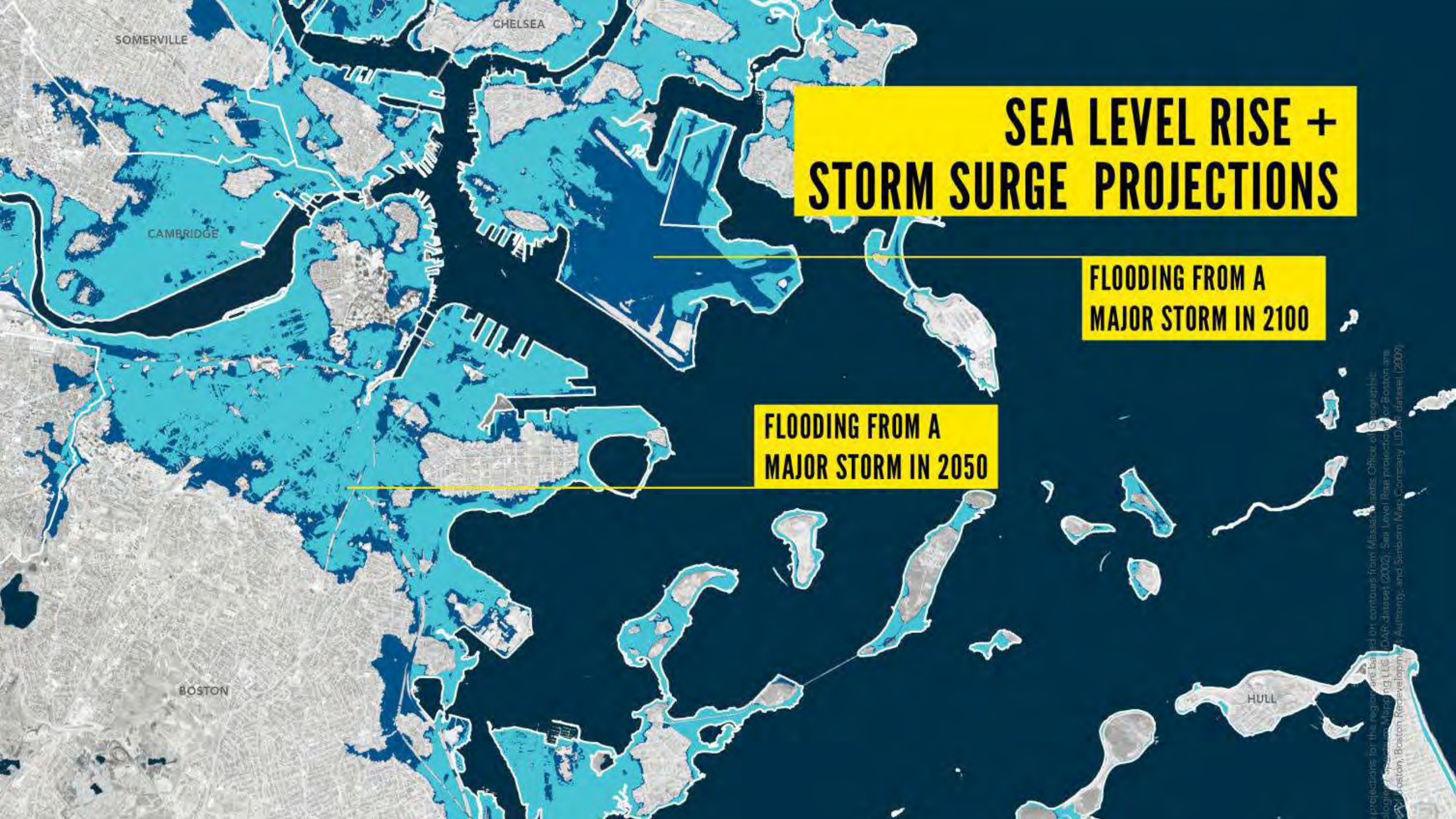
Sea level rise projections for the region are based on scenarios from Massachusetts Office of Geographic Information, Massachusetts Office of Energy and Environmental Affairs, and the Massachusetts Office of Energy and Environmental Affairs. Projections for Boston are based on the Massachusetts Office of Energy and Environmental Affairs, and the Massachusetts Office of Energy and Environmental Affairs. Projections for Boston are based on the Massachusetts Office of Energy and Environmental Affairs, and the Massachusetts Office of Energy and Environmental Affairs.

BOSTON HAS A HISTORY OF DEVASTATING STORMS



Historic Hurricane Intensity & Damage in New England





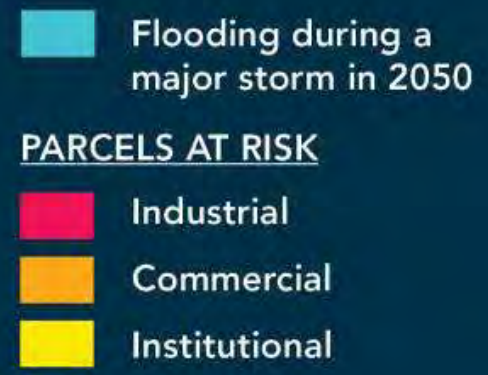
SEA LEVEL RISE + STORM SURGE PROJECTIONS

FLOODING FROM A
MAJOR STORM IN 2100

FLOODING FROM A
MAJOR STORM IN 2050

projections for the region are based on data from the Massachusetts Office of Geographic Information (MassGIS) and the Massachusetts Department of Transportation (MassDOT). The data is based on the NOAA Sea Level Rise Projection (2002) and the NOAA Storm Surge Projection (2002). The data is based on the NOAA Sea Level Rise Projection (2002) and the NOAA Storm Surge Projection (2002). The data is based on the NOAA Sea Level Rise Projection (2002) and the NOAA Storm Surge Projection (2002).





- Industrial
- Commercial
- Institutional

Fore River Shipyard



WHAT ARE THE OPTIONS?

1 FORTIFY
(KEEP WATER OUT)



2 ADAPT
(LIVE WITH WATER)



3 RETREAT
(MOVE TO HIGHER GROUND)



WE NEED TO DESIGN FOR RISING SEAS AT MULTIPLE SCALES.



Absorbent
Street



Floodable
Park



Dry Flood-
Proofing



Temporary
Floodwall



Wet Flood-
Proofing



Elevated
Building



Multi-
Purpose
Levee



Floating
Building



Living
Shoreline



Dune
Restoration

CATALOG OF DESIGN STRATEGIES



Dry Flood-Proofing



Wet Flood-Proofing



Elevated Building



Floating Building



Living Shoreline



Floodable Park



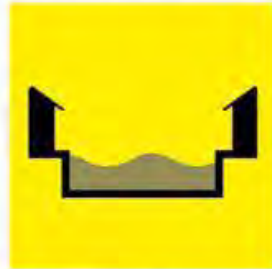
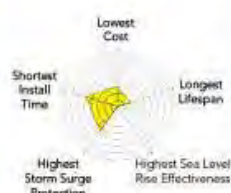
Dune Restoration



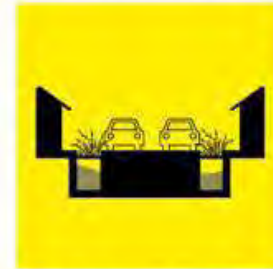
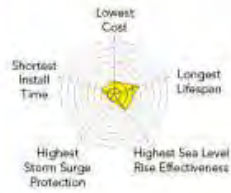
Revetment



Temporary Floodwall



Canal Street



Absorbent Street



Multi-Purpose Levee





**"I HAVE BEEN
DOING THIS
MY WHOLE
LIFE. THE
INDUSTRY
HAS NEVER
BEEN MORE
VULNERABLE."**



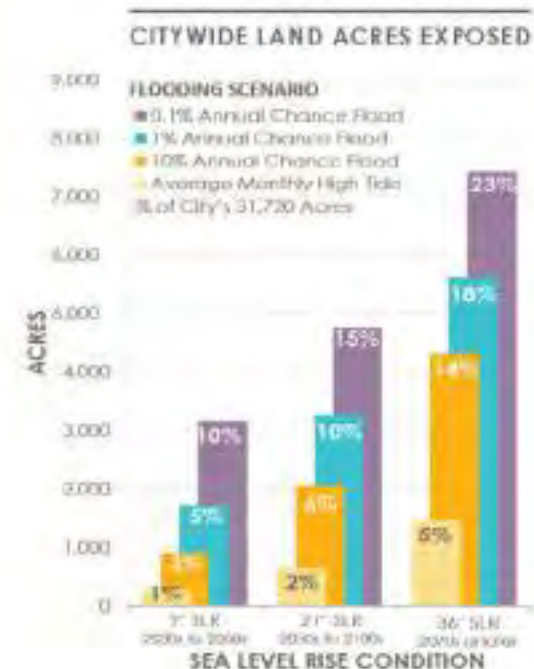
**"WE WERE HERE
DURING THE
BLIZZARD OF 1978.
IT WAS A MESS."**



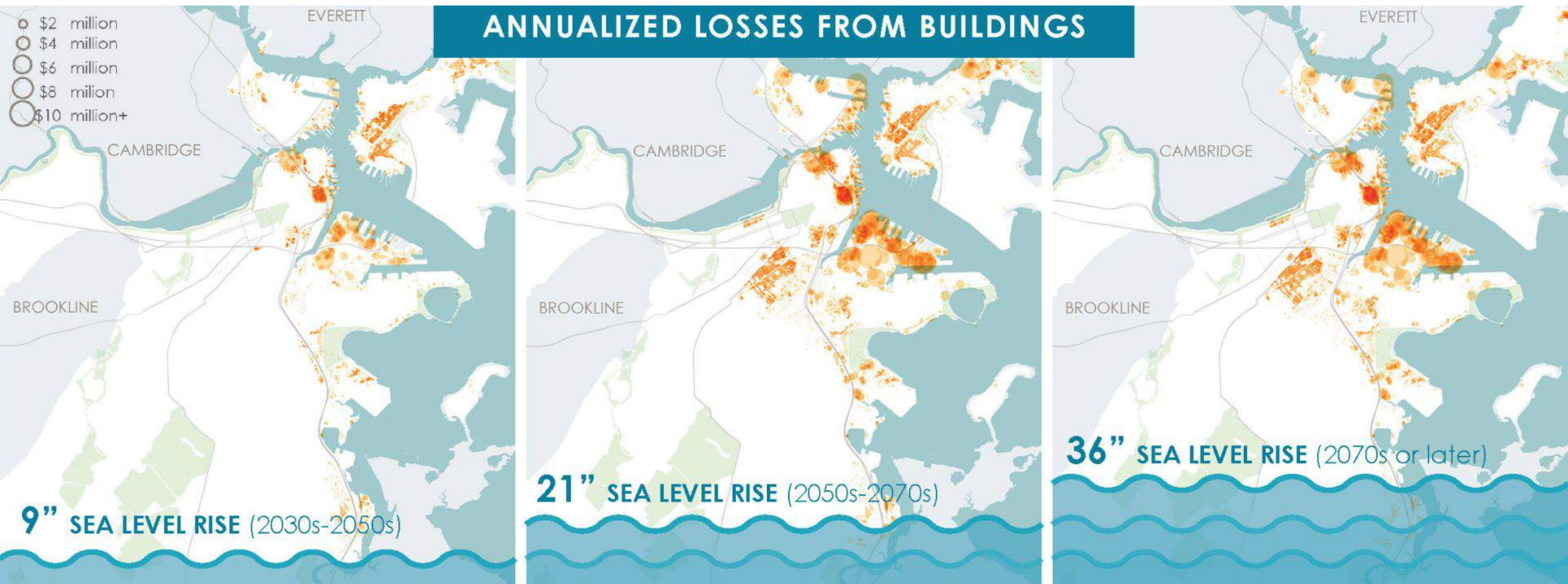
**"PEOPLE NEED
RESPECT
FOR NATURE
AND THE
EARTH."**



COASTAL & RIVERINE FLOODING IMPACTS
 As the sea level continues to rise, the likelihood of major floods will increase from a 1% annual chance to a monthly reality

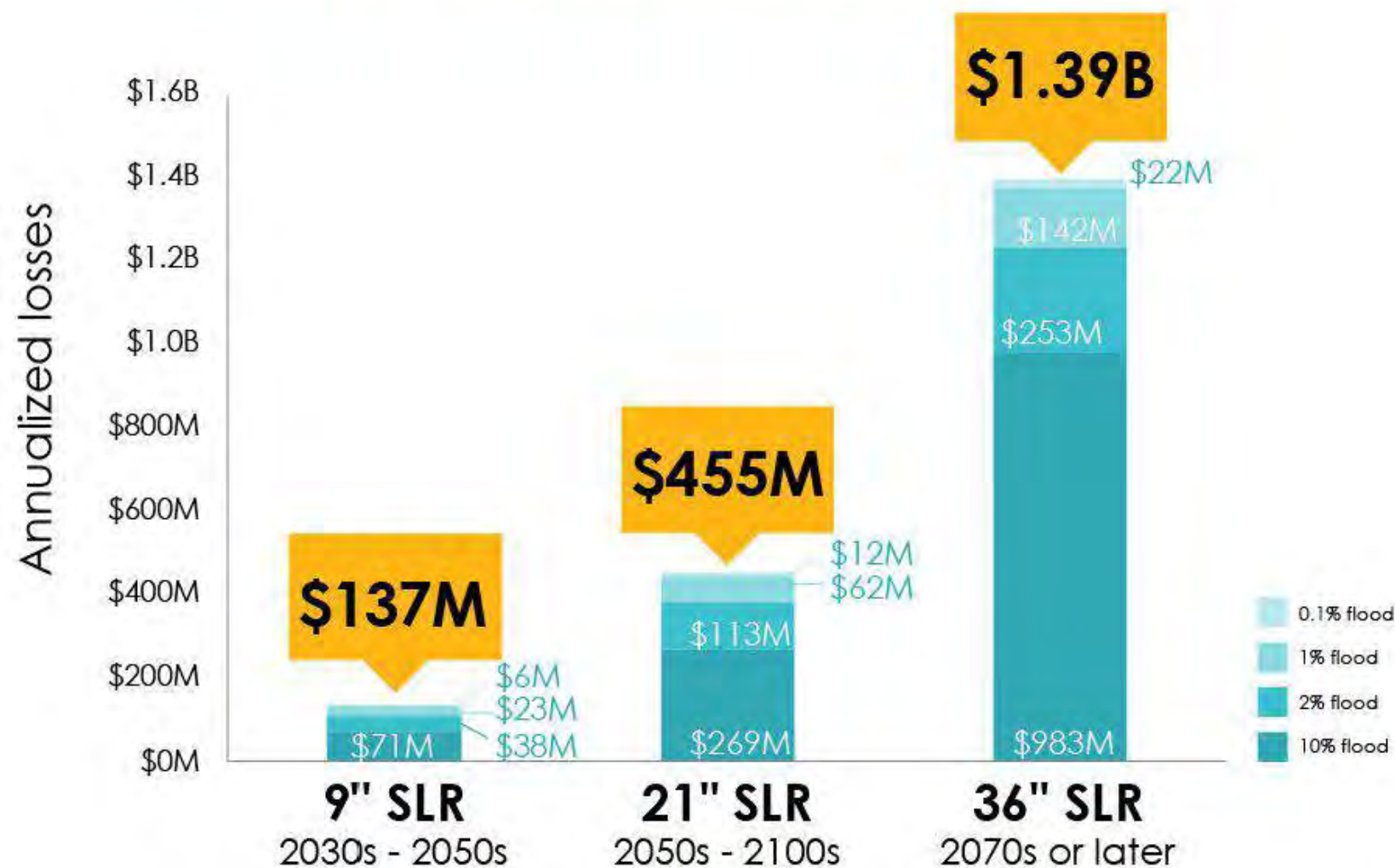




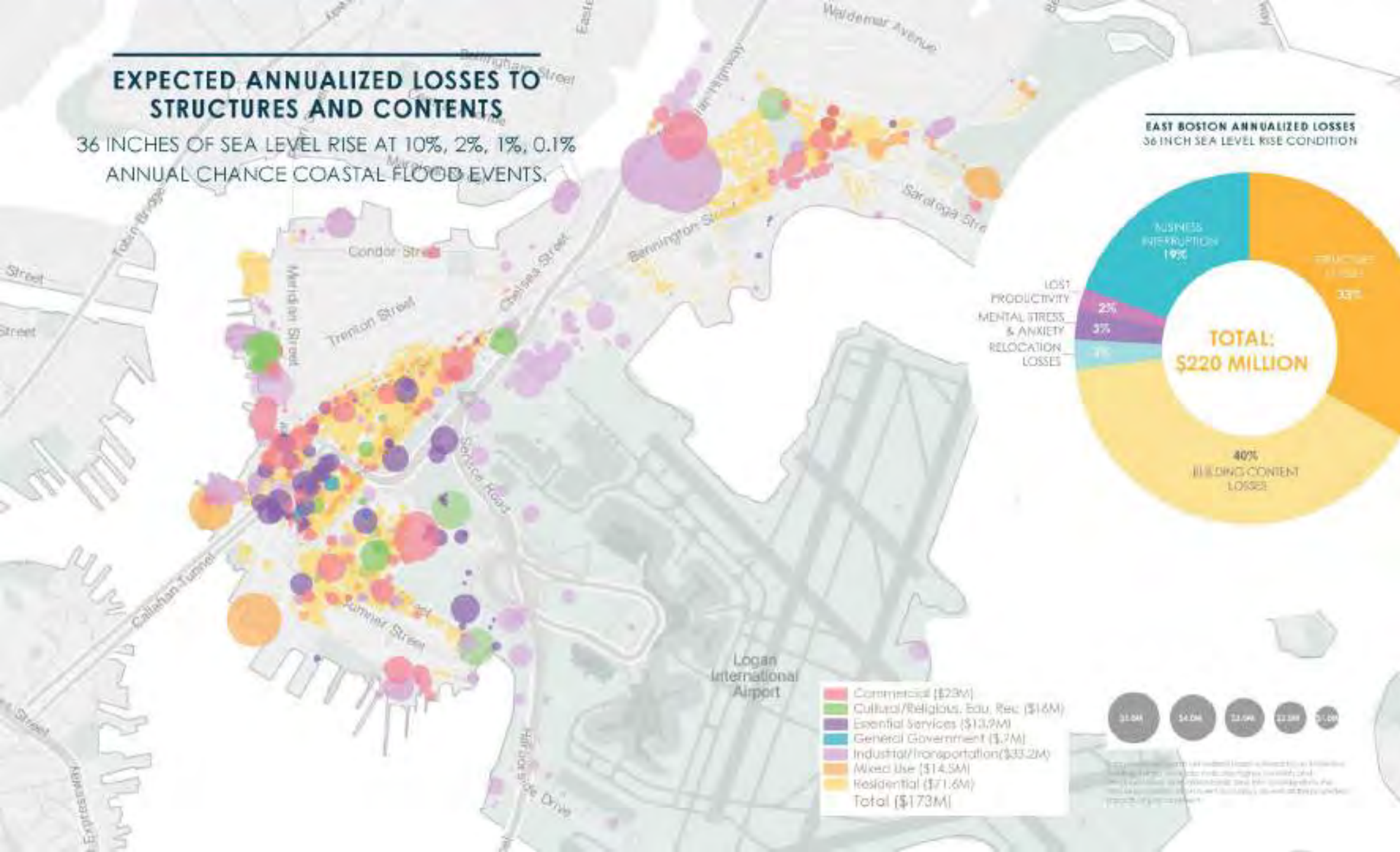


COASTAL & RIVERINE FLOODING IMPACTS

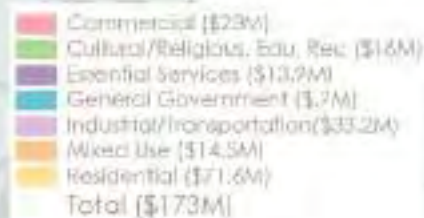
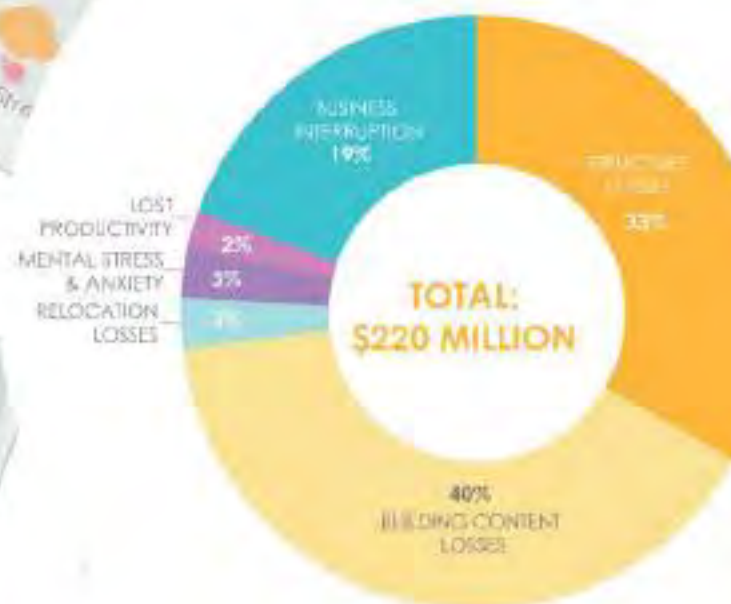
Annual impacts will increase as the sea rises, with more than \$1.3B at risk annually later this century.



36 INCHES OF SEA LEVEL RISE AT 10%, 2%, 1%, 0.1% ANNUAL CHANCE COASTAL FLOOD EVENTS.



EAST BOSTON ANNUALIZED LOSSES
36 INCH SEA LEVEL RISE CONDITION



ADAPTING TO CLIMATE CHANGE



PROTECTED SHORES



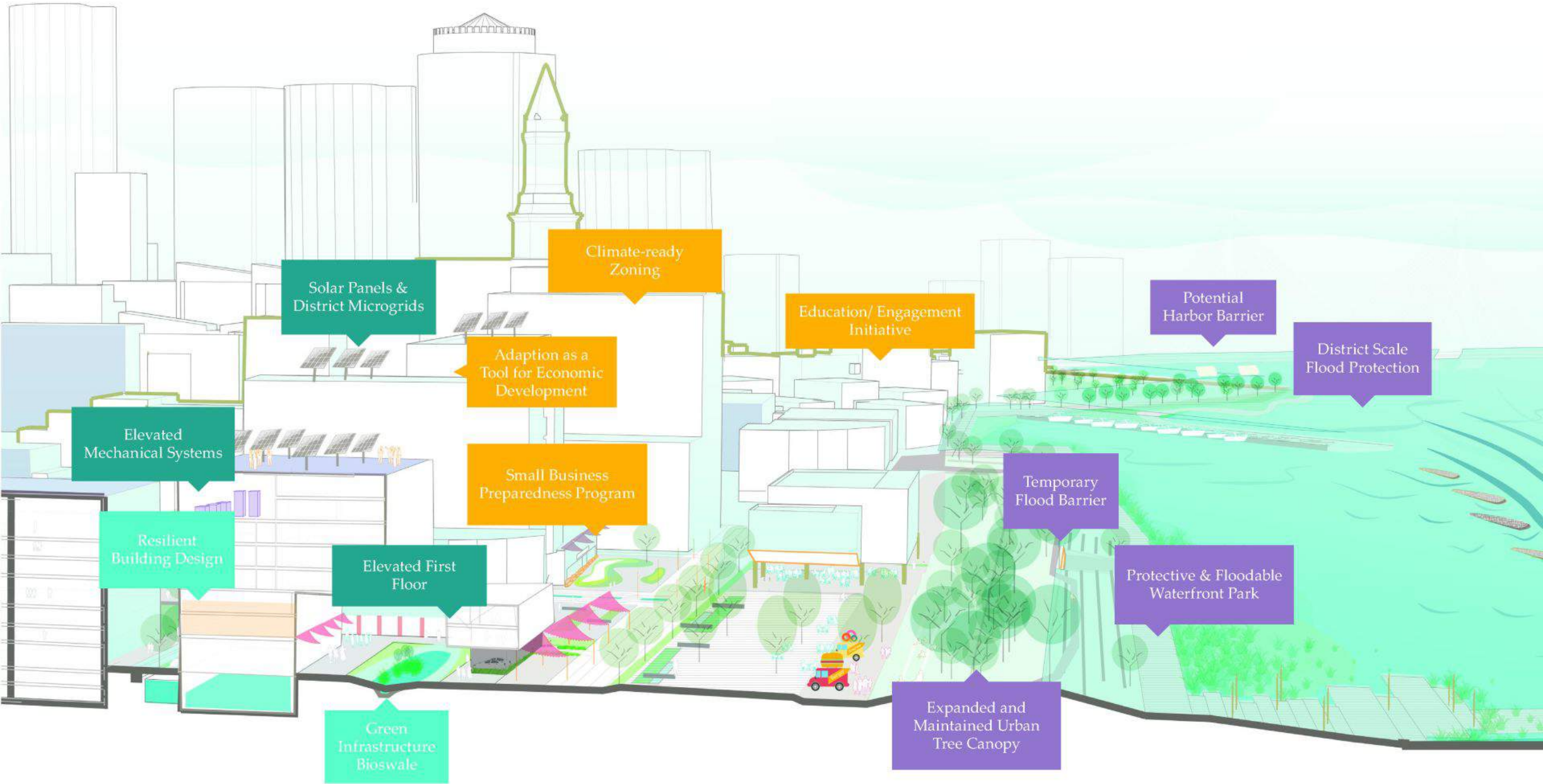
PREPARED AND CONNECTED COMMUNITIES



RESILIENT INFRASTRUCTURE



ADAPTED BUILDINGS



Landscape Architects are...

Implementing Bold Ideas that will Change our Relationship with the Land



CASE STUDY:

SHANGHAI SUNQIAO URBAN AGRICULTURE DISTRICT



**By 2050, the planet will have
9.7 billion mouths to feed.**

UNITED NATIONS FOOD AND AGRICULTURE ORGANIZATION

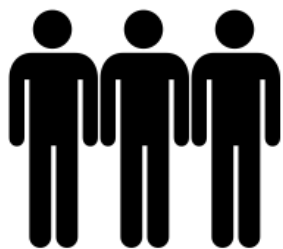


**To address climate change,
we must talk about food.**

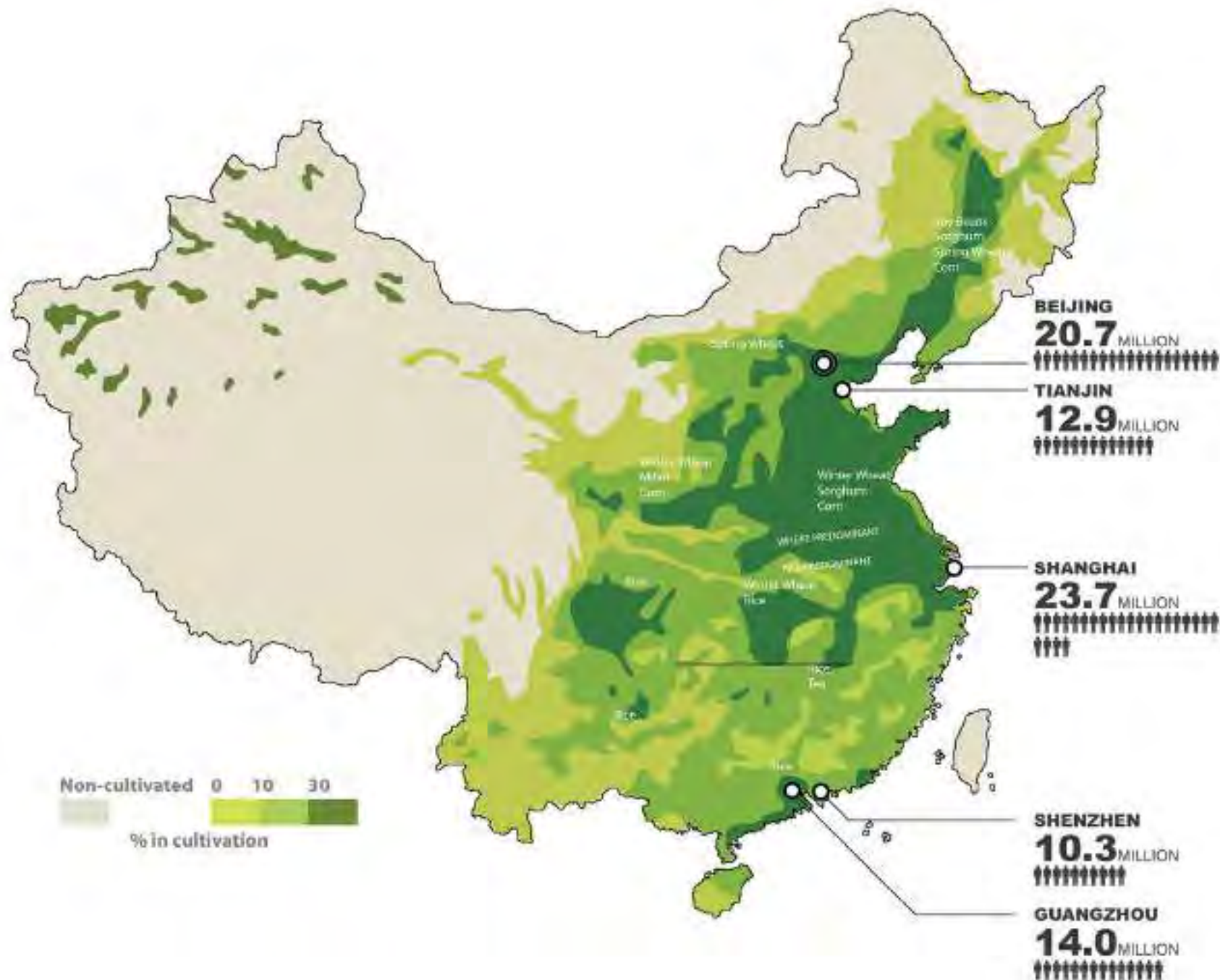




122 MILLION HECTARES OF CHINA'S 960 MILLION HECTARE LAND AREA IS DESIGNATED AS FARMLAND, REPRESENTING ABOUT 13% OF THE COUNTRY'S OVERALL LAND USE



1.3 BILLION OF CHINA'S 1.4 BILLION POPULATION LIVES IN THE EASTERN HALF OF THE COUNTRY, WHICH CORRELATES WITH ARABLE LAND.



A photograph of a vast green agricultural field, likely a rice paddy, in the foreground. In the background, a line of trees separates the field from a city skyline featuring several tall, modern buildings under a hazy sky. The text is overlaid on the lower half of the image.

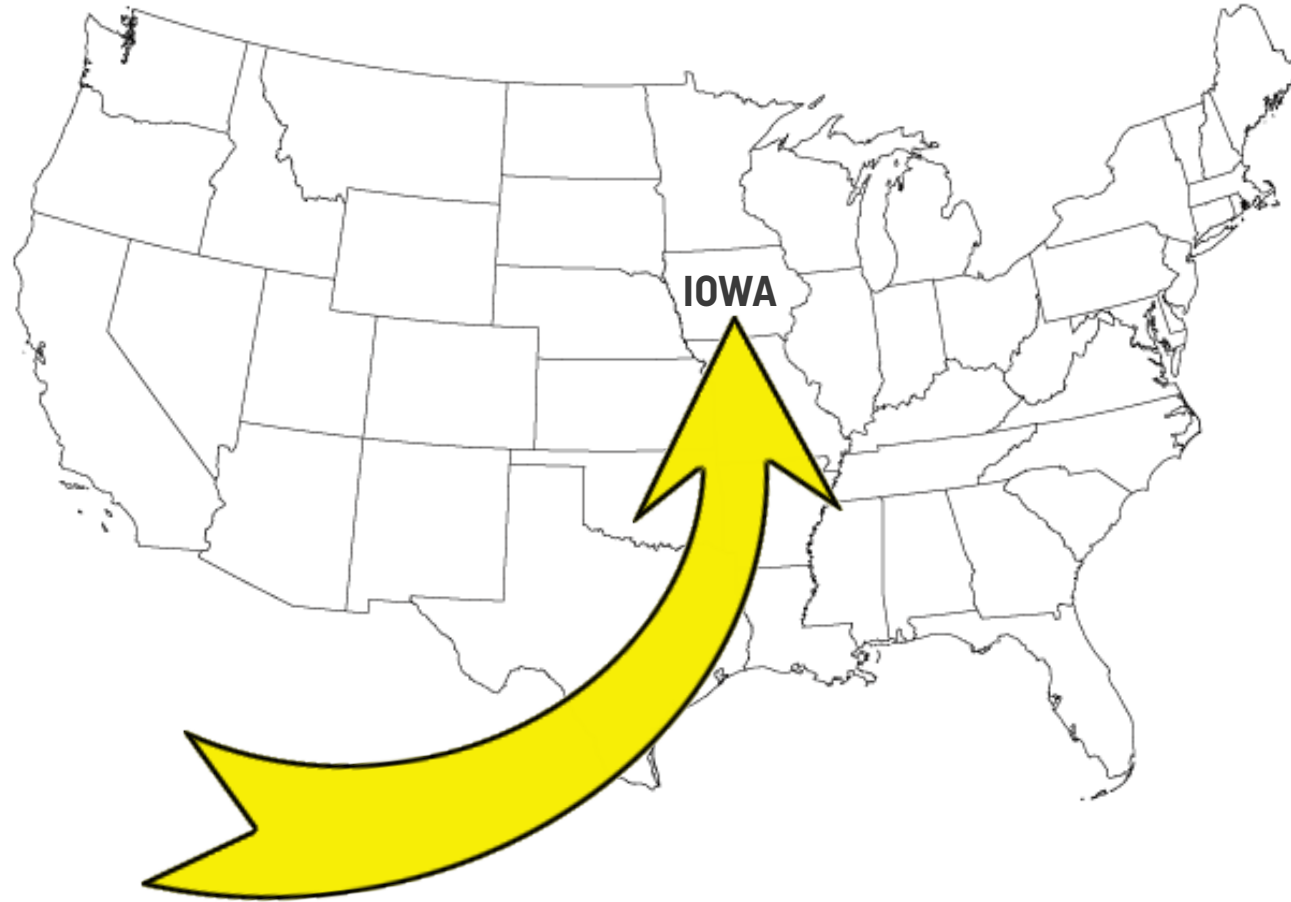
China lost

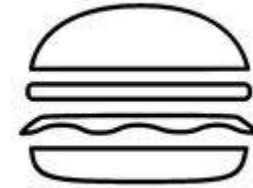
123,000 km²

of arable land between 2008 and 2018.

For those of you who are spatial thinkers...

THAT'S EQUIVALENT IN SIZE
TO THE STATE OF IOWA

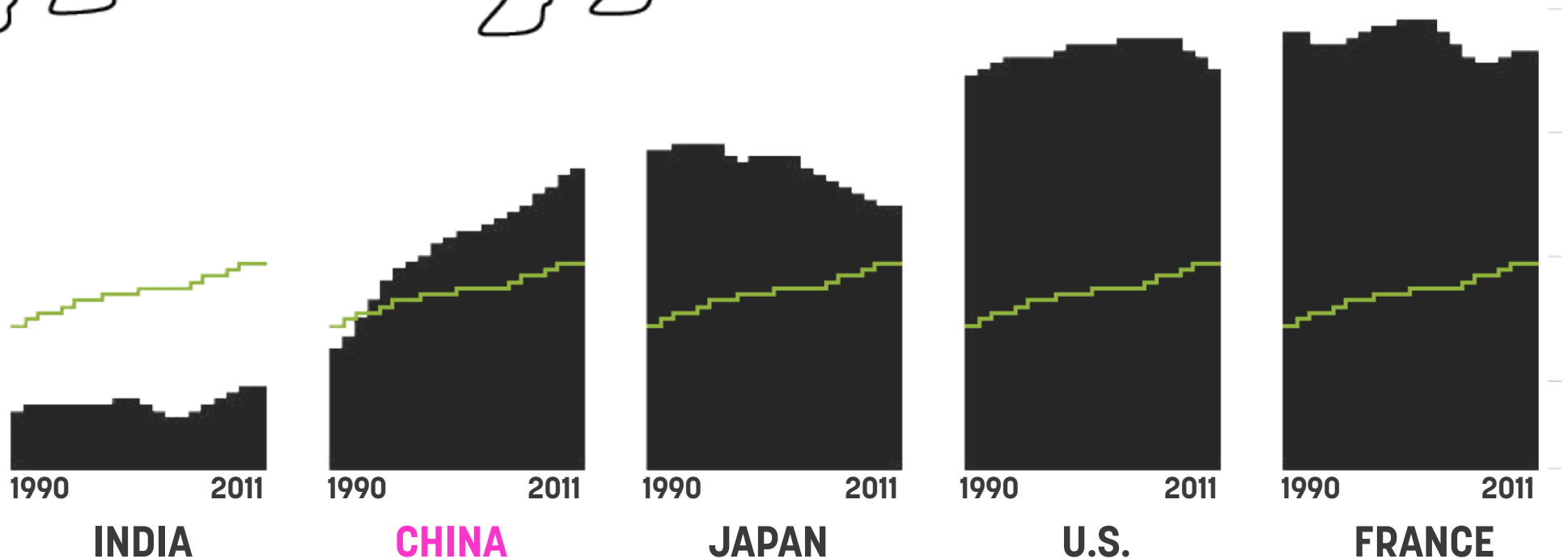




CALORIC INTAKE OF THE AVERAGE CHINESE PERSON HAS MORE THAN DOUBLED IN THE LAST 50 YEARS, RISING FASTER THAN ANY OTHER COUNTRY IN THE WORLD.

■ AVERAGE PROTEIN SUPPLY

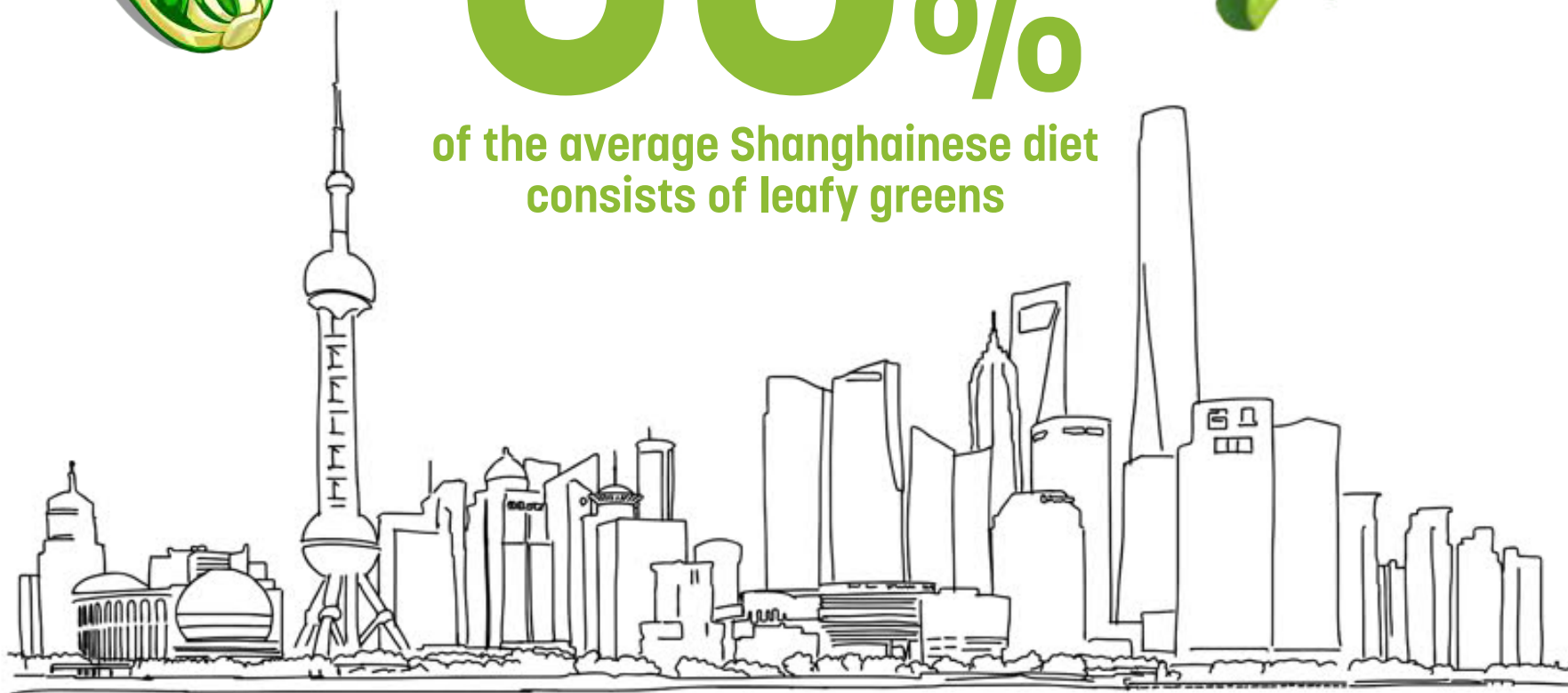
— WORLD AVERAGE





56%

of the average Shanghainese diet
consists of leafy greens







Vertical farming of tomatoes, lettuce, celery, and bok choy yield between 40 and 100 times more produce than a typical outdoor field of the same size.

CHINESE ACADEMY OF AGRICULTURAL SCIENCES



鱼菜共生
Deep Water Culture (DWC) Floating Bed

孙桥
鱼菜共生池

鱼菜共生是一种结合了水生植物种植和水产养殖的生态循环系统。它通过利用水中的氮、磷等营养物质，促进水生植物的生长，同时植物又能吸收水中的有害物质，保持水质清洁。这种系统不仅节约空间，还能有效减少化肥和农药的使用，实现绿色生产。



AIR, WATER, AND SOIL POLLUTION



AIR POLLUTION IN CHINA IS OFTEN AS MUCH AS FIVE TIMES THE LEVEL THE WORLD HEALTH ORGANIZATION CONSIDERS SAFE.



ACCORDING TO THE MINISTRY OF WATER RESOURCES, 80% OF CHINA'S GROUNDWATER IS UNFIT FOR DRINKING OR BATHING DUE TO POLLUTION FROM FARMS.

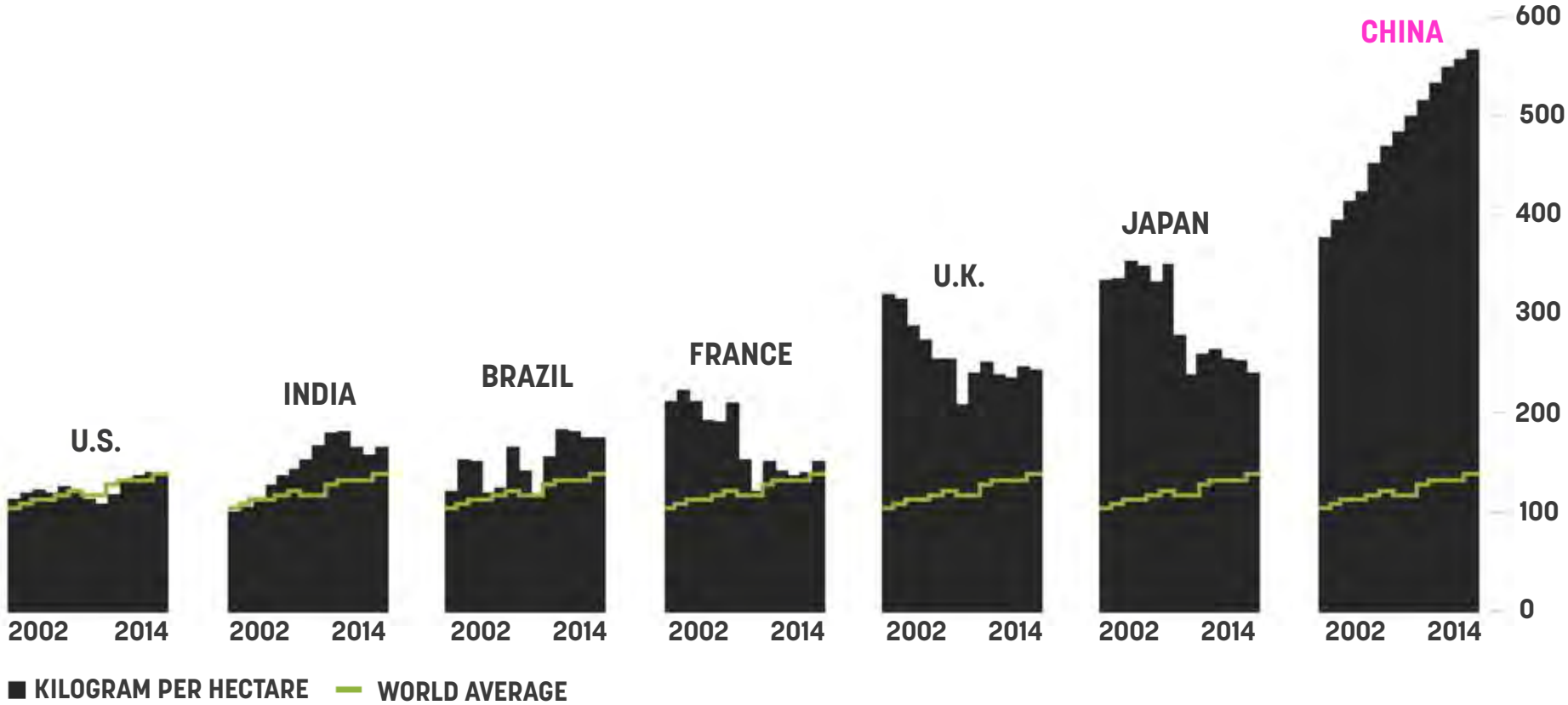


HEAVY METALS INCLUDING CADMIUM, ARSENIC, AND LEAD ARE PREVALENT, ESPECIALLY IN EAST COAST MANUFACTURING AREAS

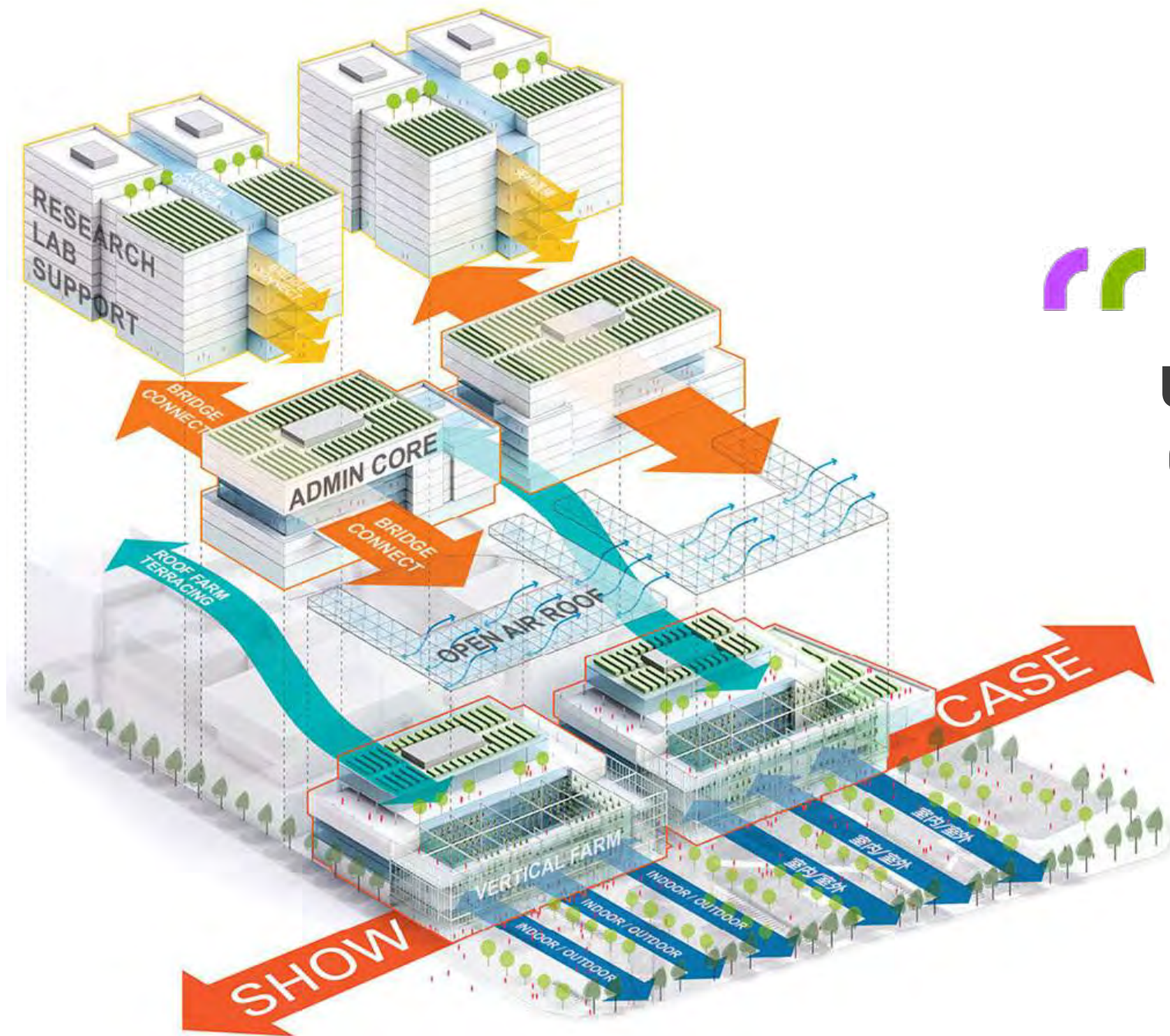


CHINA'S FERTILIZER CONSUMPTION

FARMERS IN CHINA USE 4.5X MORE FERTILIZER PER HECTARE OF ARABLE LAND THAN FARMERS IN NORTH AMERICA



Source: World Health Organization / World Bank



Using vertical agriculture, we don't need to use pesticides, and we can use less chemical fertilizers - and produce safe food.



YANG QICHANG

**INSTITUTE OF ENVIRONMENT AND
SUSTAINABLE DEVELOPMENT IN AGRICULTURE**



Landscape Architects are...

Stewards of Native Habitats and Champions of Conservation Efforts



CASE STUDY:
CHENGDU PANDA RESERVE





BEIJING ★

SHANGHAI

CHENGDU

GUANGZHOU

Habitat Undisturbed by
Roads & Infrastructure

Evergreen Broad-Leaf Forests

*Cyclobalanopsis, Castanopsis, Lithocarpus,
Phoebe, and Cinnamom spp.*

+Bamboo understory



Temperatures below 25°C
to minimize heat stress



**Hillslopes of
30% or less**

4000m

1200m

Elevation Range
for cooler climate & seasonal
greater bamboo diversity



Commonly Browsed Bamboo Species

*Bashania fargesii
Yushannia brevipaniculata
Fargesia robusta*

**Close Proximity
to Fresh Water**



(on-site) In Situ Conservation

New Giant Panda National Park
Expanded protection for existing preserves



Connecting Isolated Reserves
67 separate reserves connected



One Large Conservation zone
27,000km² total area
(the size of Massachusetts)



Expanded Protection
Ecosystem Services & Listed Species



Return to the wild
Pre-release training & release areas



Ex Situ (off-site) Conservation

Panda Reserve Facilities

- 1 Dujiangyan Panda Wilderness
- 2 Beihu Panda Park
- 3 Lonquanshan Panda Village
- 4 Wolong Panda Centers
- 5 Bifengxia Panda Base

Study Sites



Scientific Research
Captive breeding & disease prevention



Conservation Education
Public education & support for planning



Eco-Tourism
Awareness and funding for conservation

TIBETAN PLATEAU

CHENGDU

SICHUAN BASIN

- Present Giant Panda Habitat
- Giant Panda National Park
- Other Protected
- Biodiversity Hotspot

Wolong Giant Panda Preserve Area

Giant Panda National Park



dujiaanyang pandawilderness

total area:
23km²

current visitation:
2 million/year
50,000/day (max)

primary focus:



Eco-Tourism



Pre-Release Training



beihu pandapark

total area:
35km²

current visitation:
8 million/year
160,000/day (max)

primary focus:



Scientific Research & Breeding Base



Conservation Education



longquanshan pandavillage

total area:
11km²

current visitation:
proposed facility

primary focus:



Cultural Experience



Bamboo Ecology & Research

CHENGDU

Chengdu Shuangliu International Airport

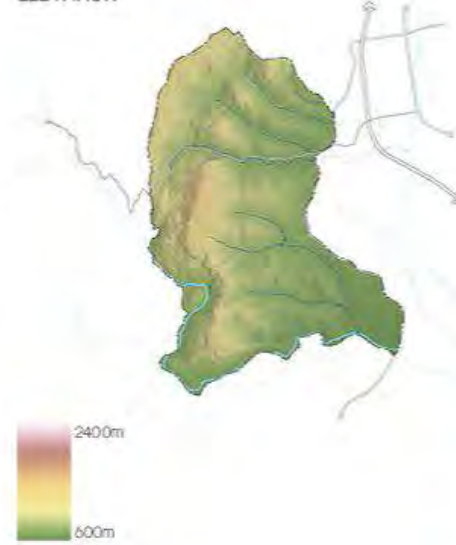


Tianfu International Airport
Operational in 2020

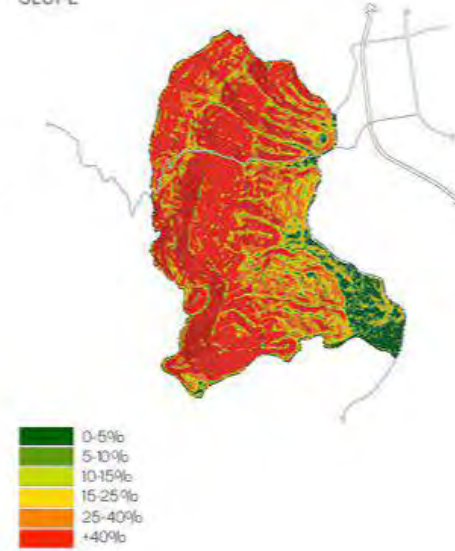
EXISTING SITE & ACCESS



ELEVATION



SLOPE



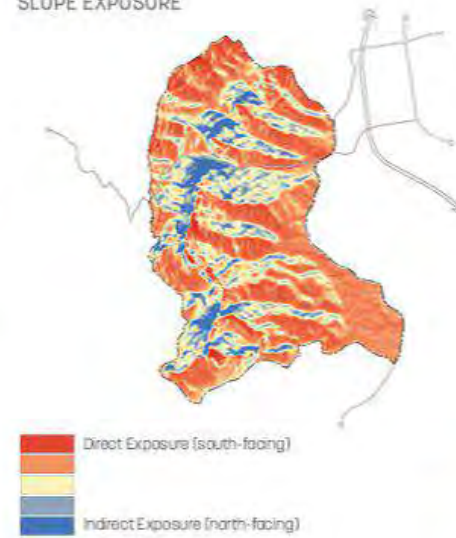
HYDROLOGY



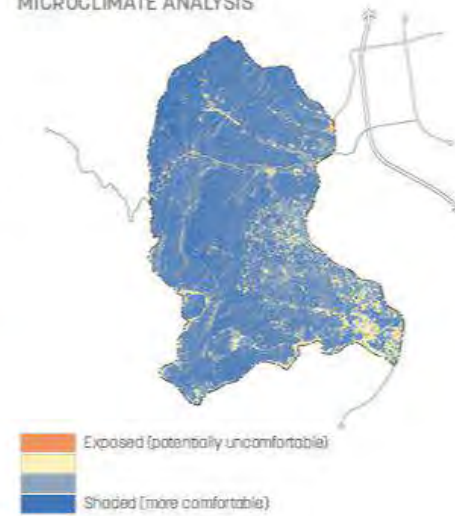
VEGETATION DENSITY



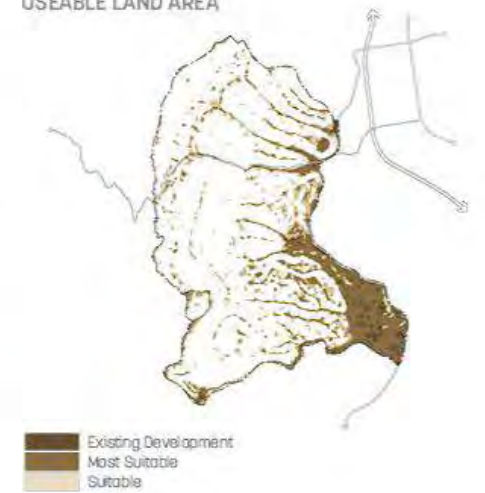
SLOPE EXPOSURE



MICROCLIMATE ANALYSIS

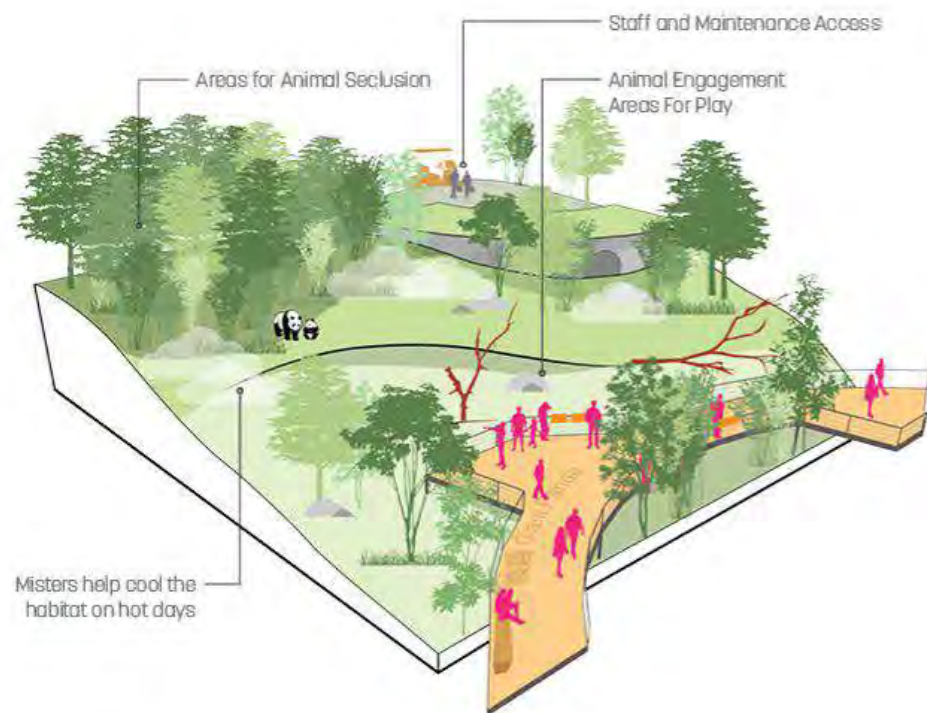


USEABLE LAND AREA





STEEP TOPOGRAPHY



Spatial Requirements:

4 giant pandas/house

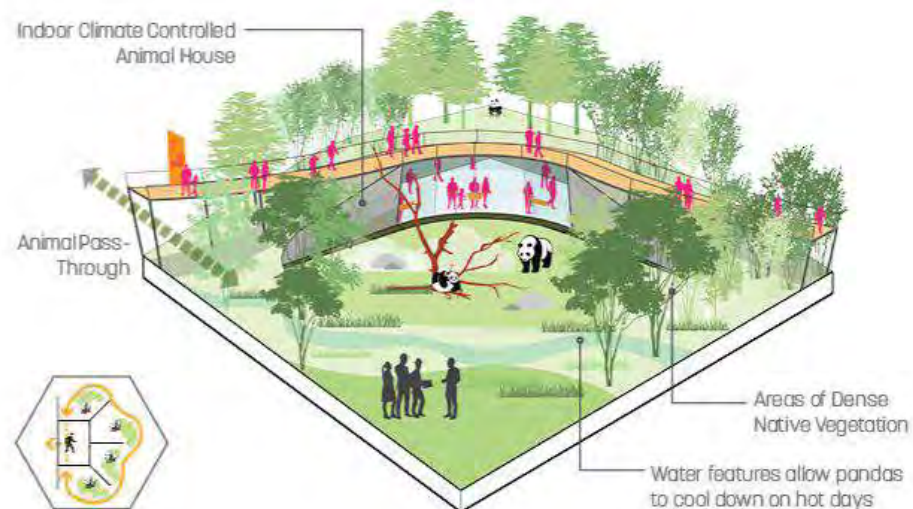
3000m² outdoor areas

1000m² indoor facilities

VARIABLE TOPOGRAPHY



FLAT TOPOGRAPHY



Naturalistic
Enclosure
Design



Immersive Exhibit
Design

Low-Impact
Walkway

Location Maximizes
Microclimate Benefits



Interpretive
Displays



Structural Elements for
Animal Engagement



*As a biodiversity hotspot
habitat preservation for the
giant panda also protects*



31%

of China's amphibian
species (82 endemic)



365

bird species
(20 endemic)



109

mammal species
(14 endemic)





竹



可食用

FOOD



可做衣物

CLOTHING



建材

BUILDING MATERIALS



手工艺品

FURNITURE & CRAFTS



生物发电

FUEL / BIOMASS



9%

pandaquest

Education & Research Center



Panda Valley Tram

Location Maximizes
Microclimate Benefits



Low-Impact
Interpretive Walkway



Naturalistic
Enclosure
Design



Pre-Release Training

*Researchers dress in panda suits treated
with natural panda 'scents' to prevent
cubs from imprinting on humans*



Landscape Architects are...

Thinking in Non-Traditional ways about how to Design Traditional Landscapes

CASE STUDY:

WUHAN YANGTZE RIVERFRONT









DIVERSE PLANT COMMUNITIES AND BLOOD-FLUKES PREVENTION



SCHISTOSOMA

PARASITE



SNAIL

SNAILS ARE ONLY ABLE TO LIVE IN THE VEGETATION WITH SPECIFIC RANGE OF HEIGHT AND COVERAGE RATIO.

VEGETATION





ABANDONED STRUCTURE
DISCOVERED ON SITE

SECOND WUHAN
YANGTZE RIVER BRIDGE

RAIL TRACK
STRUCTURE REMAINS

2150



SECOND WUHAN
YANGTZE RIVER BRIDGE

ABANDONED STRUCTURE
DISCOVERED ON SITE

24.50
▼

RAIL TRACK
STRUCTURE REMAINS

LIGHT INSTALLATION



EXISTING
BARGES

PUBLIC TRANSIT

FLOODWALL

UNDULATING METAL GRID PLAZA

21.50

FLOATING
WALKWAY



PUBLIC TRANSIT

FLOODWALL

24.50

SUBMERGED PLAZA

FLOATING WALKWAY

EXISTING BARGES

65,000

PUBLIC FEEDBACKS GATHERED THROUGH ON SITE TOURS, MAIL
AND EMAIL SURVEYS, COMMENTS AND MESSAGES ON THE WEBSITE/SOCIAL MEDIA PLATFORM.

I grew up in Wuhan. The port culture and all the historical heritage affect my life. The riverfront park should demonstrate our local culture.

I'm concerned about the highway idea. It will impact the riverfront landscape and bring noises. It also gives me a feeling of depression.

I always go to the riverfront park with my little grandson. I hope the park will be more and more ecological, and provide an educational value.

Riverfront urban design should take public facilities like libraries, museums and the ones for the elderly as top priority.



Landscape Architects are...

Changing how we Design and Build Cities



2017



Present: Typical Monsoonal Flood



Present: Extreme Flood

2050



2050: Typical Flood



2050: Extreme Flood



2050: Saline Intrusion

ISSUES TODAY & ON THE HORIZON



Flash flooding

- While total annual rainfall is expected to remain the same, intensity of rainfall events has increased
- Urban flash flooding has increased compounded by urbanization and undersized stormwater infrastructure in many locations



Urban Heat Island

- Temperatures in HCMC have increased at a rate nearly double the surrounding region (1-2°C)
- Reduced vegetation cover in addition to an increase in heat absorbing/retaining surfaces will raise urban temperatures to higher levels impacting comfort and overall energy demand



Land Subsidence

- As a result of reduced groundwater infiltration and over extraction, several areas of HCMC are subject to land subsidence
- Vulnerability of flooding in these areas will continue to increase as subsidence progresses



Extreme Tidal Flooding

- Tropical storms in HCMC were once rare, however their frequency has been increasing in recent decades
- Projections for sea level rise estimate an increase in the range of 24-26 cm significantly impacting the reach of tidal flooding and storm surge



Salt Water Intrusion & Drought

- Drought conditions are typical in the dry season lasting from December through April
- Dry season drought conditions may become more persistent, but currently being investigated

A Resilient System



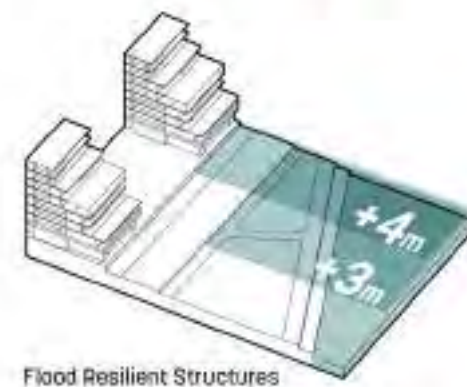
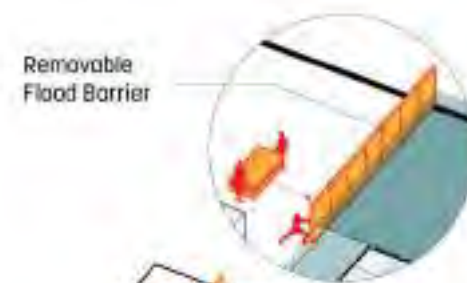
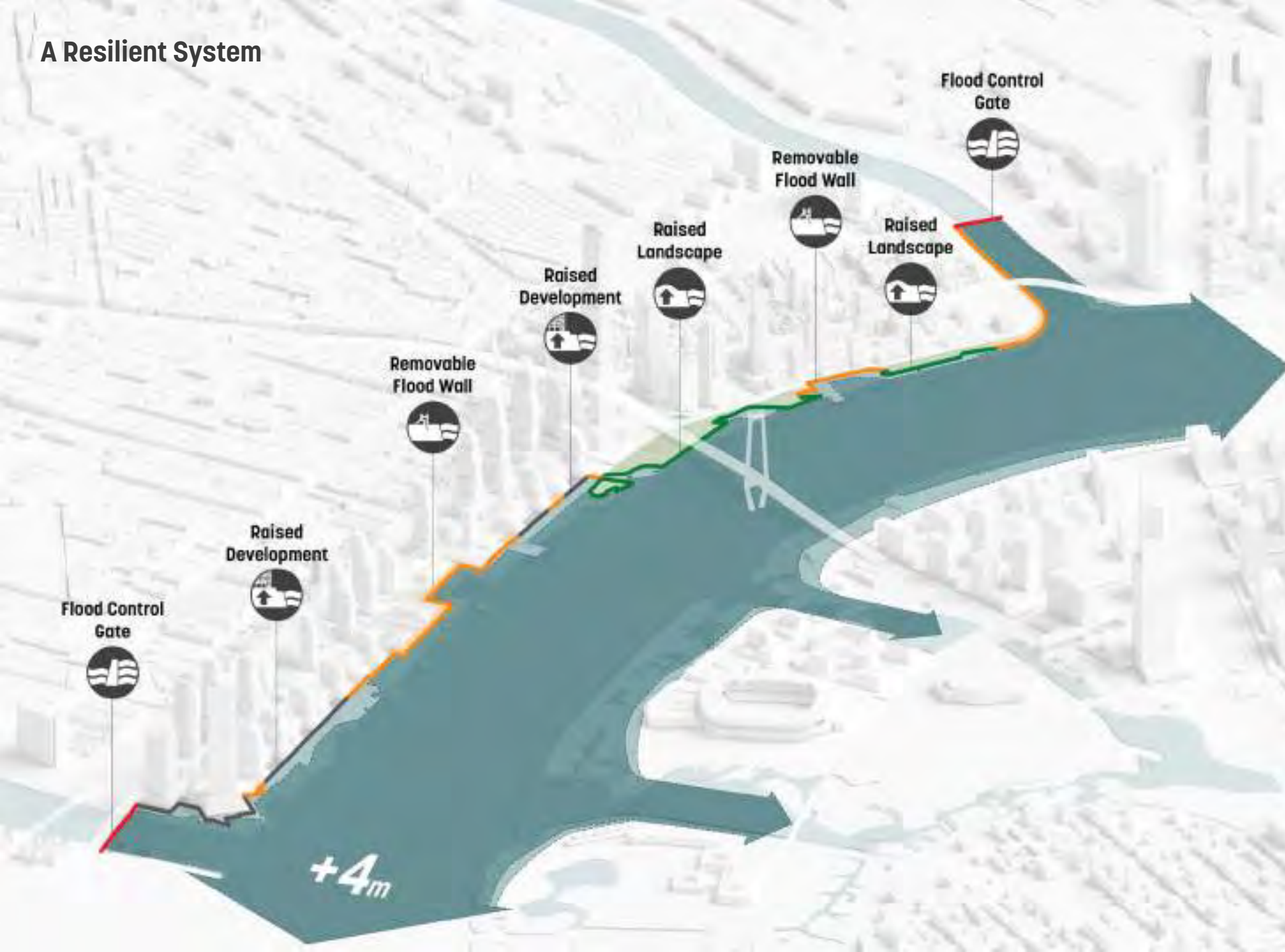
A Resilient System



5.24 km
In Street
Bio-Swales

24%
Water Receiving
Landscapes

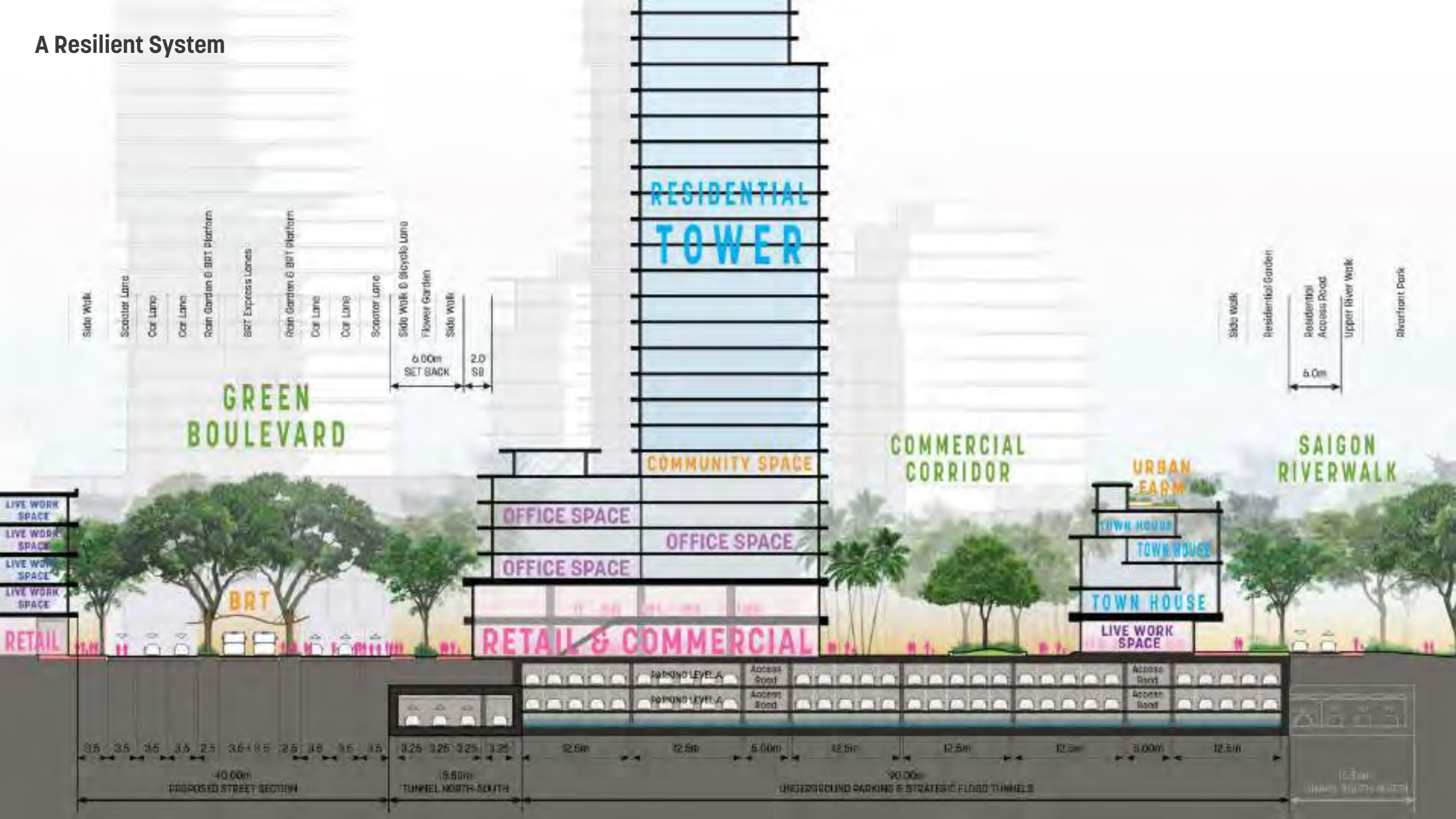
A Resilient System



A Resilient System



A Resilient System



A Resilient System

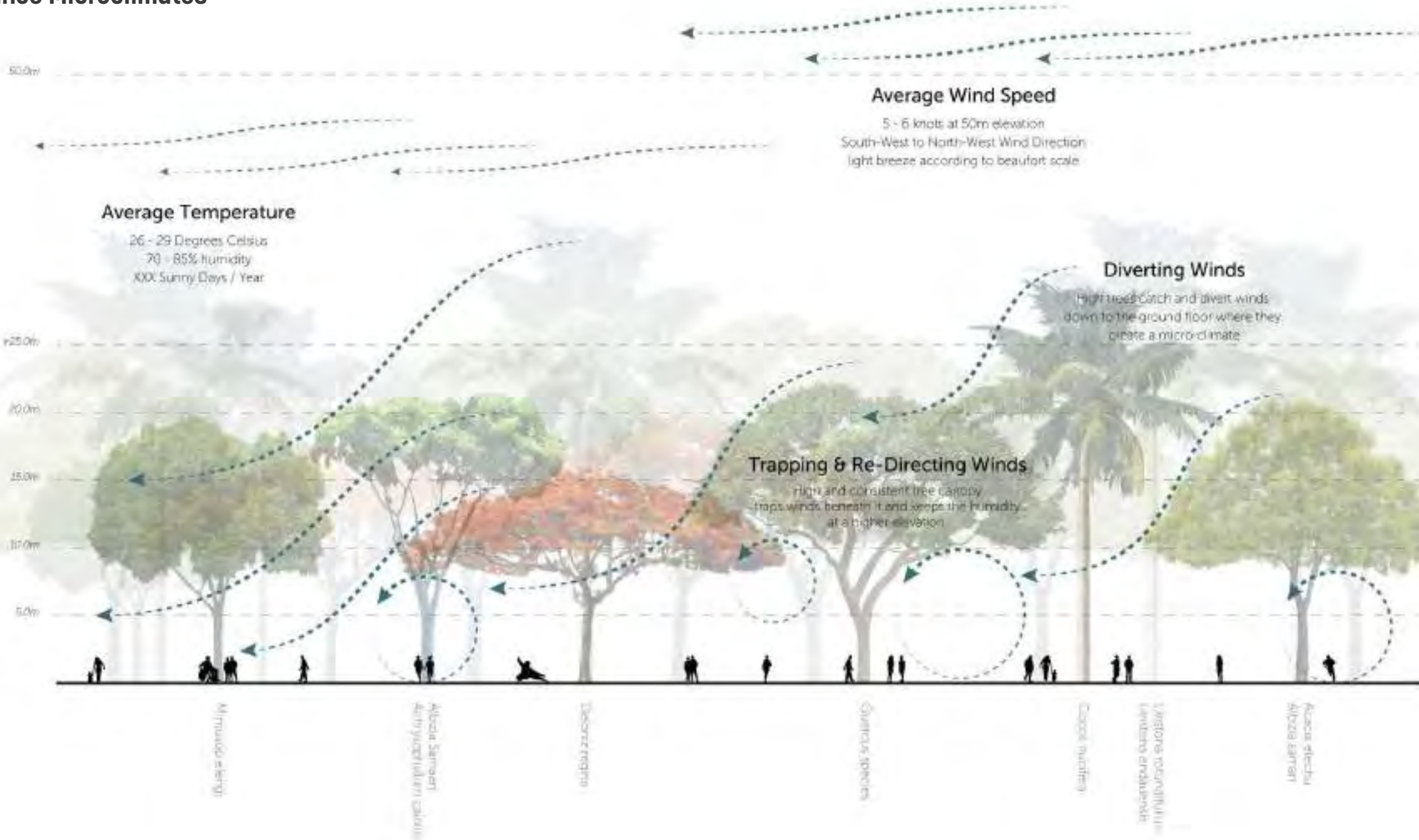


Enhance Microclimates



25%
Tree Canopy
Coverage

Enhance Microclimates





**The best time to plant a tree was 20 years ago.
The next best time is now.**

CHINESE PROVERB





www.sasaki.com

Boston | Shanghai