WELCOME

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

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2023

World Forum on Urban Forests

Food and Agriculture Organization of the United Nations

Simone Borelli
Urban Forestry Officer, Forestry Division
Food and Agriculture Organization of the United Nations (FAO)

World Forum on Urban Forests

Arbor Day Foundation®

Dan Lambe
Chief Executive Officer, Arbor Day Foundation

𝕏 @DanLambe

World Forum on Urban Forests


Arbor Day Foundation®
WE INSPIRE PEOPLE TO PLANT,
NURTURE, AND CELEBRATE TREES.


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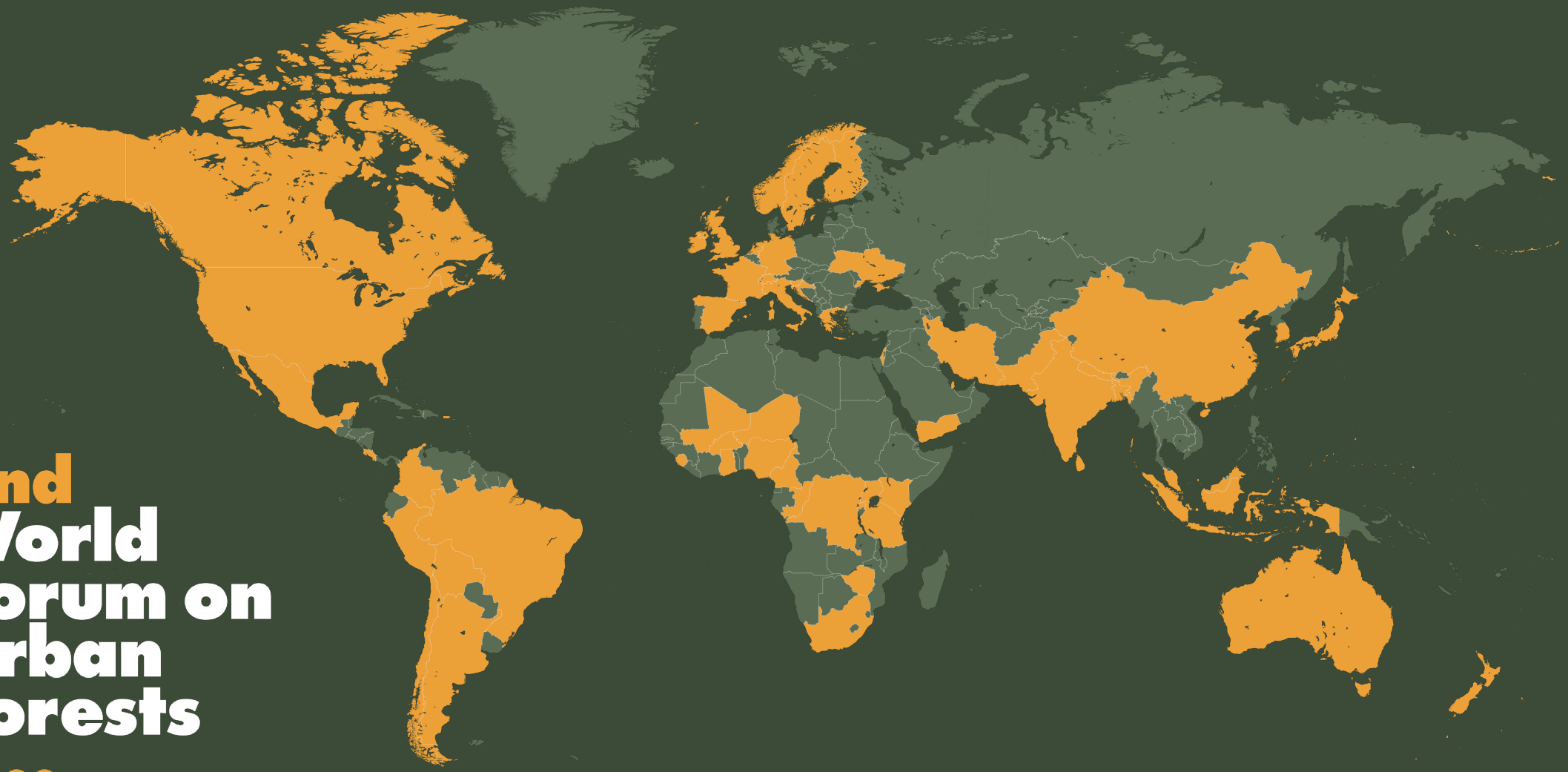
स्वागत
benvenuto
Willkommen
Tervetuloa
WELCOME
Witamy
dobrodošli
croeso
Sveiki
欢迎
Welkom
Välkommen
Vítejte
Fàilte
اهلا وسهلا
Добро пожаловать
Bem-vindo
World Forum on
Urban Forests



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2023

World Forum on Urban Forests
Mantova 2018

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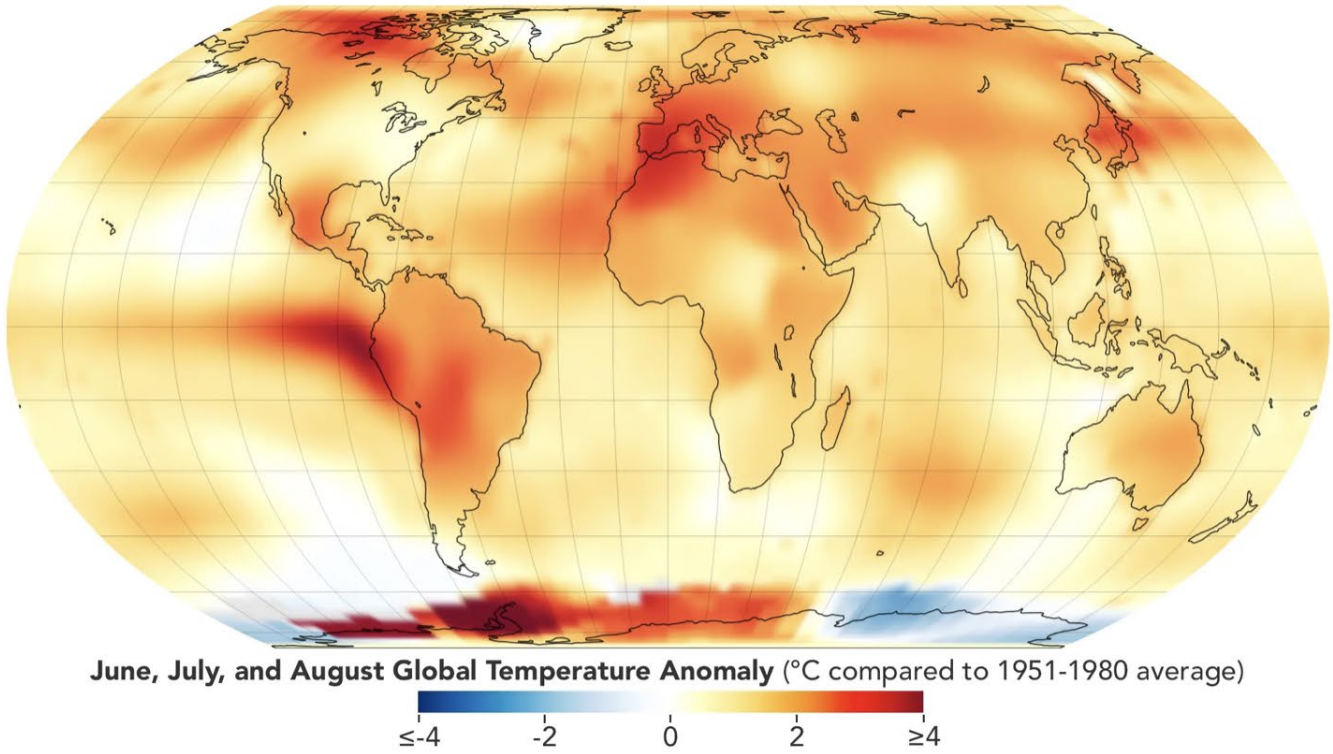
Hawai'i DLNR

NEWS | September 14, 2023

NASA Announces Summer 2023 Hottest on Record



This map depicts global temperature anomalies for meteorological summer in 2023 (June, July, and August). It shows how much warmer or cooler different regions of Earth were compared to the baseline average from 1951 to 1980. Credit: NASA's Earth Observatory/Lauren Dauphin

Summer of 2023 was Earth's hottest since global records began in 1880, according to scientists at

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AND

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COLLABORATION
ADAPTABILITY
INCLUSIVITY

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YES, AND

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Washington DC, 2023

AND

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Urban Forests
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“CAN’T kills creativity.”

– Camille Paglia

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LISTEN

YES, AND

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Chief Mark Tayac

Piscataway Indian Nation

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2023

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Food and Agriculture Organization of the United Nations

Jocelyn Brown- Hall
Director, Liaison Office for North America
Food and Agriculture Organization of the United Nations (FAO)

World Forum on Urban Forests

d.

Earl Eutsler
Associate Director / State Forester
Urban Forestry Division
District Department of Transportation

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ISA
International Society of Arboriculture

Nicolaas Verloop
President
International Society of Arboriculture

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Associate Professor
Politecnico di Milano

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Fabio Salbitano
Associate Professor
University of Sassari

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Beattra Wilson
Assistant Director for Urban and Community Forestry
U.S. Forest Service

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Smithsonian Gardens

Joy Columbus
Director
Smithsonian Gardens

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Arbor Day Foundation®

Alana Tucker
Program Manager
Arbor Day Foundation

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Brenda Mallory
Chair, CEQ
The White House

World Forum on Urban Forests

Ali Zaidi
Assistant to the President and
National Climate Advisor
The White House

World Forum on
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Health and Greenness

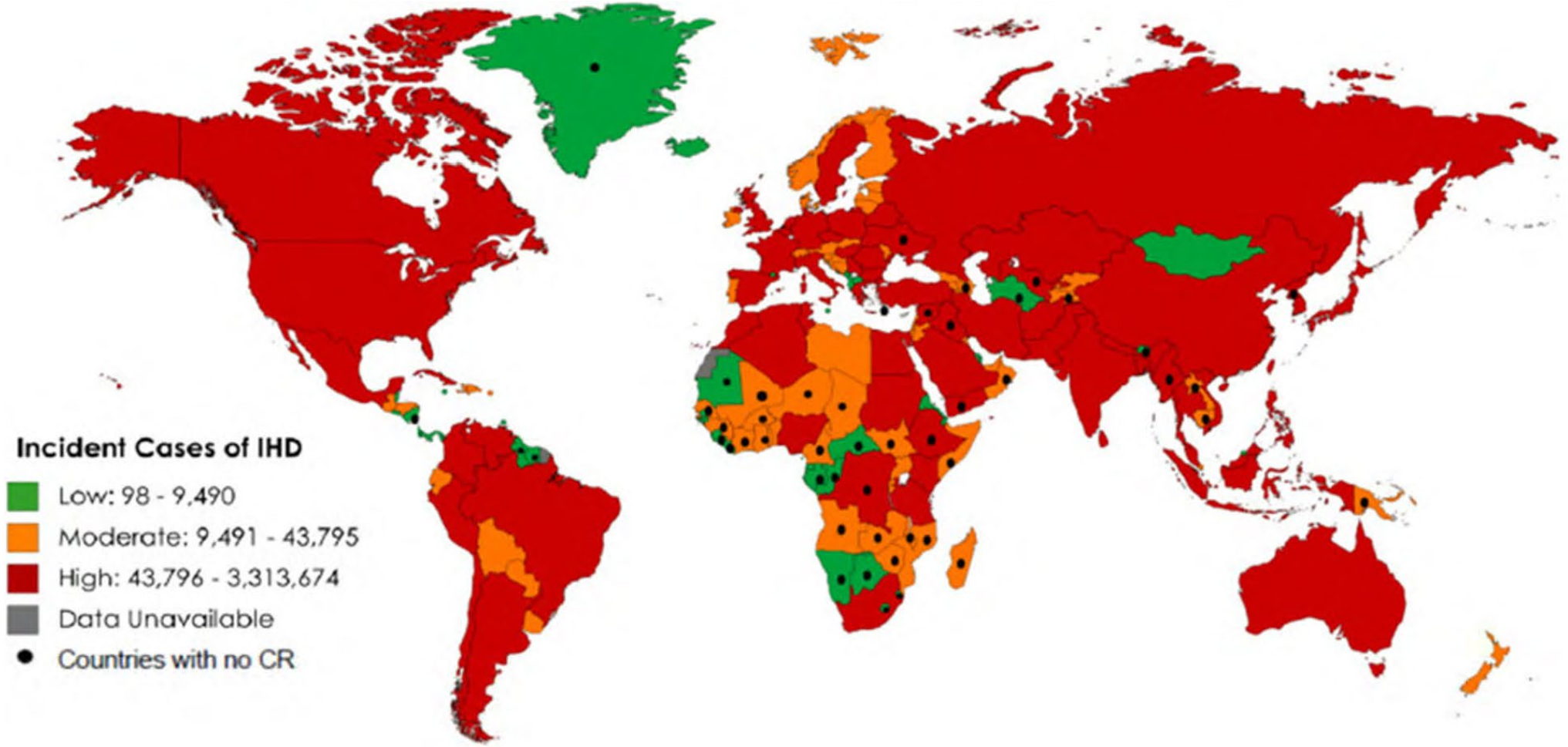
THE GREEN HEART PROJECT

Presented by

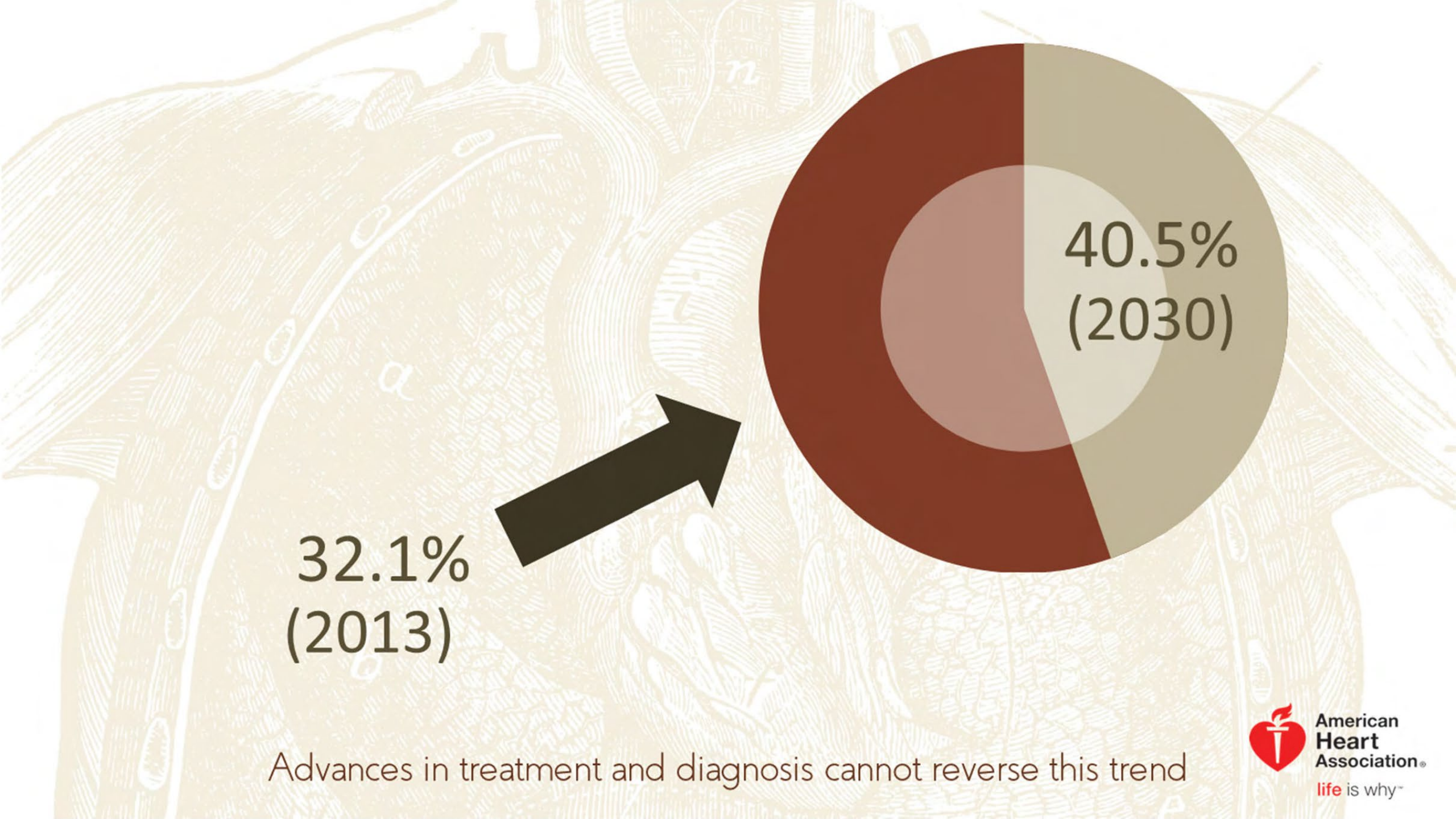
Aruni Bhatnagar

Department of Medicine

University of Louisville



CORONARY HEART DISEASE IS A GLOBAL EPIDEMIC

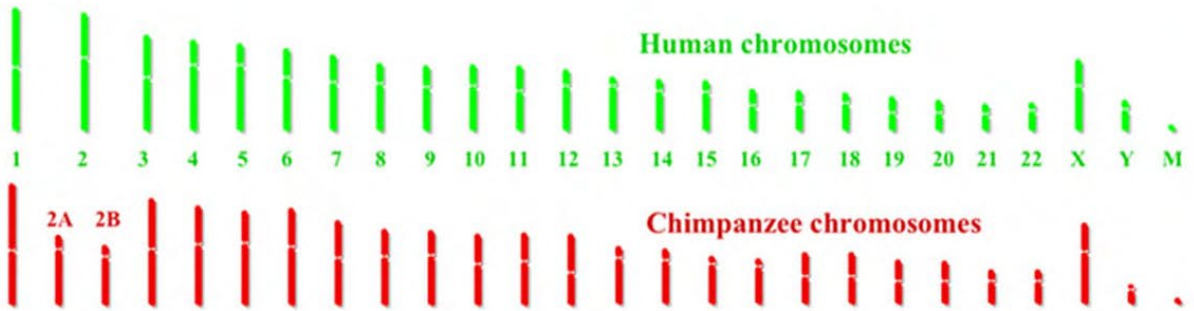


Advances in treatment and diagnosis cannot reverse this trend

American Heart Association®
life is why™

LESS THAN 3% CHIMPS DEVELOP ATHEROSCLEROTIC DISEASE

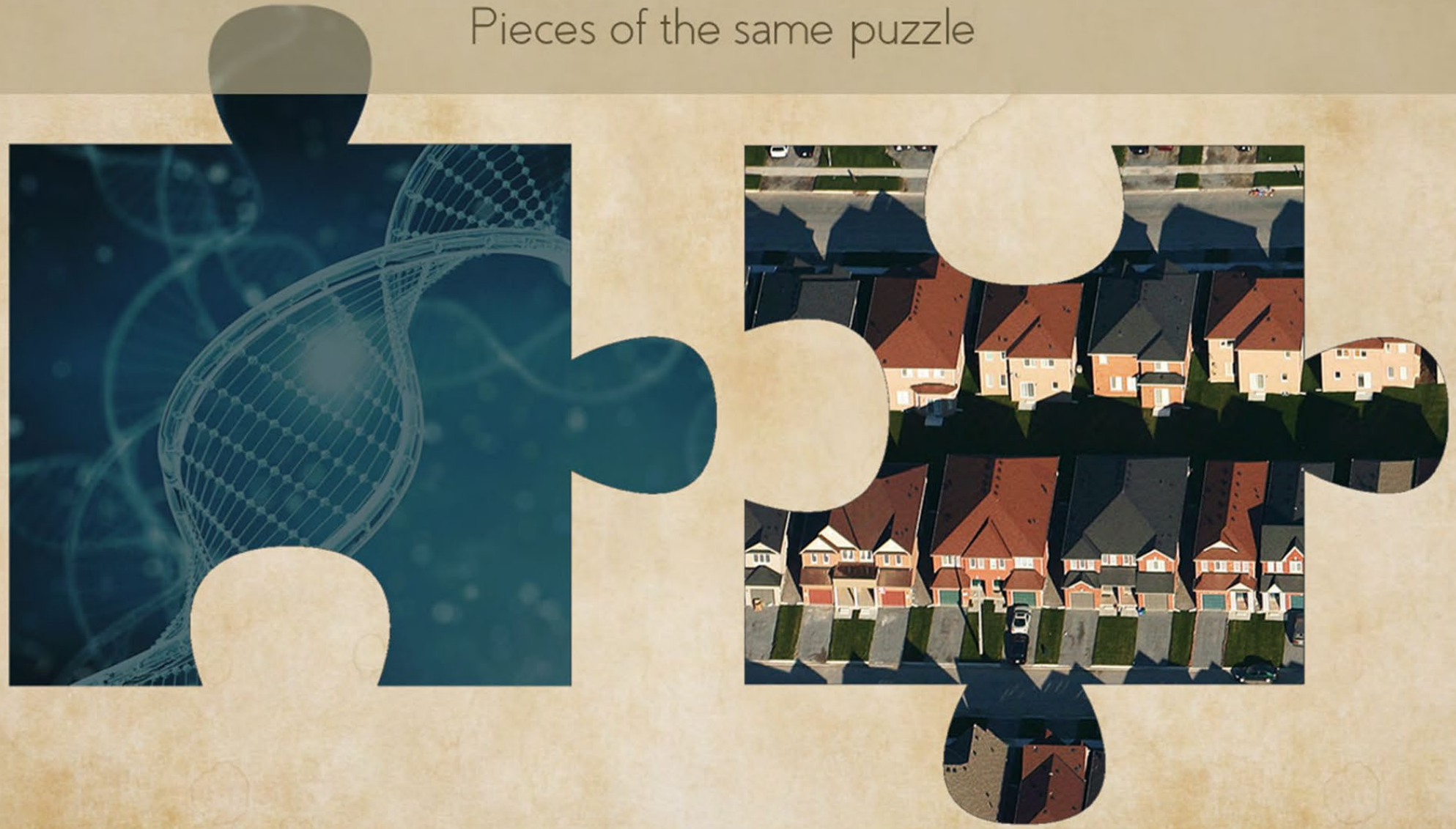
Human and Chimp genomes differ by 2.5%

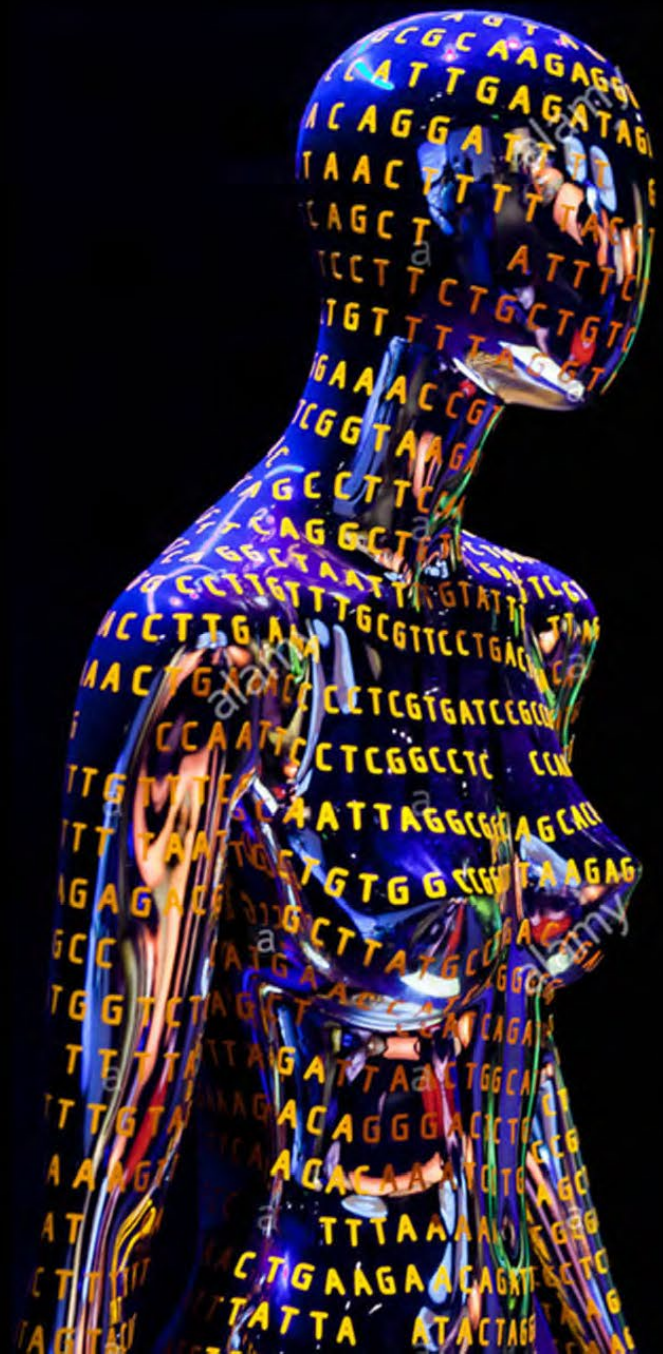


Human genomes differ by 0.5 %

GENES AND ENVIRONMENT

Pieces of the same puzzle

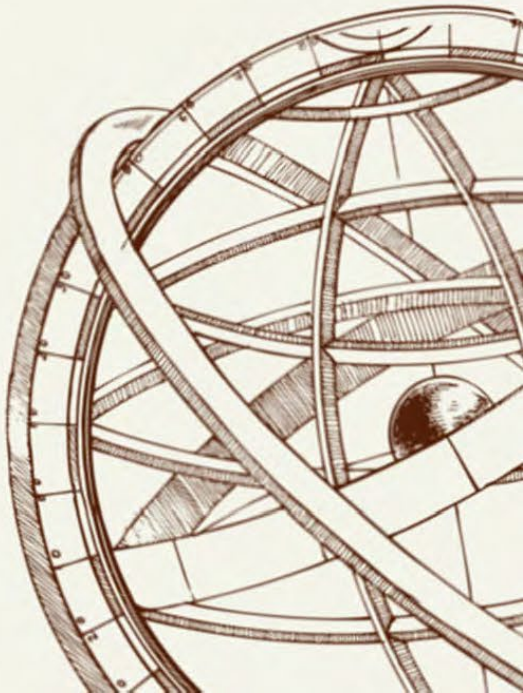




THE HUMAN GENOME PROJECT

ENVIROME

The complete set of environmental conditions that affect the fitness and the health of a specific individual



HUMANS EXIST IN LARGE SOCIAL NETWORKS FASHIONED BY THEIR UNIQUE HISTORY AND CULTURE

CHRONIC DISEASES ORIGINATES FROM...

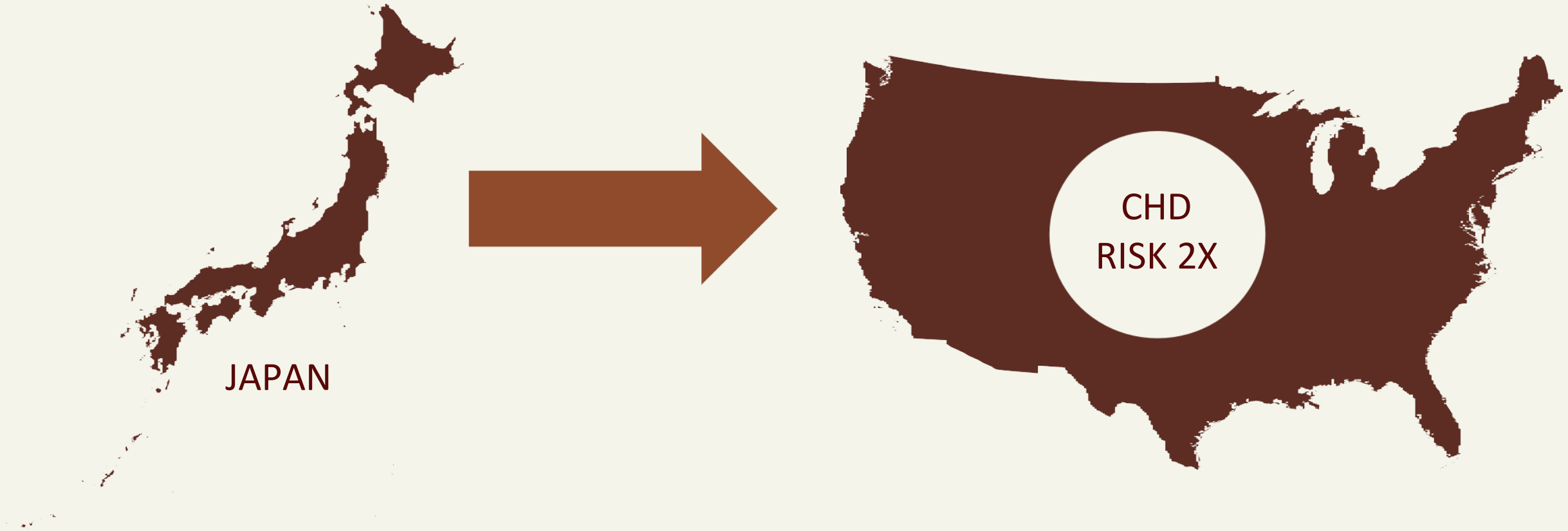
Living in unconducive environments

Environmental dys-synchrony

Mismatch between genes and environment


ENVRONMENTAL CHANGES SI
NFCANTLY
AFFECTCHD RSK

MIGRATION TO NEW ENVIRONMENTS



Am J Epidemiol 102, 514, 1975

CHANGE IN ENVIRONMENTAL CONDITIONS

Ischemic heart disease mortality

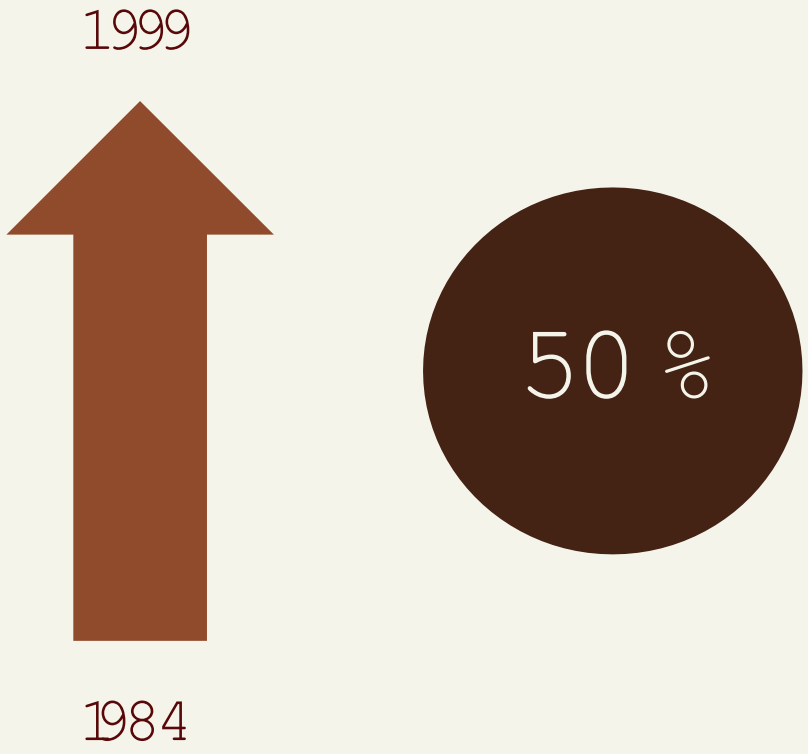
FINLAND

1971

1995

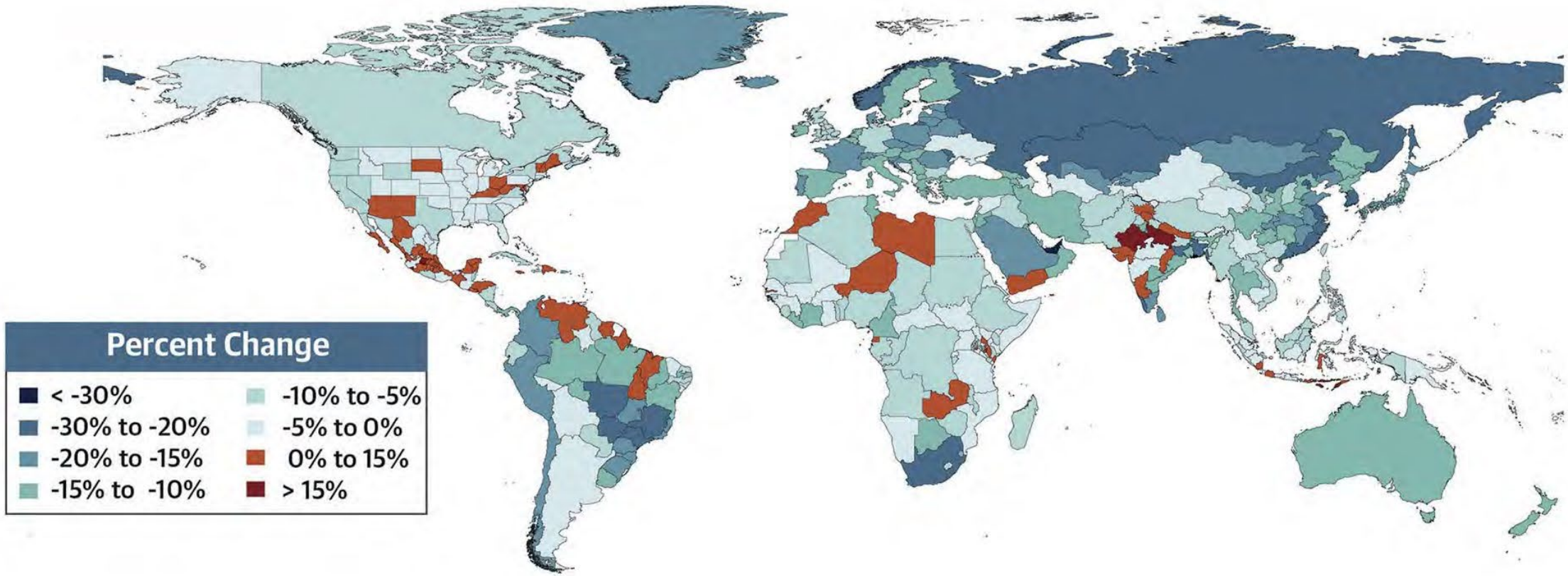
Public Health Nutr 5, 245, 2002

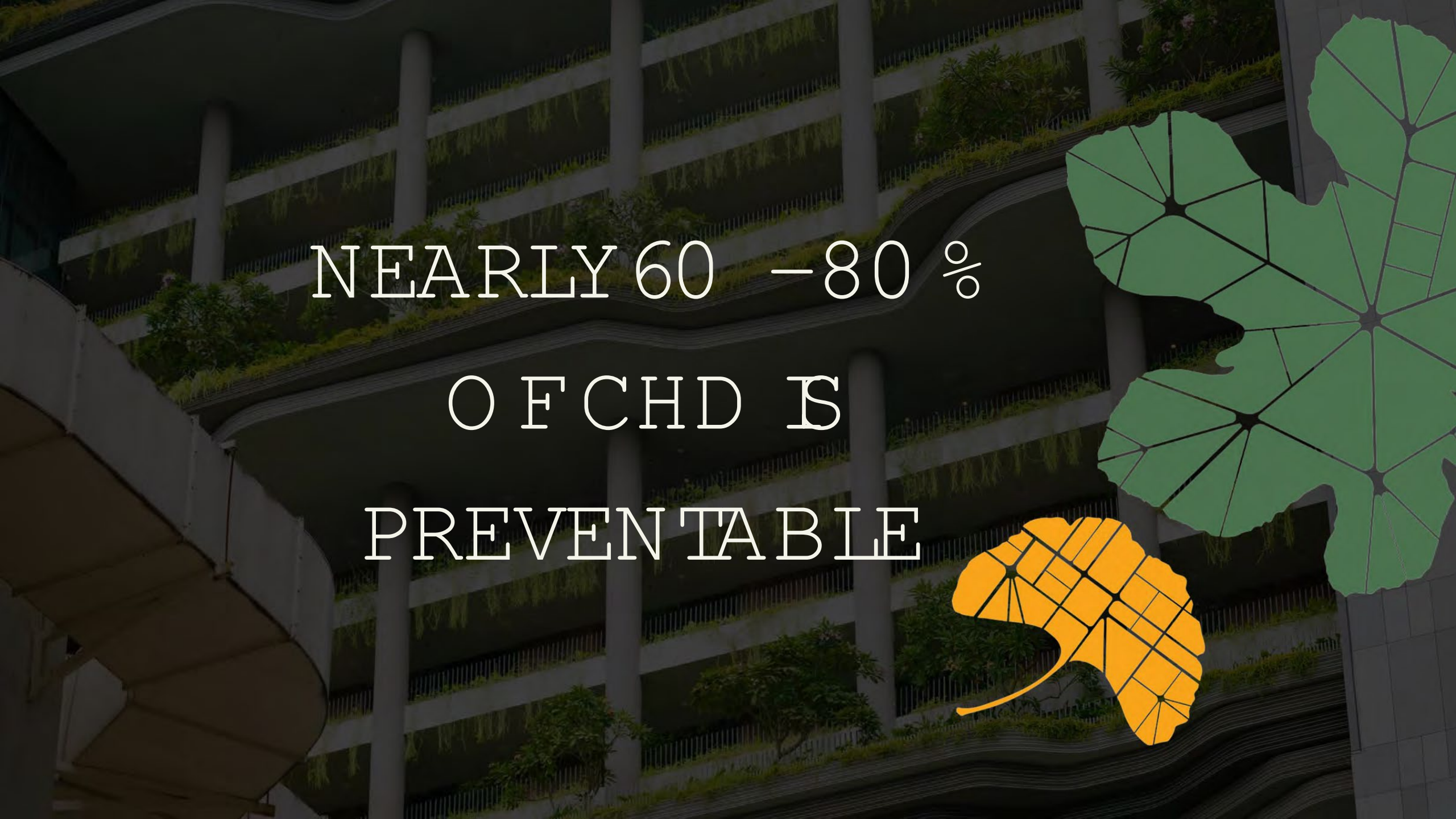
CHANGE IN ENVIRONMENTAL CONDITIONS



Circulation 110, 1236, 2004

Percent Change in Age-Standarized CVD Death Rate from 2010-2019



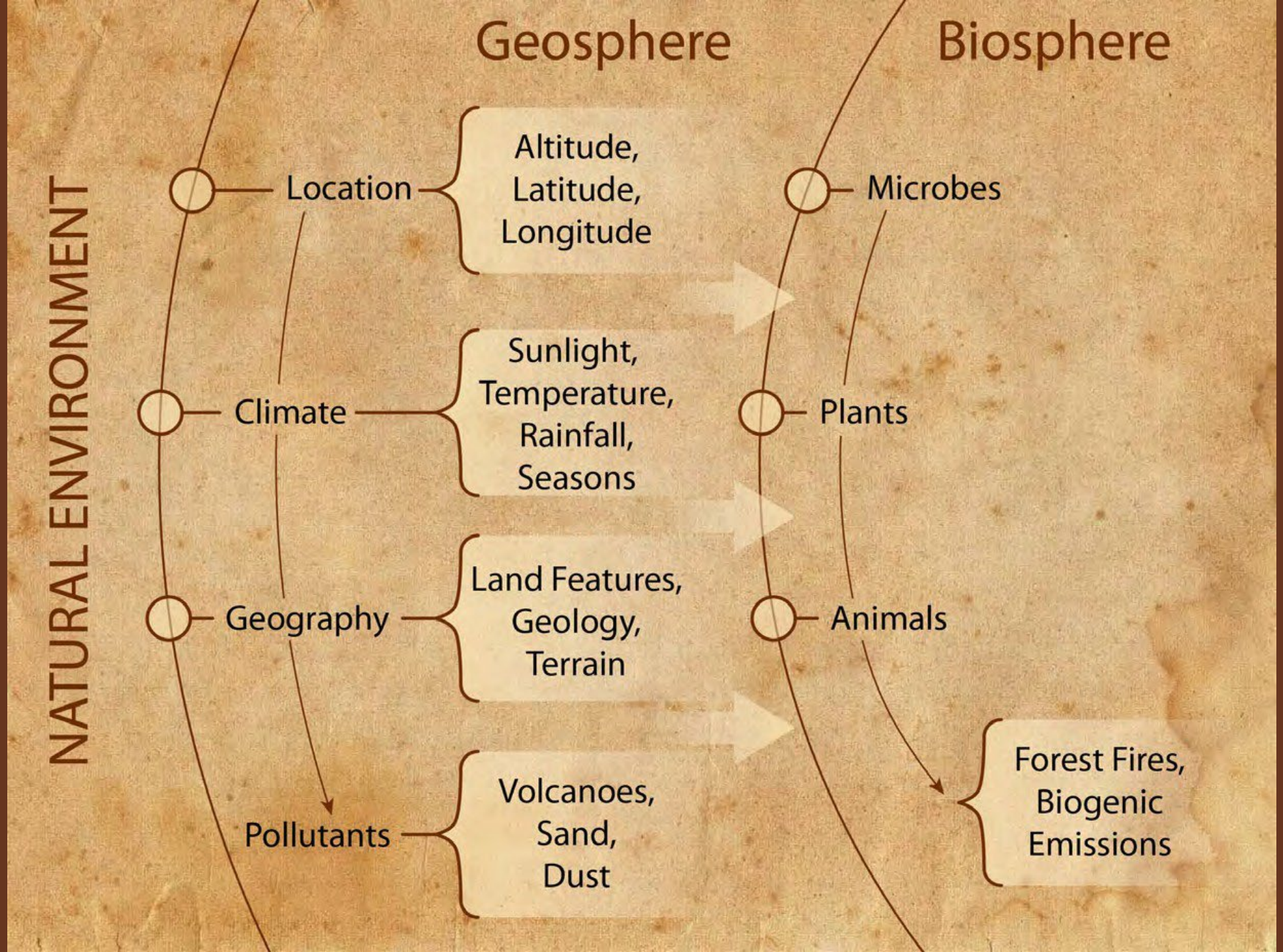

NEARLY 60 -80 %
OF CHD IS
PREVENTABLE

NATURAL ENVIRONMENT

SOCIAL ENVIRONMENT

PERSONAL ENVIRONMENT

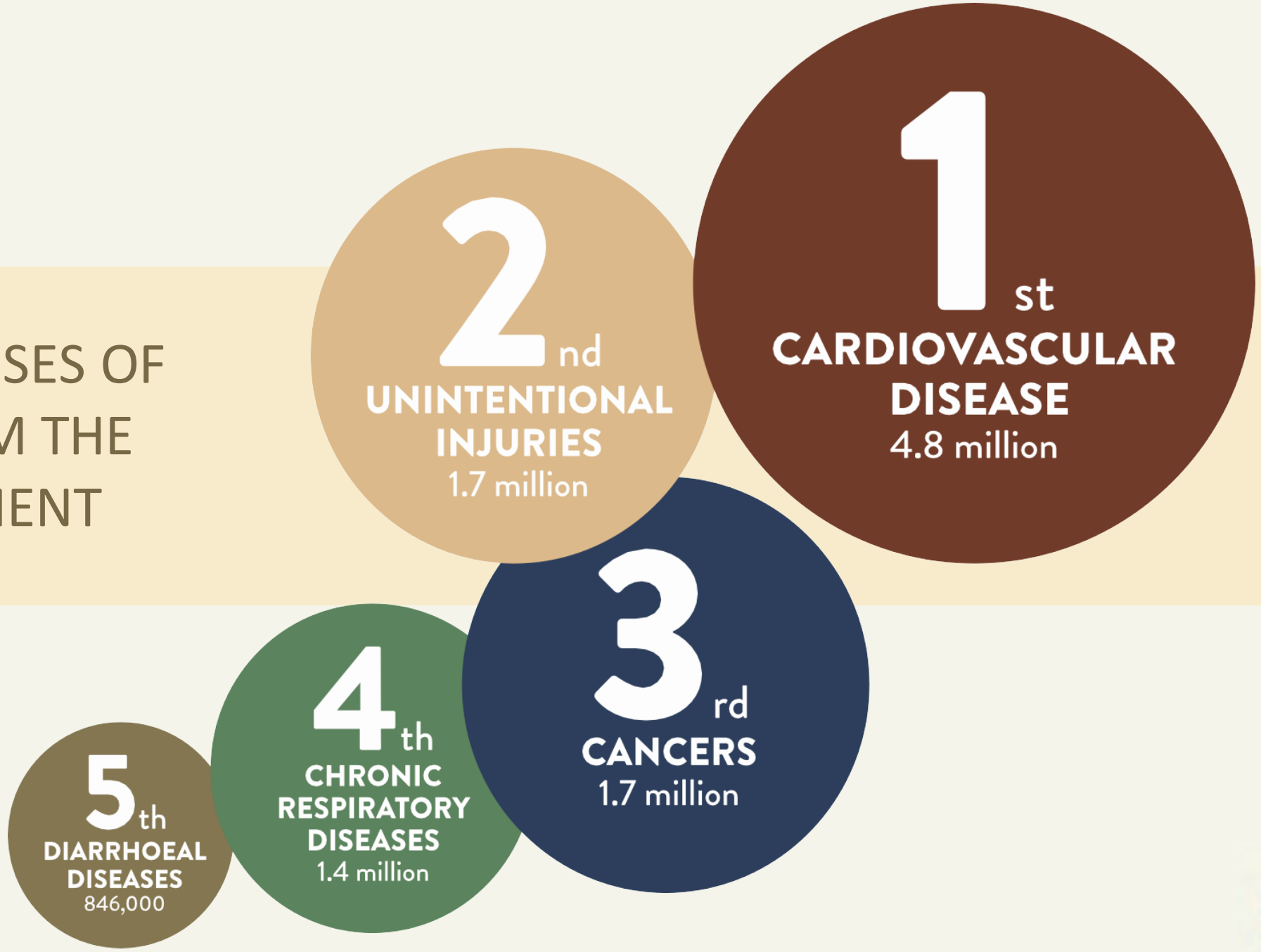
THE HUMAN ENVIROME


NATURAL ENVIRONMENT
Geosphere
Biosphere
Location
Altitude,
Latitude,
Longitude
Climate
Sunlight,
Temperature,
Rainfall,
Seasons
Geography
Land Features,
Geology,
Terrain
Pollutants
Volcanoes,
Sand,
Dust
Microbes
Plants
Animals
Forest Fires,
Biogenic
Emissions

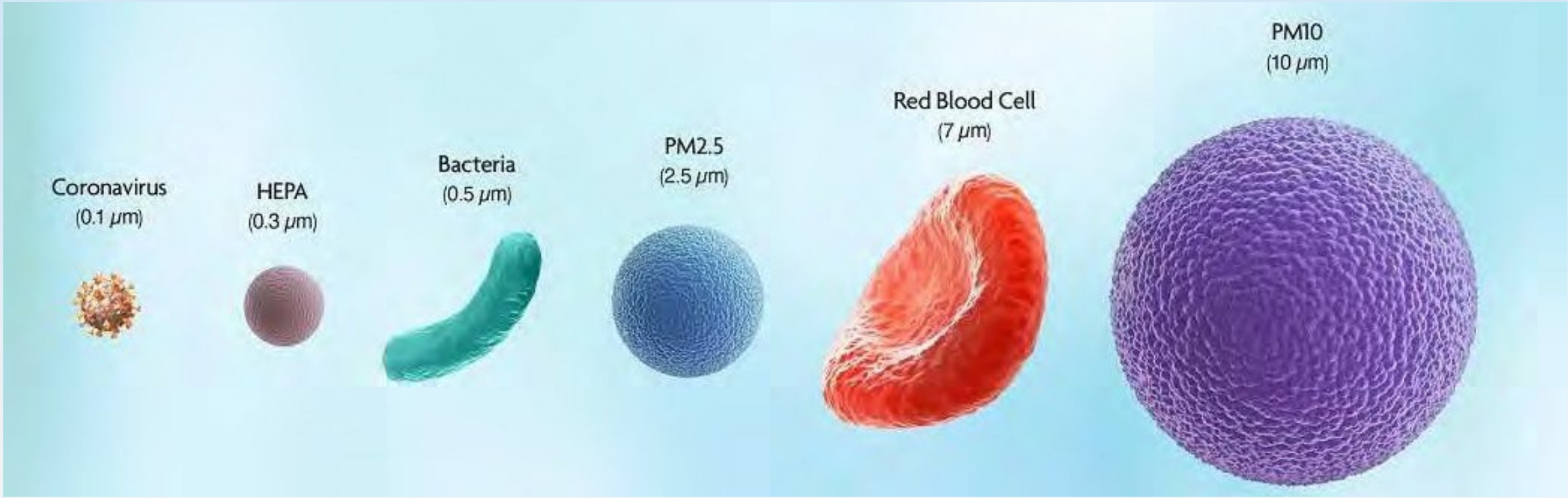
POLLUTION

Nearly 150,000 cardiovascular deaths in the US

LEADING CAUSES OF DEATH FROM THE ENVIRONMENT

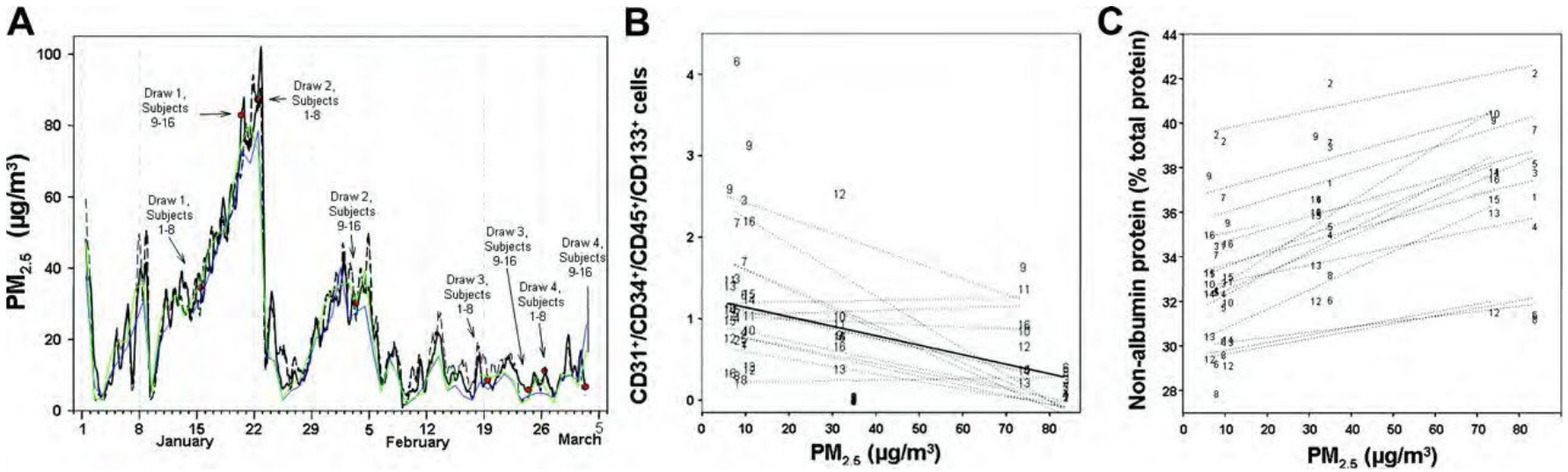


Particulate Matter



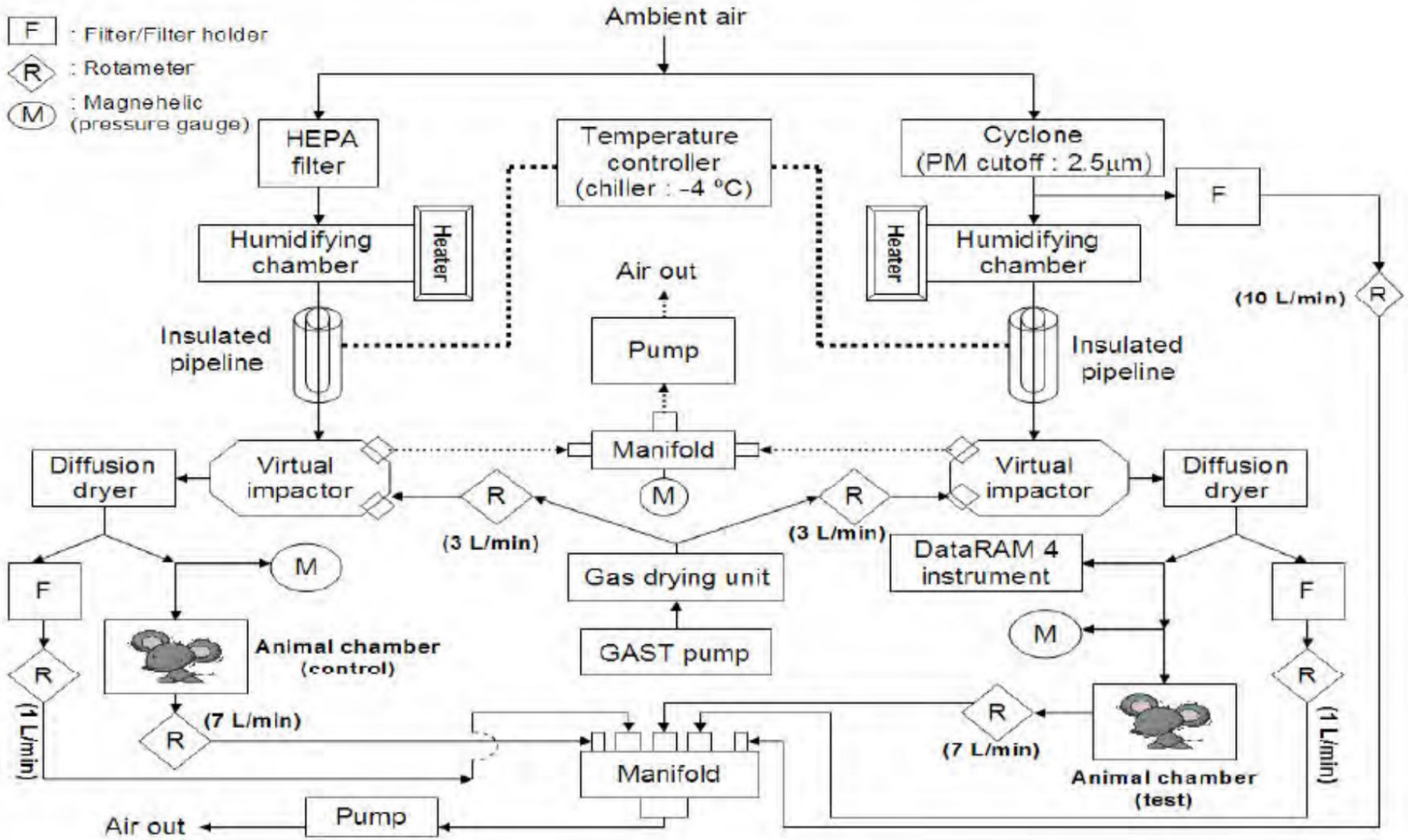
Airborne particles act as ersatz microbes that elicit widespread inflammatory responses leading to 8-12 million premature death annually

Hs lvrgl f#bqfuhdvh#bq#SP #ghfuhdvhv#HSF #bnyhov

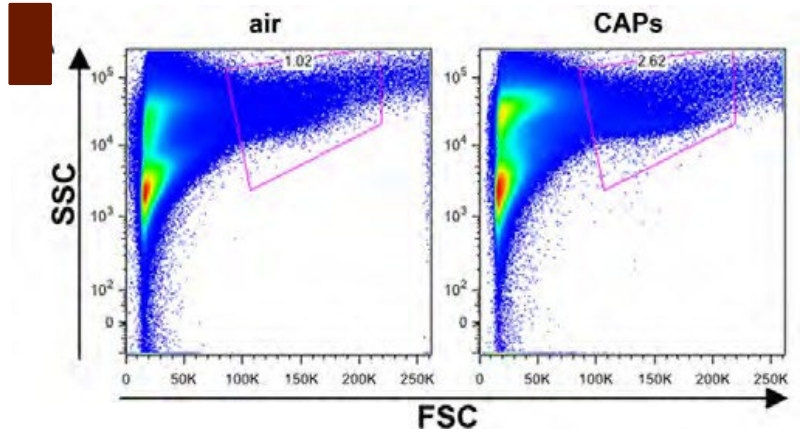


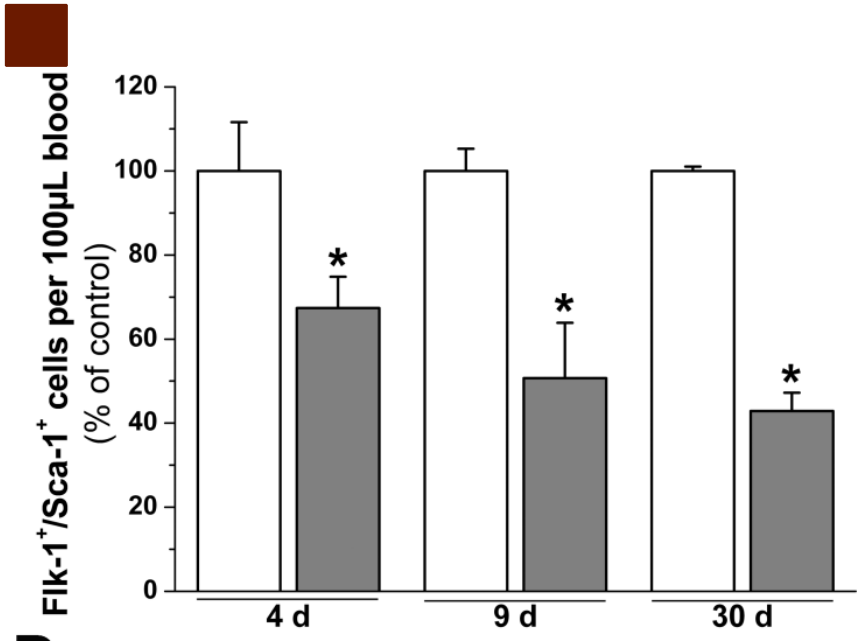
Circ Res 107, 107, 2010

Experimental Setup for exposing mice to concentrated air particulates



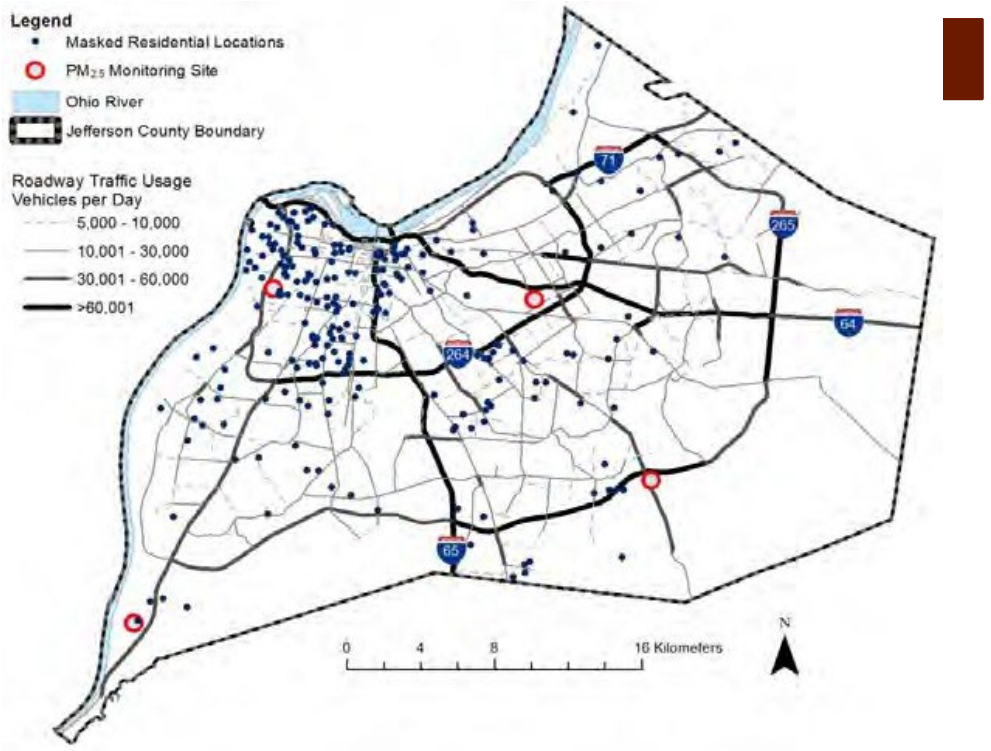
Exposure to PM Decreases Circulating EPC levels





Circ Res 107, 107, 2010

Early Progenitor Cell levels are Increased With Road Way Proximity



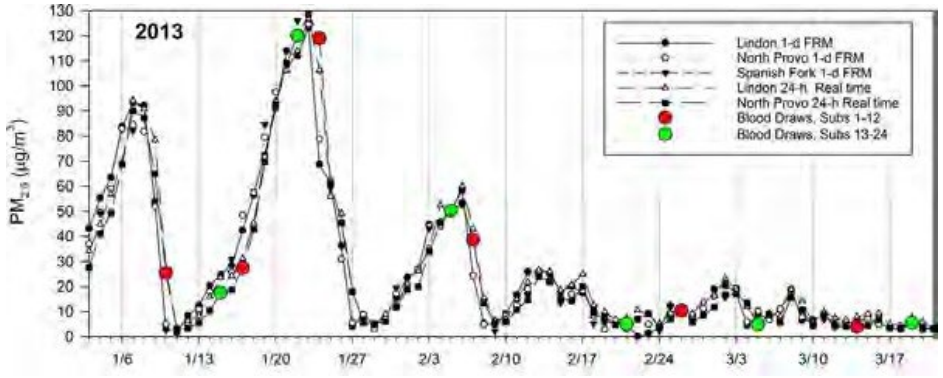
Adjusted Association between roadway proximity and CAC levels

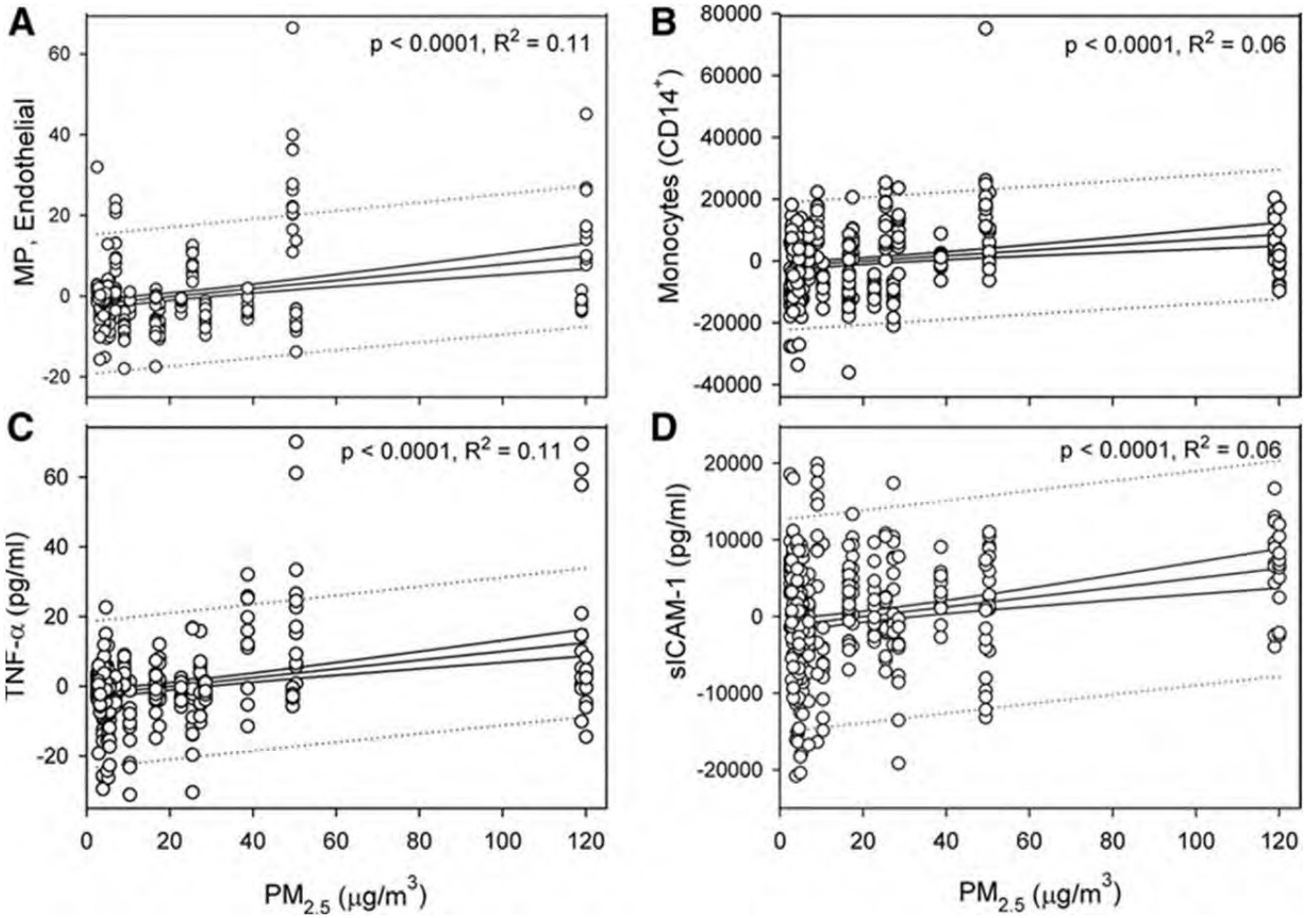
	Total population, n=151		6-month residential duration, n=73	
CAC population	β	p-value	β	p-value
CAC-4 ($CD31^+/34^+/45^+/AC133^+$)	-0.705	0.029*	-1.463	0.001*
CAC-5 ($CD31^+/AC133^+$)	-0.736	0.001*	-0.822	0.024*
CAC-11 ($AC133^+$)	-0.620	0.005*	-0.760	0.063
CAC-14 ($CD34^+/45^+/AC133^+$)	-1.260	0.007*	-1.011	0.014*

ATVB 35, 2468, 2015

Inflammation in $PM_{2.5}$ exposure studies

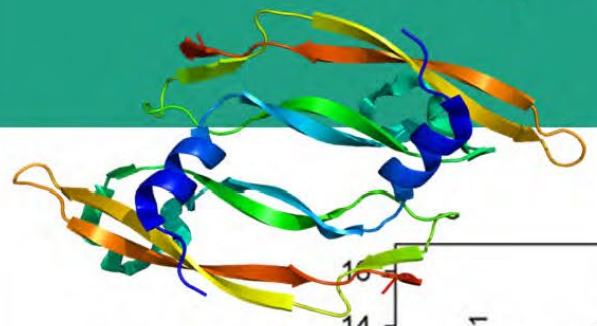
Young healthy adults (n=72) examined over 3 years during periods of high and low $PM_{2.5}$ levels

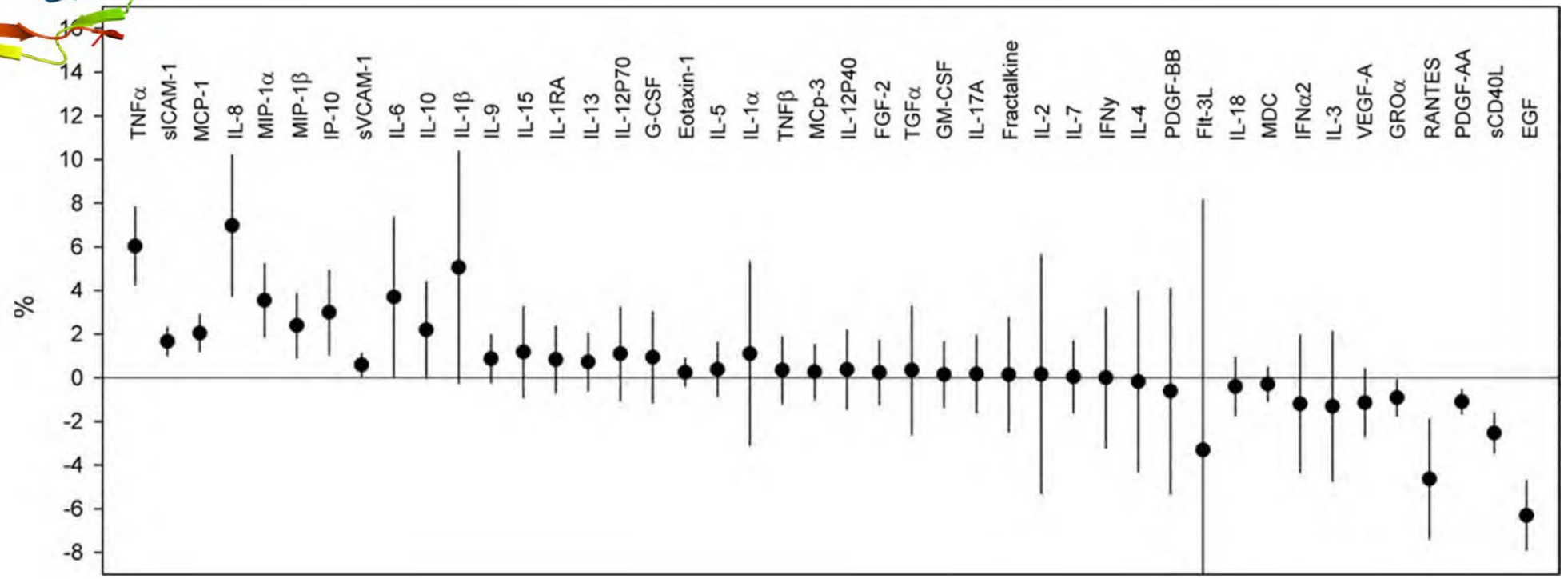




Circ Res 119, 1204, 2016

Exposure to $PM_{2.5}$ establishes anti-angiogenic profile

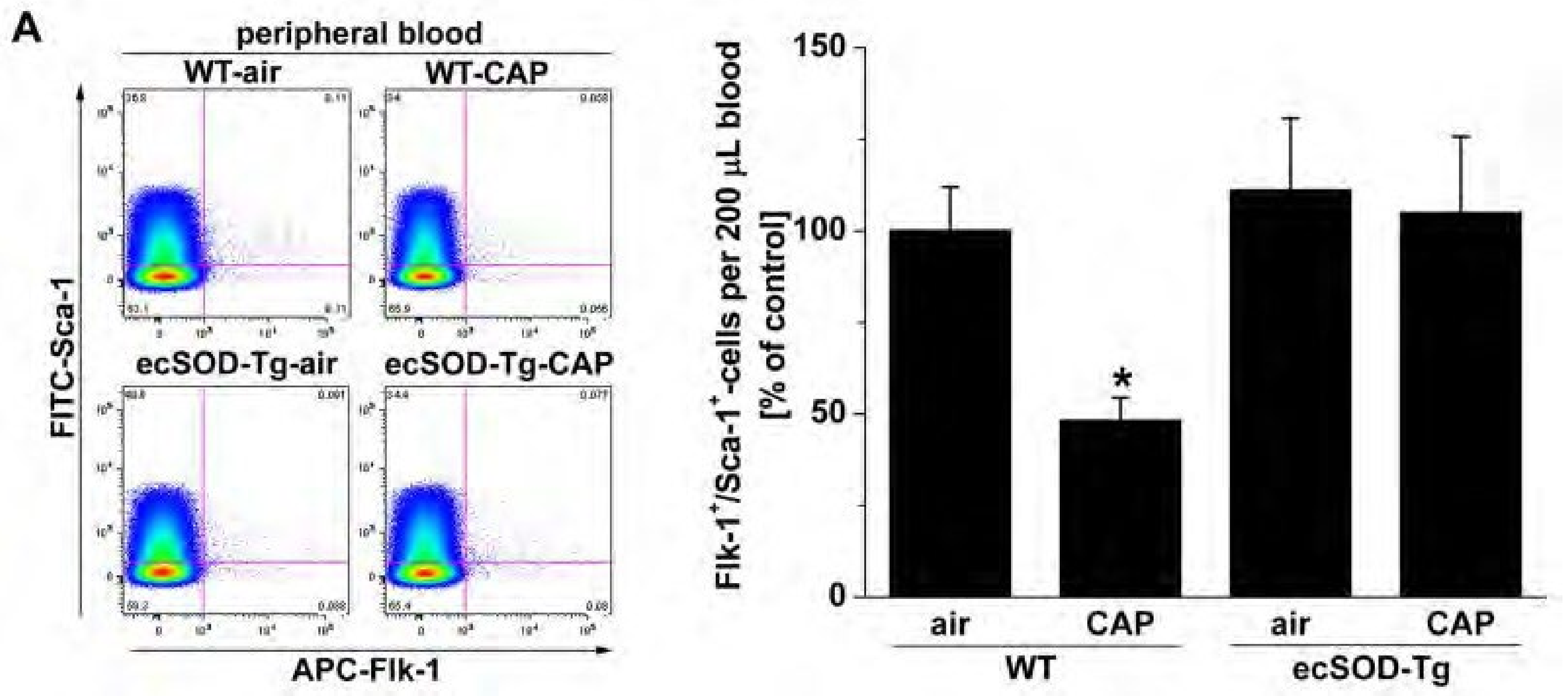




Circ Res 119, 1204, 2016

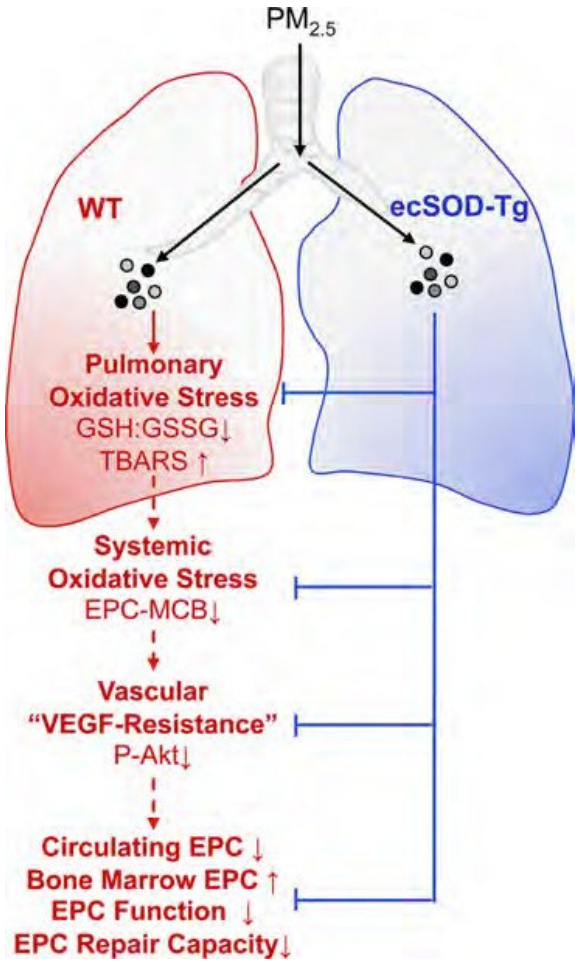
Sxp rqduI#hfVRG Suhyhqw#SP 518Obgxfhg #HSF #ghsdwlrq

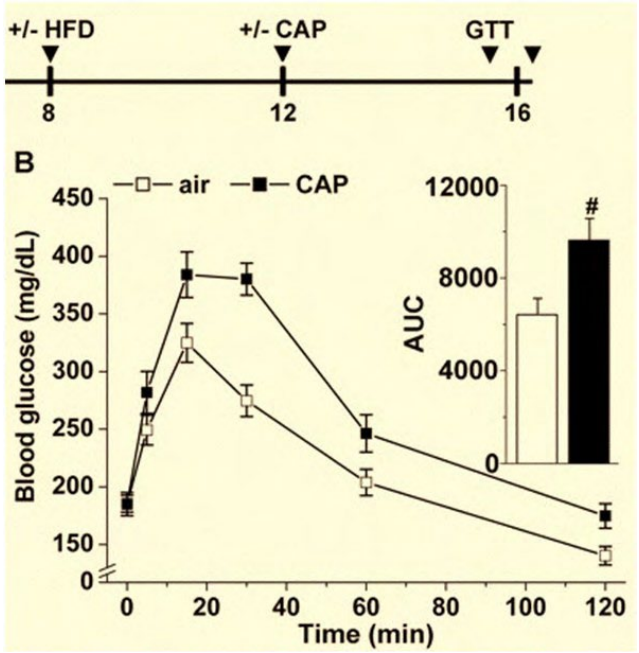
WT and lung-specific ecSOD Tg mice exposed to concentrated air particles (CAPS) or filtered air for 9 days

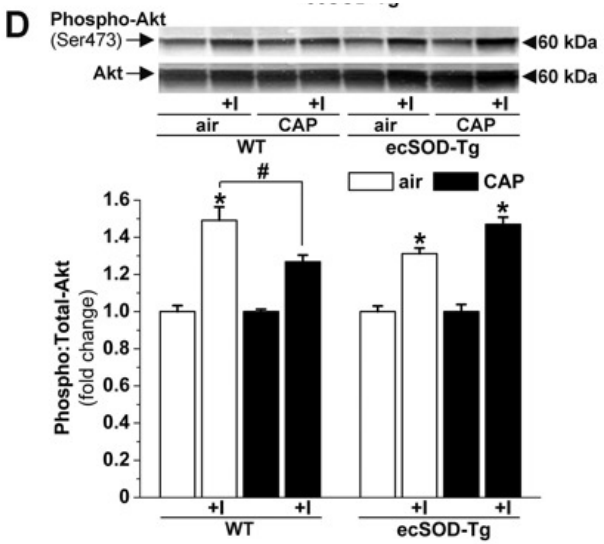


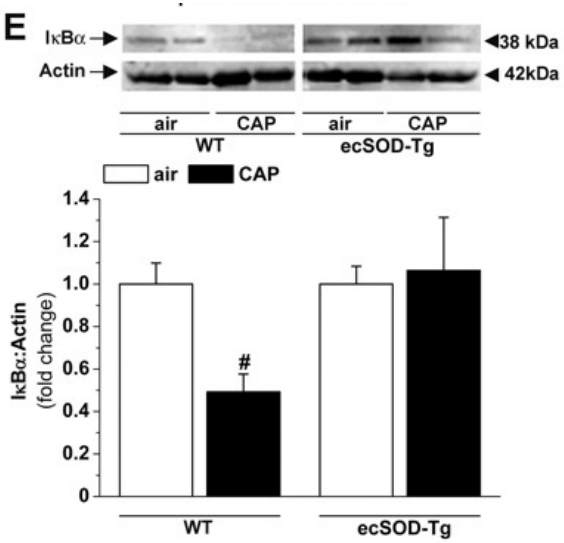
Arterioscl. Thromb. Vasc. Biol. 38, 38, 2018

Sxp rqduI#hfVR G Suhyhqw#SP 518Cbqgxfhg#qiolp p dwrq









Circ Res 108,644,20 **1**

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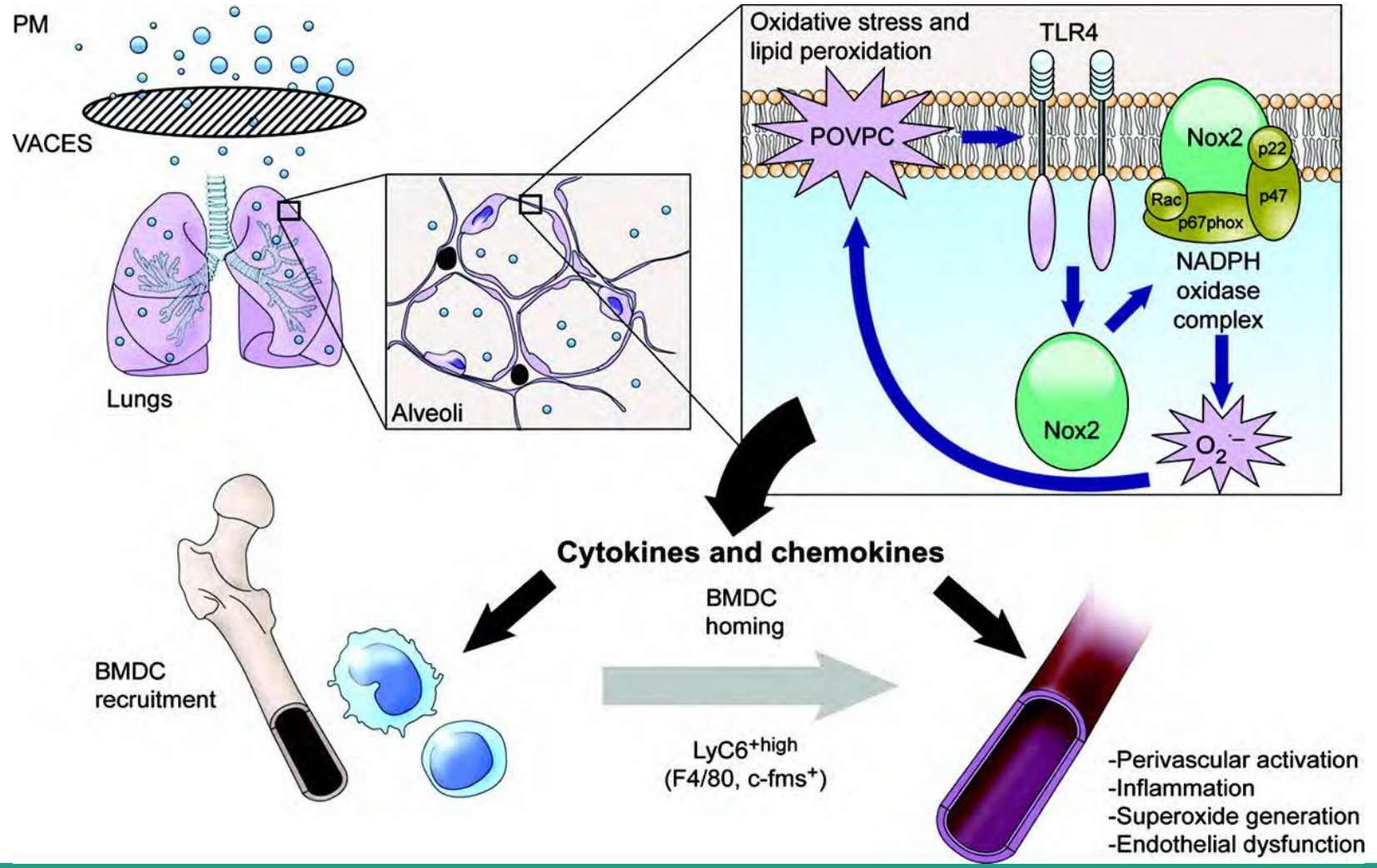
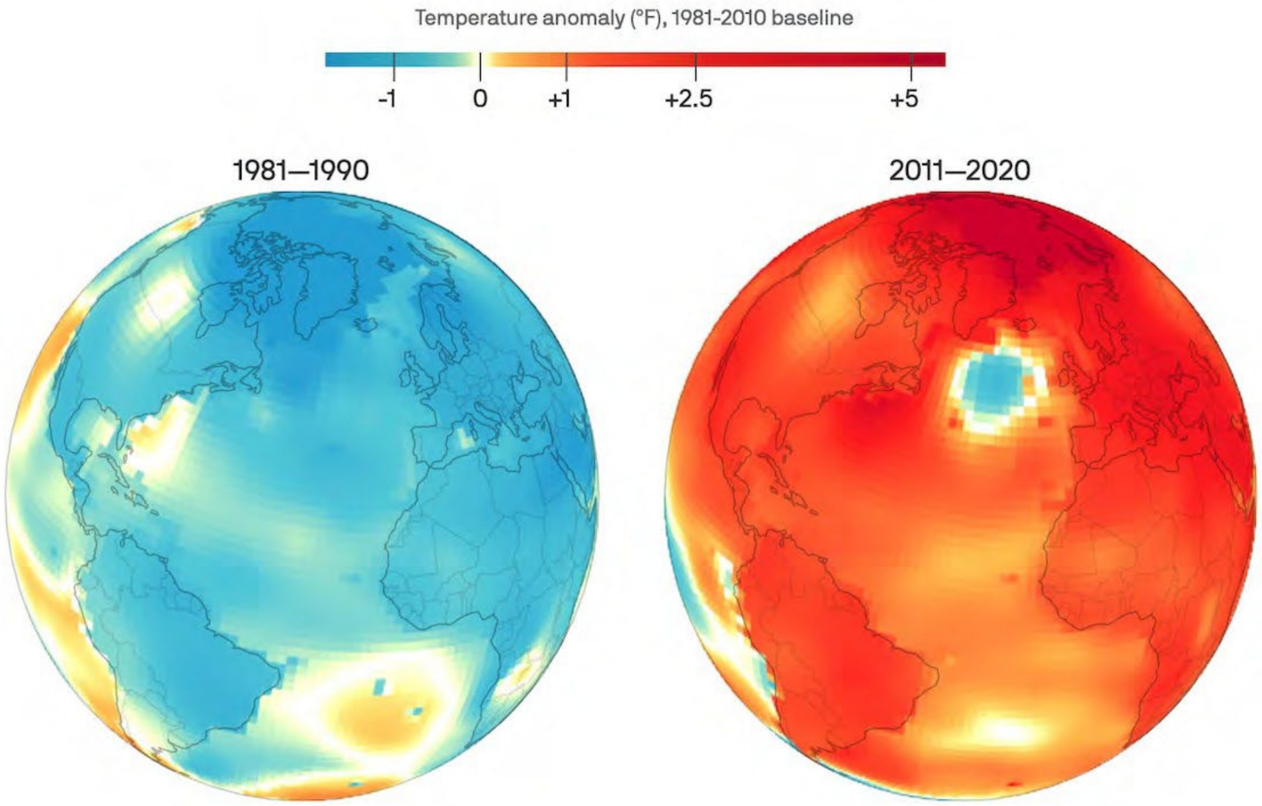


Circ Res 108,644,20 **1**

SOCIAL ENVIRONMENT

INDUSTRIAL POLLUTION, SEWAGE, WASTE, BIOMASS BURNING,



FR 5#ohyhov#kdyh#lqfuhdvhg#64 (#vlqfh#wkh#suhlqgxvwuldo#wlp h#dqg#kdoi#wkh#lqfuhdvh#kdv#ehhq#vlqfh#4<98

Hxurshdq#sroxwlrq#ri#wkh#P hglwhuudqhdq#orz hu#wursrvskhuh#kdv#lqfuhdvhg#wkh#ohyhov#ri#r}rqh#dqg#fduerq#glr{lgh#507#iro g

HyhuI#Ihdu#iru#wkh#odvw#63#Ihduv#wkh#hduwkv#folp dwh#kdv#frqvlvwhqwoI#h{fhhghg#wkh#erxqgv#ri#qdwxudo#ydulde lolwI

TREES shade buildings reducing the need for air conditioning which reduces fossil fuel consumption

TREES absorb small particulate matter from the air

LARGE, HEALTHY TREES have the greatest per tree effects at pollution removal

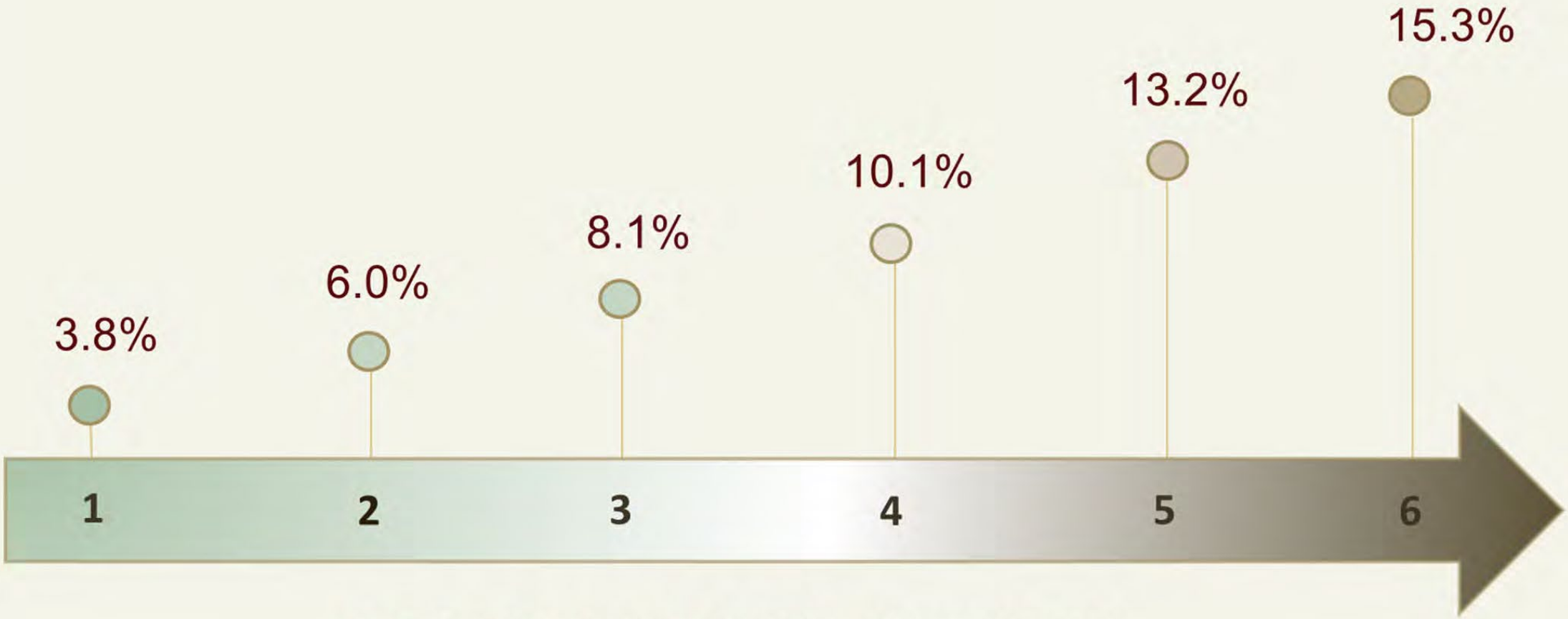
REDUCED HEART ATTACKS, STROKES AND ASTHMA

HEALTHIER PEOPLE

IMPROVED NEIGHBORHOOD AIR QUALITY

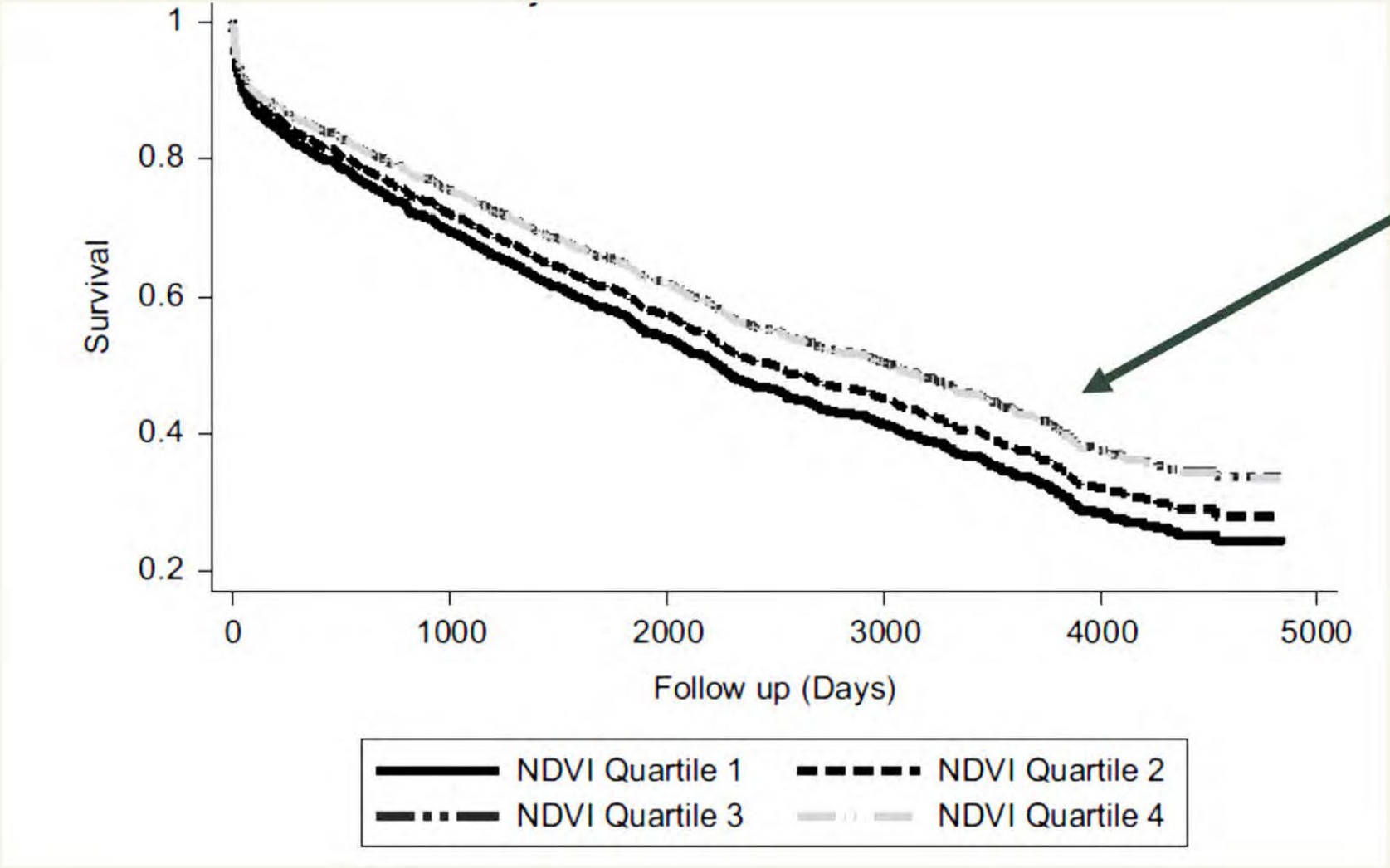
In England, the rate of cardiovascular mortality in least green areas was twice that of greenest areas.

INCREASE IN CARDIOVASCULAR MORTALITY



Am J Prev Med 44. 139. 2013

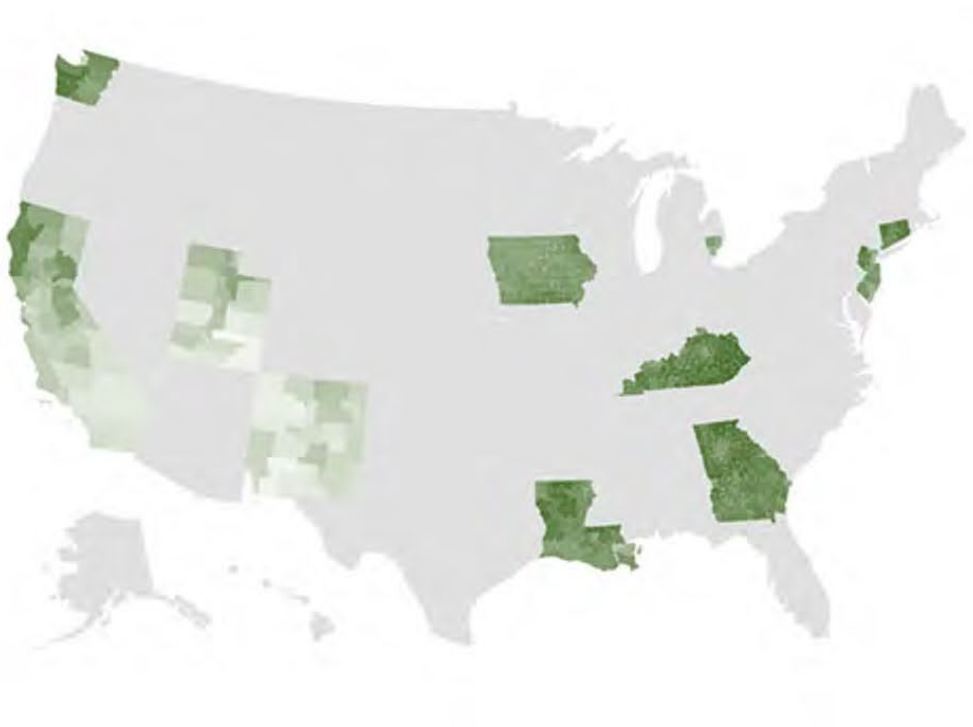
LIVING IN GREEN SPACES AND STROKE SURVIVAL

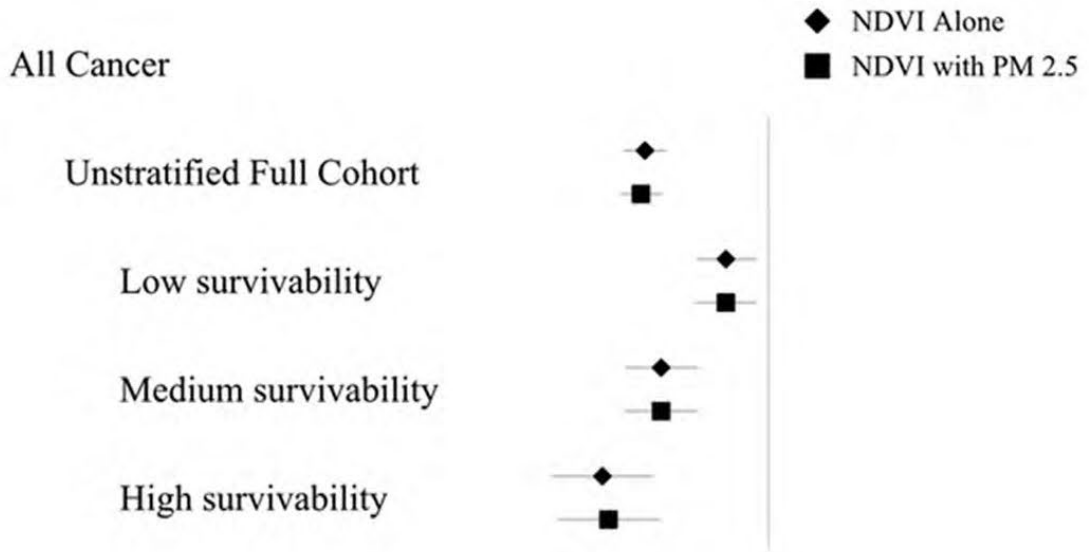


HIGH GREENNESS

THE US NATIONAL CANCER INSTITUTE'S SURVEILLANCE. EPIDEMIOLOGY AND END RESULTS (SEER) COHORT

Cohort of 5.529.005 individuals. 2.263.874 deaths





Environ Int 157. 2021


NATURAL ENVIRONMENT
Forests
Grasslands
Brush
Mosses
Wetlands
SOCIAL ENVIRONMENT
Parks
Yards
Yard trees
Street trees
Gardens
PERSONAL ENVIRONMENT
Indoor plants
Residential Yards

PHYSICAL ACTIVITY

Green Spaces Promote Physical Activity

SOCIAL COHESION

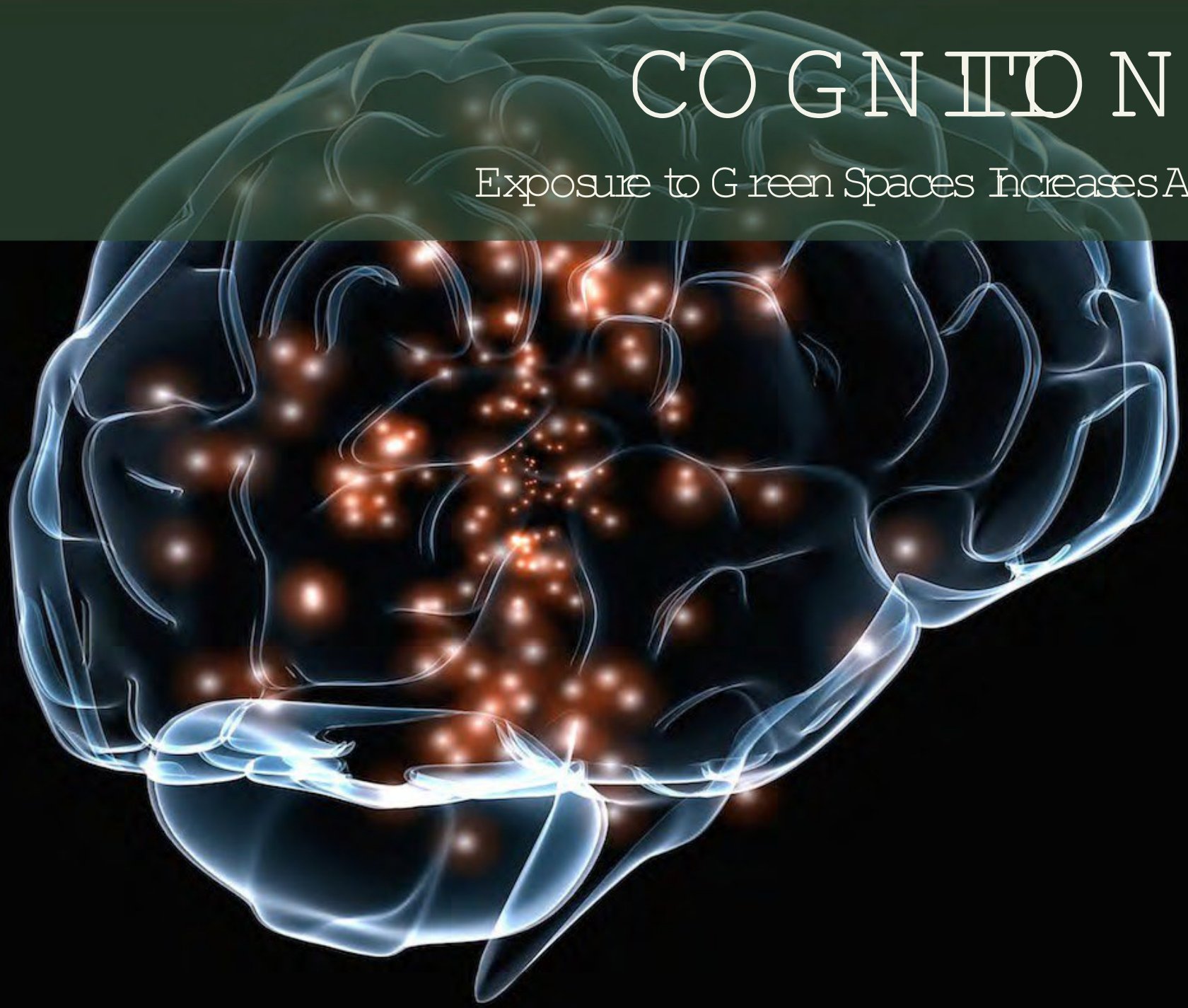
Green Outdoor Spaces Promote Social Interactions and Cohesion

MENTAL HEALTH

Individuals living in greenspaces report better mental he

COGNITION

Exposure to Green Spaces Increases Attention



IMMUNITY

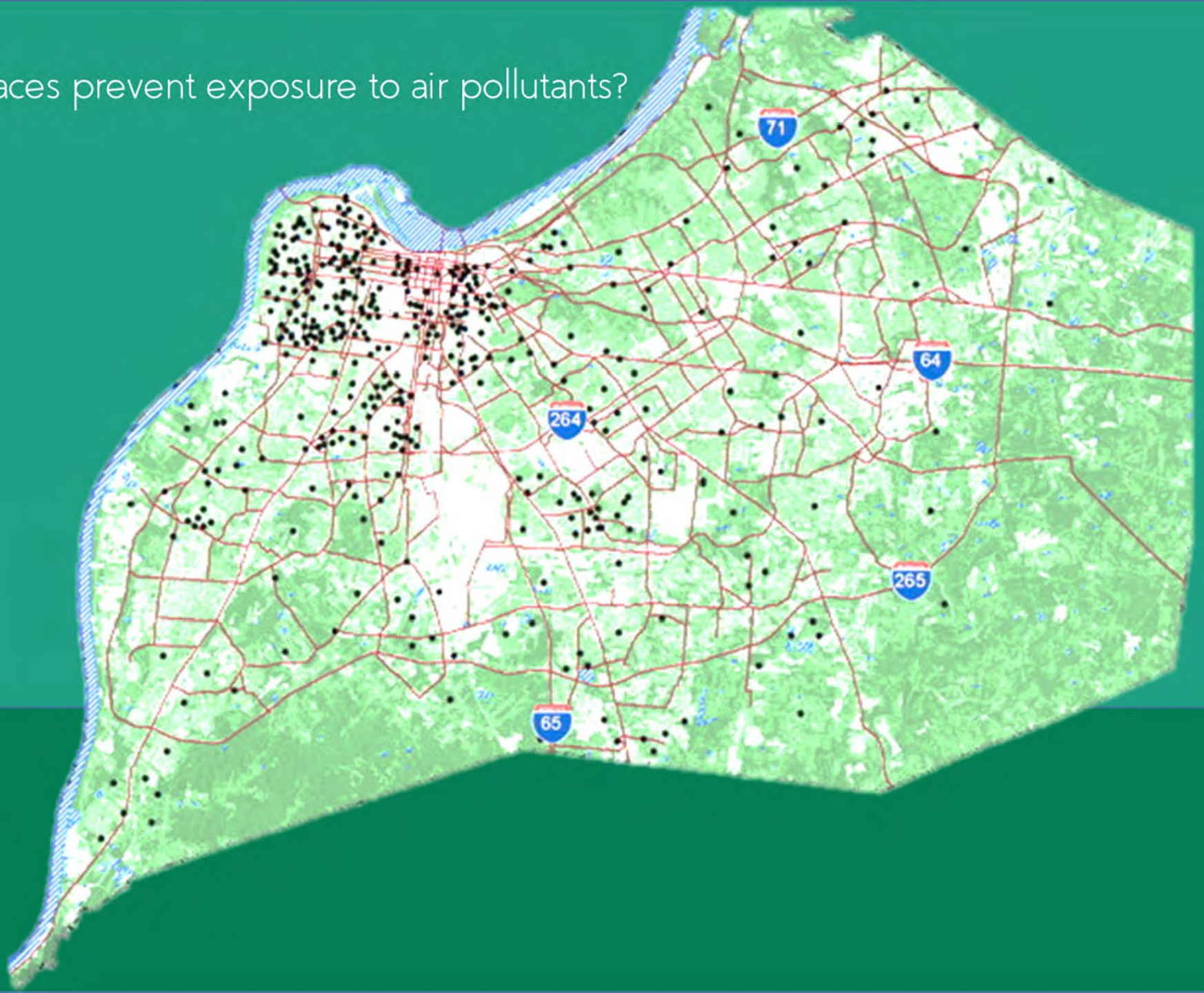
Plant antigens educate the human immune system

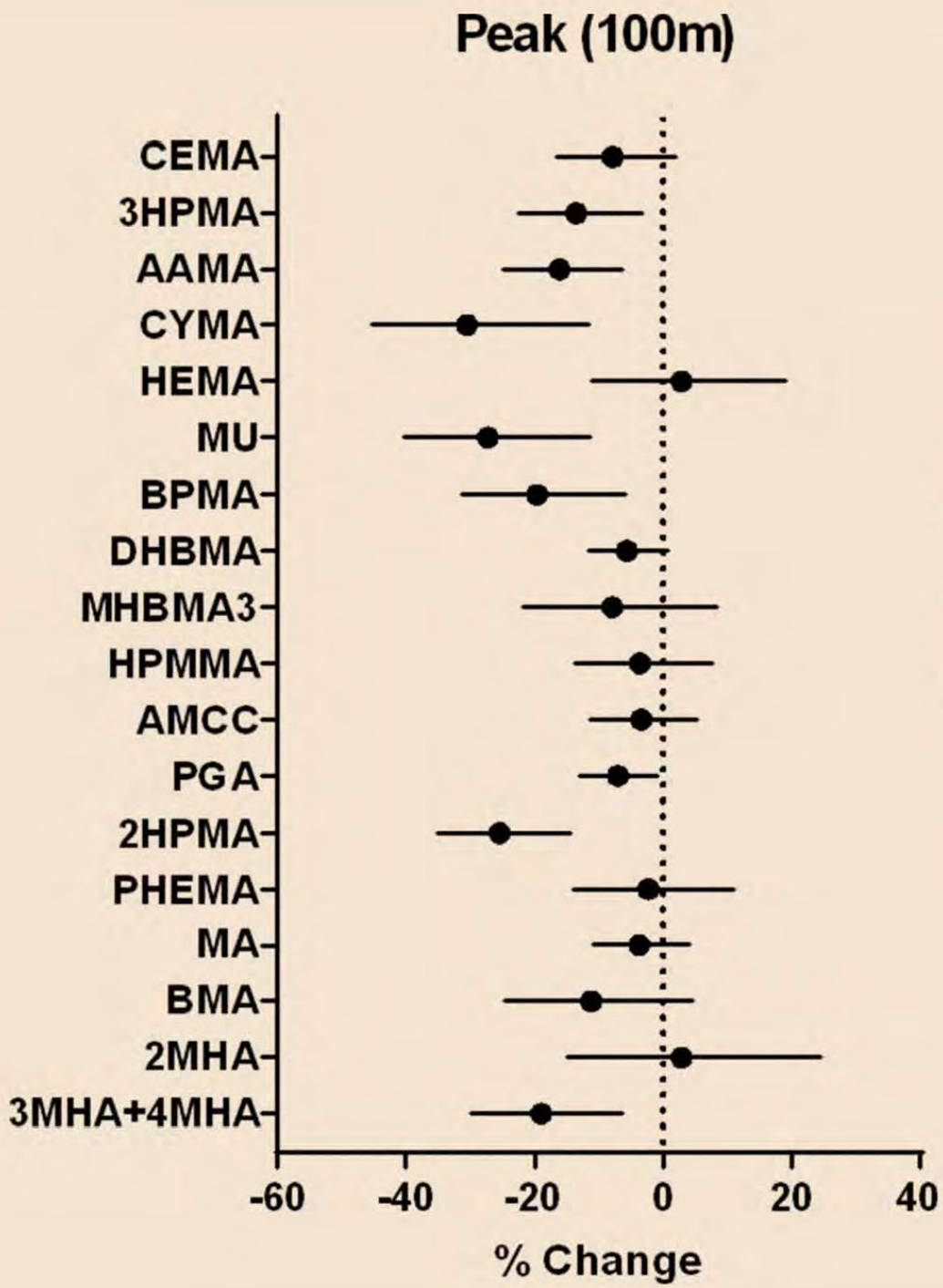
ASTHMA

Children living in green spaces have less asthma

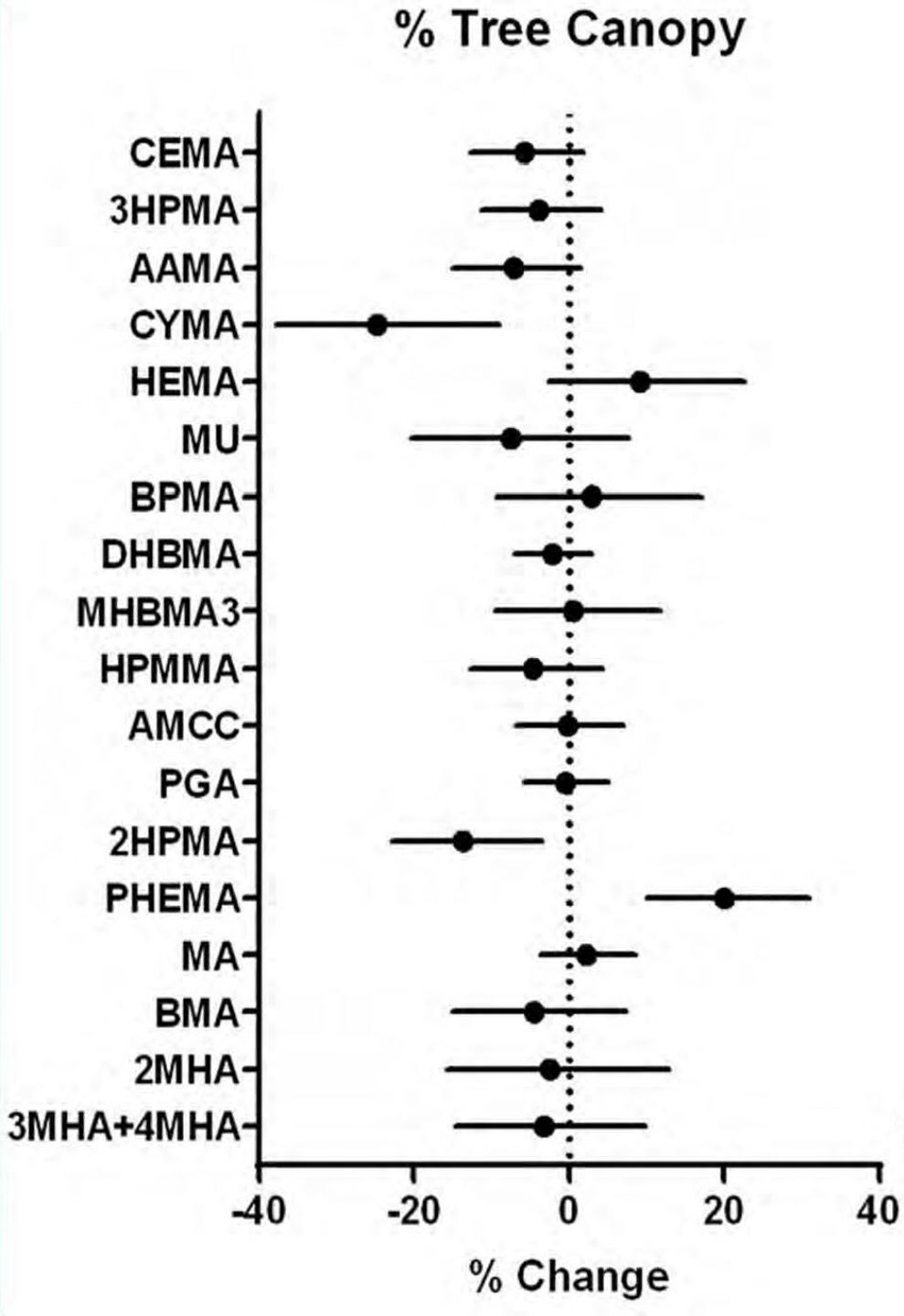
A Room With A View

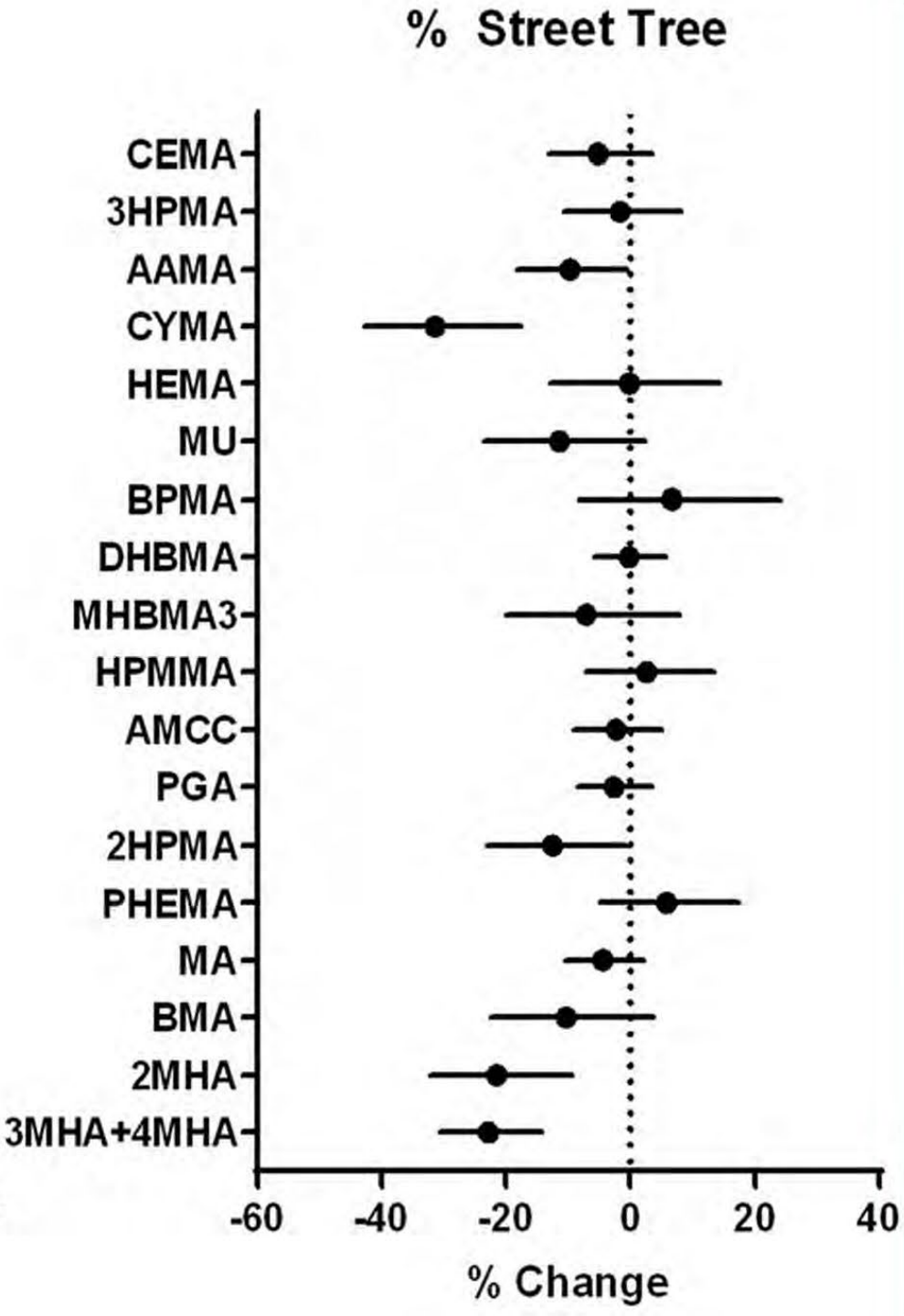
Do green spaces prevent exposure to air pollutants?



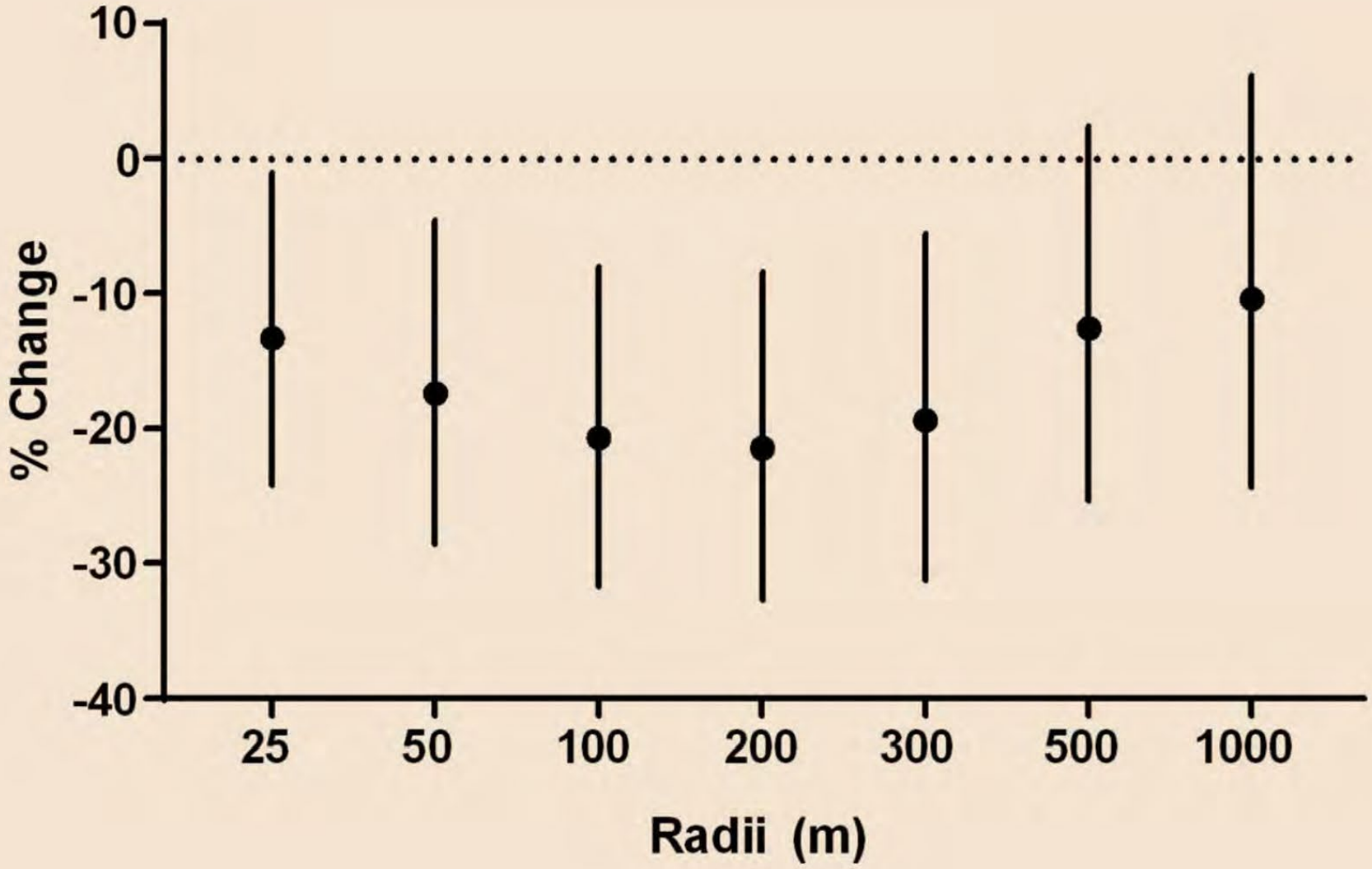


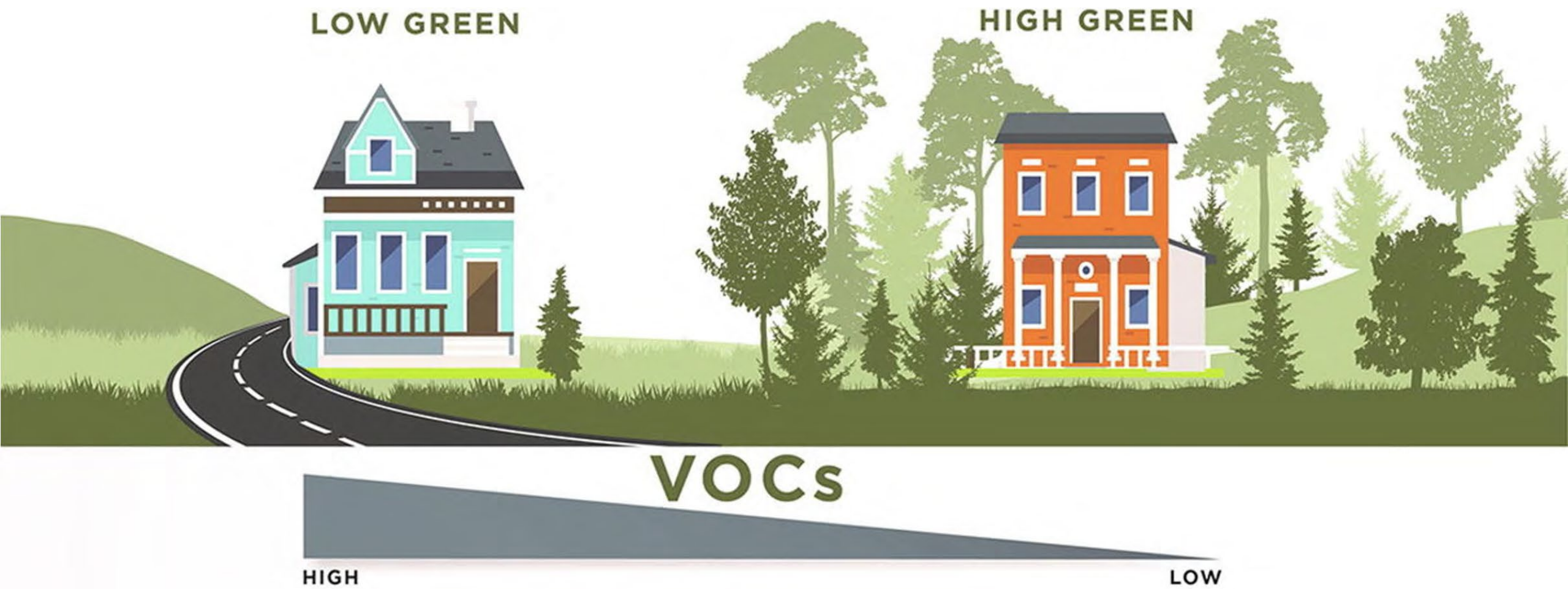
Association between urinary VOC metabolites and residential greenness


% Tree Canopy
CEMA
3HPMA
AAMA
CYMA
HEMA
MU
BPMA
DHBMA
MHBMA3
HPMMA
AMCC
PGA
2HPMA
PHEMA
MA
BMA
2MHA
3MHA+4MHA
-40
-20
0
20
40
% Change

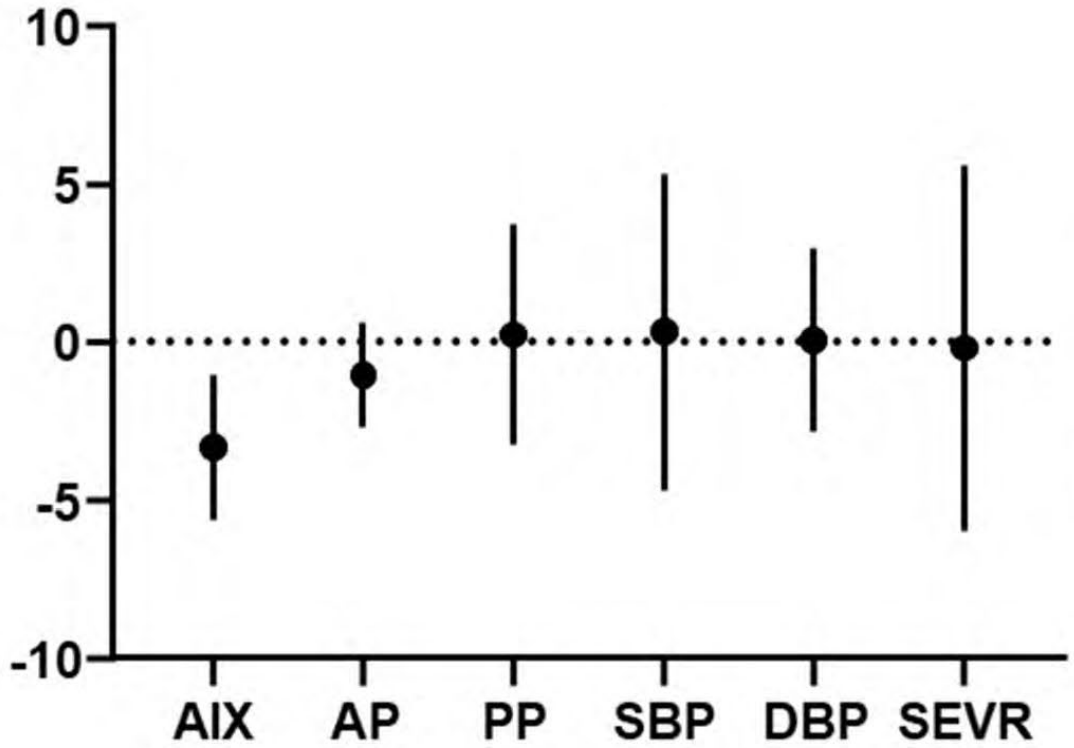

% Street Tree
CEMA
3HPMA
AAMA
CYMA
HEMA
MU
BPMA
DHBMA
MHBMA3
HPMMA
AMCC
PGA
2HPMA
PHEMA
MA
BMA
2MHA
3MHA+4MHA
-60
-40
-20
0
20
40
% Change

Residential Distance to Greenness and Urinary VOC metabolites




LOW GREEN
HIGH GREEN
VOCs
HIGH
LOW

Residential Proximity to Greenness is associated with lower arterial stiffness

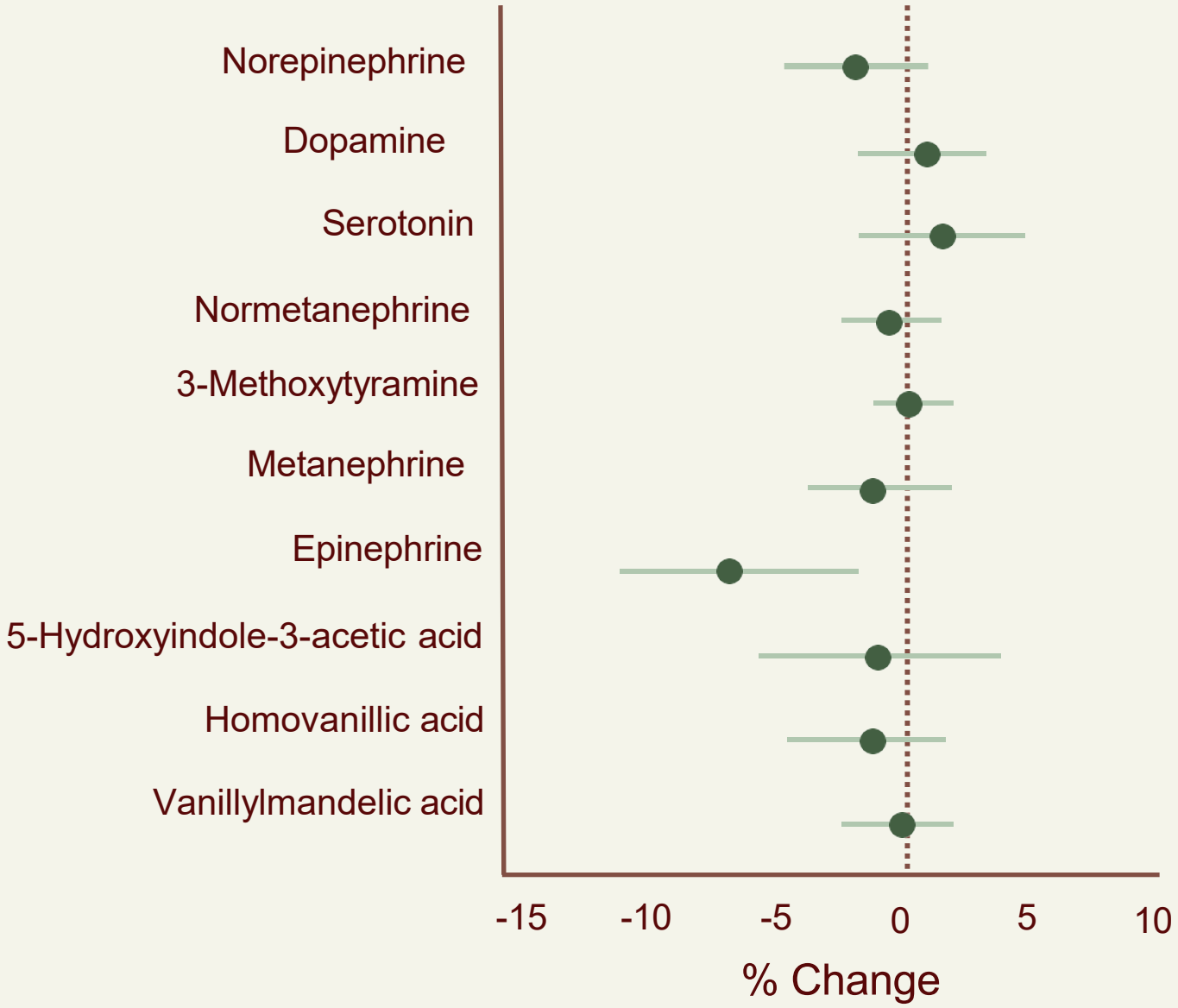


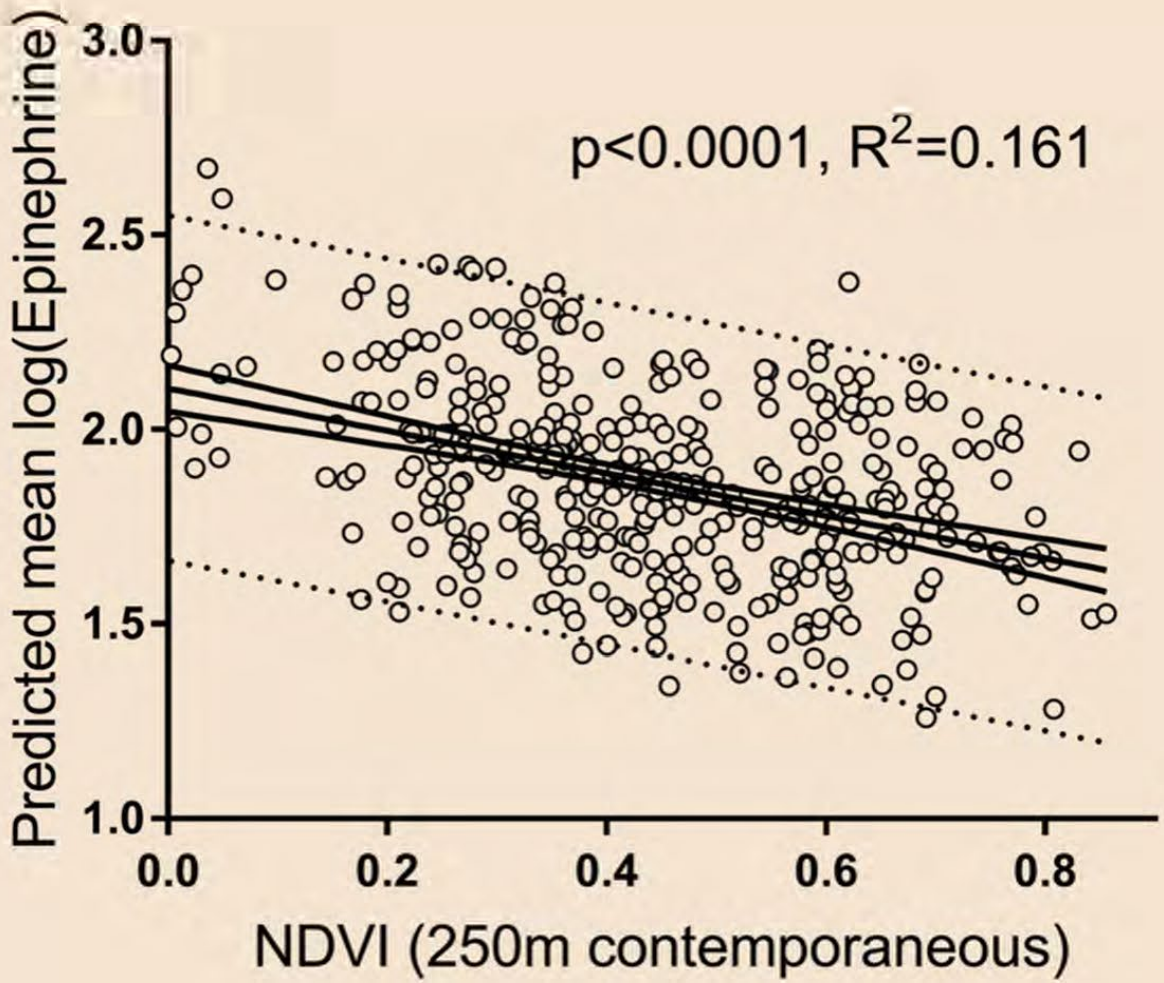
AIX: Augmentation Index
AP: Augmentation Pressure
PP: Pulse Pressure
SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure
SEVR: Sub-Endocardial Viability Ratio

Indices of Arterial Stiffness

Am J Physiol 2021

ASSOCIATION OF RESIDENTIAL GREENNESS WITH SYMPATHETIC ACTIVATION




p<0.0001, R2=0.161
Predicted mean log(Epinephrine)
3.0
2.5
2.0
1.5
1.0
0.0
0.2
0.4
0.6
0.8
NDVI (250m contemporaneous)

URBAN GREENNESS

ENVIRONMENTAL MEDIATORS

- Air Pollution ↓
- Light Pollution ↓
- Noise Pollution ↓
- Area Characteristics ↑ (walkability, neighborhood quality)

PHYSIOLOGICAL MEDIATORS

- Physical Activity ↑
- Pollution Exposure ↓
- Stress ↓
- Sleep ↑
- Immune Challenge ↑
- Social Cohesion / Interactions ↑

CARDIOVASCULAR DISEASE RISK FACTORS

- Blood Pressure ↓
- Cholesterol ↓
- Insulin Resistance ↓
- Diabetes ↓
- Obesity ↓

CARDIOVASCULAR DISEASE ↓

GREEN HEART

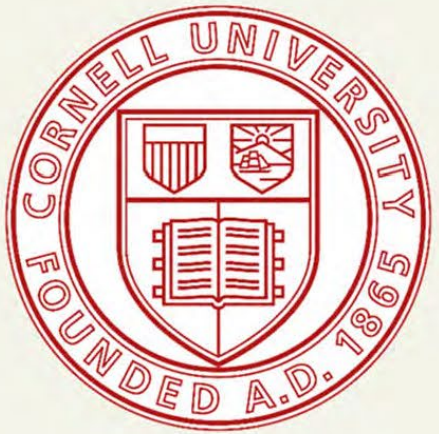
LOUISVILLE


The Nature
Conservancy


UNIVERSITY OF LOUISVILLE
1798


NIH
National Institute of
Environmental
Health Sciences


WASH


CORNELL UNIVERSITY
FOUNDED A.D. 1865

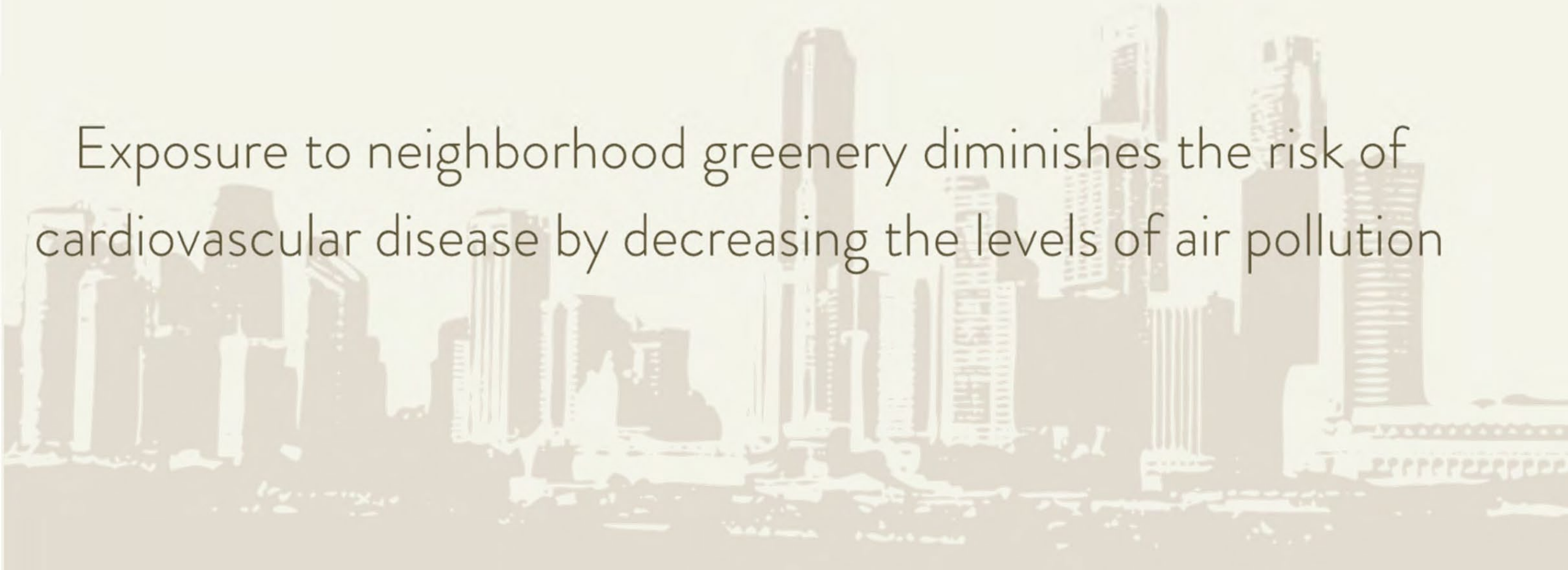

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE


hyphæ
design laboratory


LOUISVILLE
1778
1778
JEFFERSON COUNTY

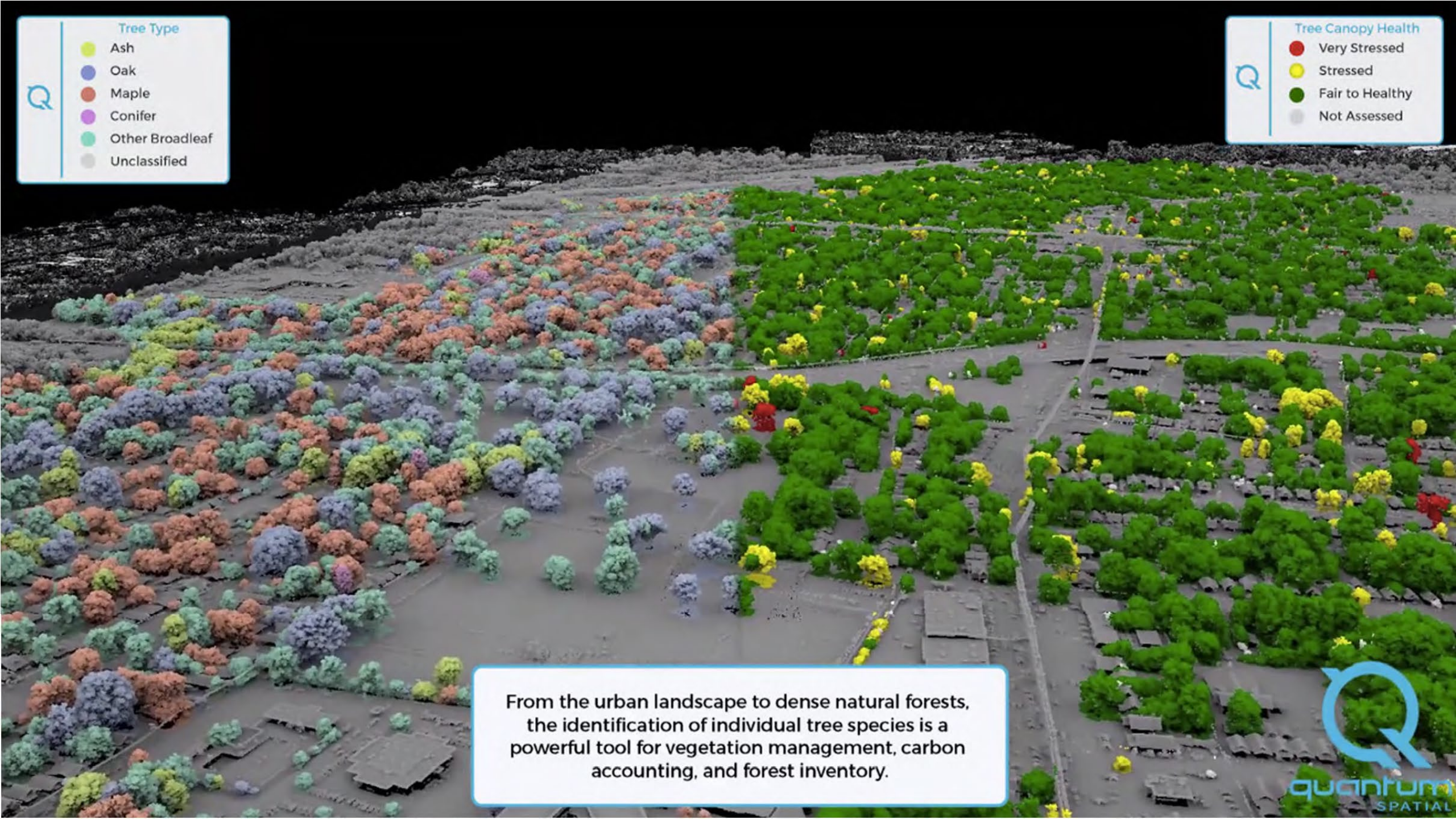
CENTRAL HYPOTHESIS

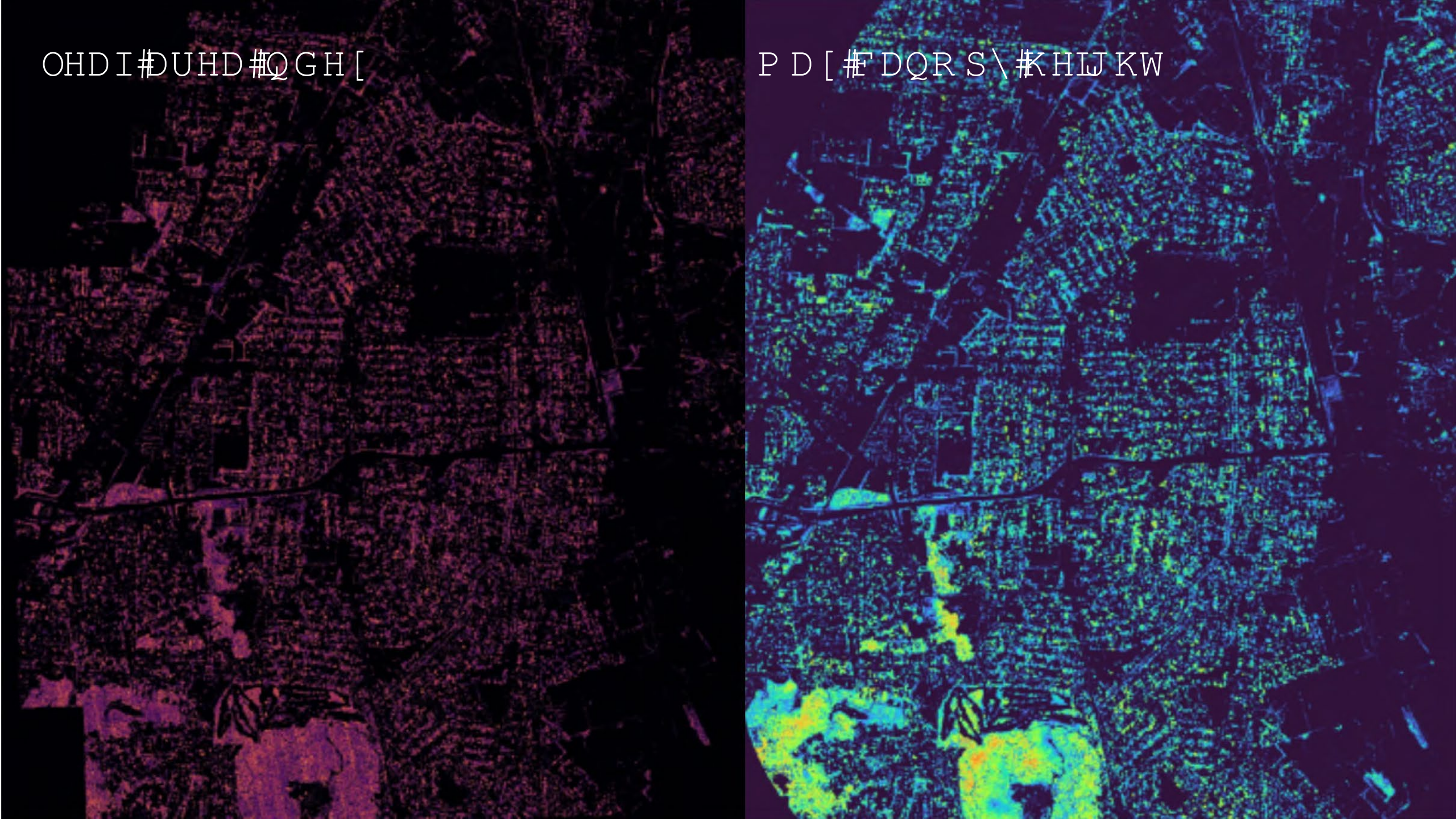
Exposure to neighborhood greenery diminishes the risk of cardiovascular disease by decreasing the levels of air pollution



What will we do?

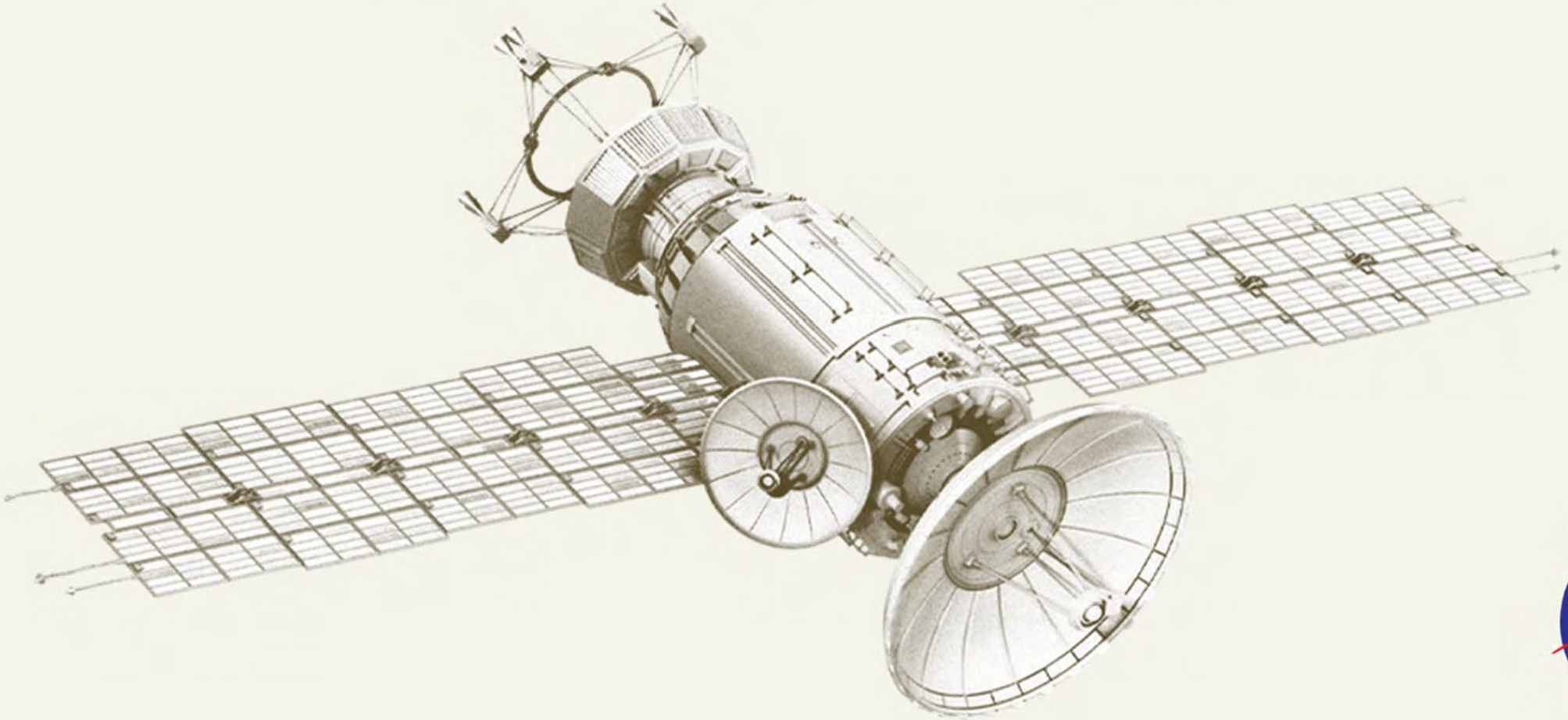
NEIGHBORHOOD GREENING


Tree Type
Ash
Oak
Maple
Conifer
Other Broadleaf
Unclassified
Tree Canopy Health
Very Stressed
Stressed
Fair to Healthy
Not Assessed
From the urban landscape to dense natural forests, the identification of individual tree species is a powerful tool for vegetation management, carbon accounting, and forest inventory.
quantum SPATIAL


OHDI#DUHD#QGH[
P D[#F DQR S\#KHLJKW

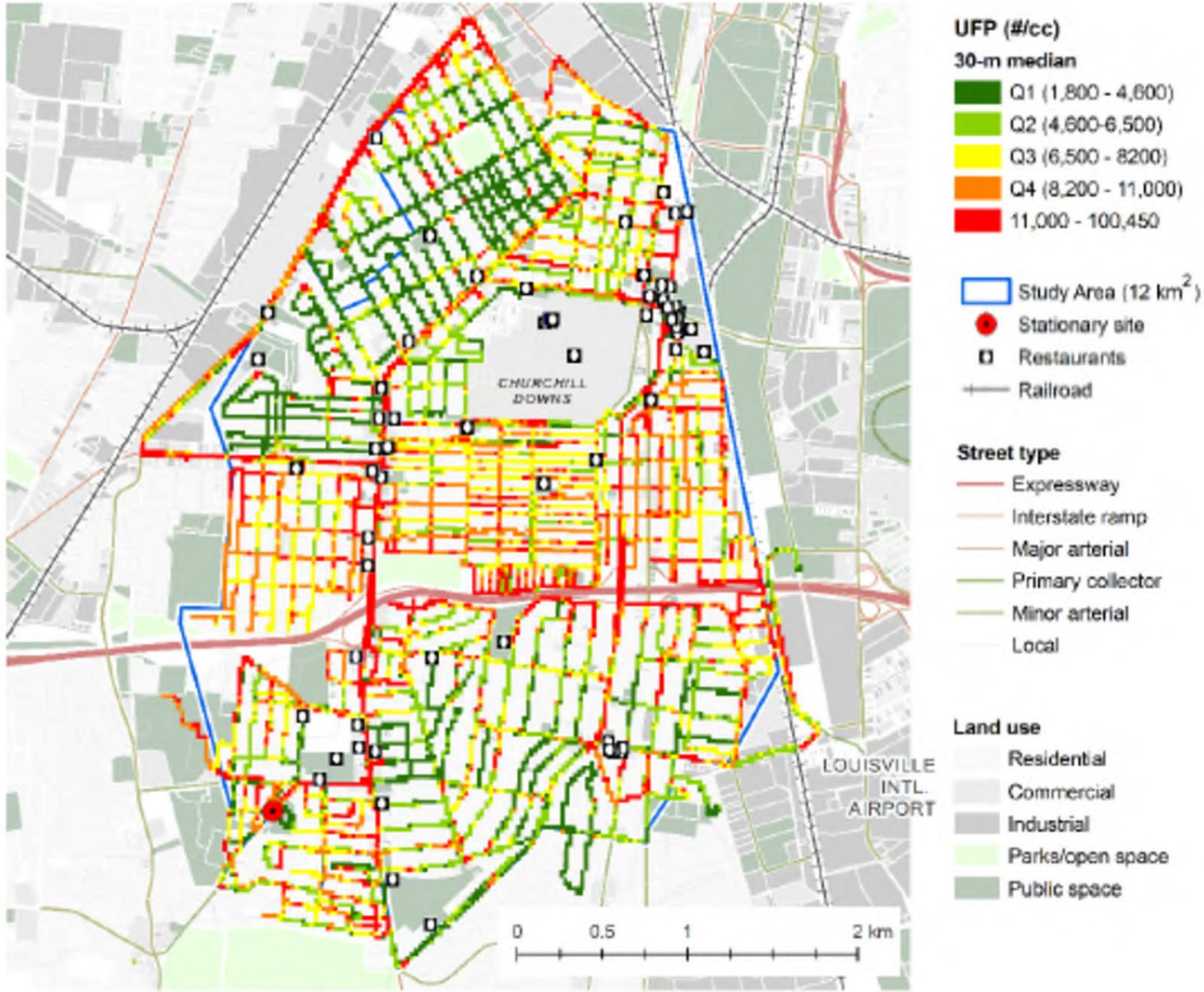
WUHH#YIHZ #QGH[

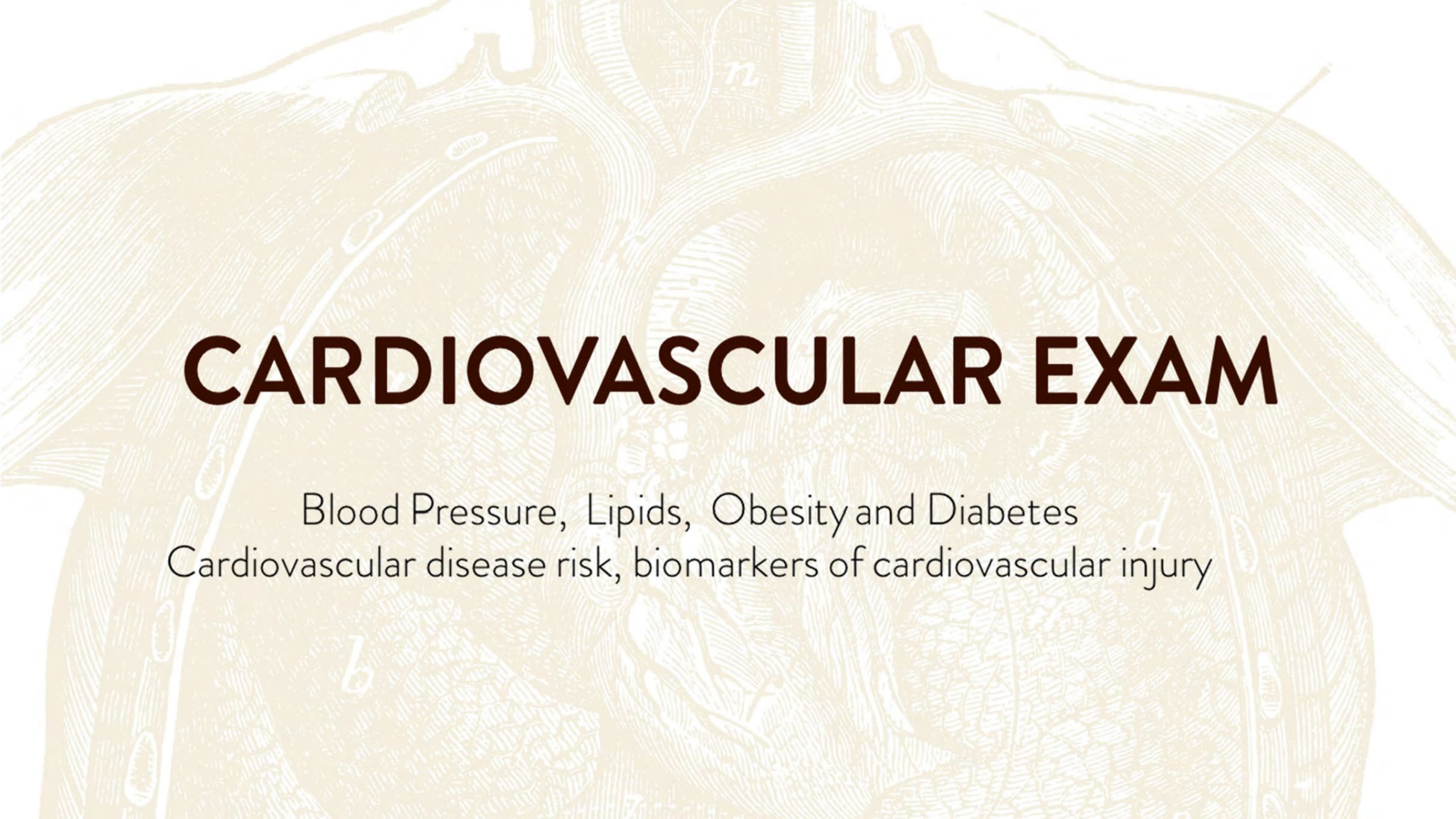
AIR POLLUTION AND GREENNESS MEASUREMENTS



LOCAL AIR POLLUTION MEASURMENTS


Oakdale
Wilder Park
Jacobs Addition
Wyandotte Park
Wyandotte Park


UFP (#/cc)
30-m median
Q1 (1,800 - 4,600)
Q2 (4,600-6,500)
Q3 (6,500 - 8200)
Q4 (8,200 - 11,000)
11,000 - 100,450
Study Area (12 km^2)
Stationary site
Restaurants
Railroad
Street type
Expressway
Interstate ramp
Major arterial
Primary collector
Minor arterial
Local
Land use
Residential
Commercial
Industrial
Parks/open space
Public space
CHURCHILL DOWNS
LOUISVILLE INTL. AIRPORT
0
0.5
1
2 km



CARDIOVASCULAR EXAM

Blood Pressure, Lipids, Obesity and Diabetes
Cardiovascular disease risk, biomarkers of cardiovascular injury

PSYCHOSOCIAL EVALUATION

TRANSPLANT LARGE TREES

PBS NEWS HOUR

WHY TIME KEEPS ON SLIPPING p. 12

DISCOVER

SCIENCE THAT MATTERS

MAY 2024

SAVE THE EARTH!

A HOW-TO GUIDE

WHAT YOU CAN DO (THAT REALLY WORKS!) p. 28

CAN TREES IMPROVE HEART HEALTH? p. 50

INSIDE AMERICA'S SECRET WATER SOURCE p. 58

WHY HUMANS NEED NATURE p. 64

BONUS ONLINE CONTENT CODE p. 3

PLUS ALIENS AND OUR ECOSYSTEM p. 38


EXIT 9
Hospital
NEXT RIGHT
STERNBERG


CT 332
DEERE


CAT

HOW PLANTS CAPTURE PARTICULATE MATTER (PM)

Vegetation Barrier

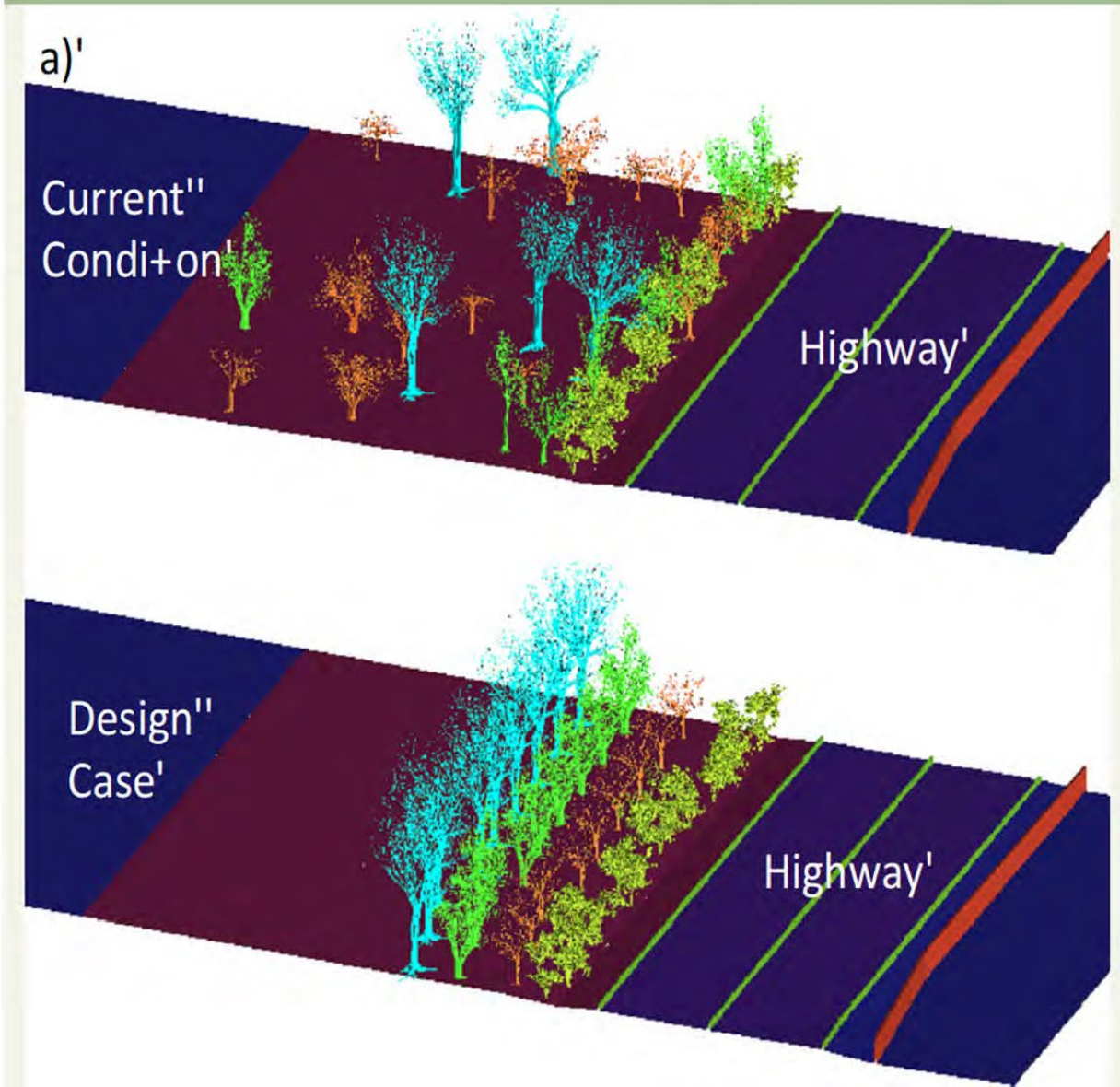
Greenbelt scenarios in which vegetation acts as a barrier to air flow, altering airflow patterns and pollution plume trajectory in addition to deposition (Steffens et al. 2012) (Lin et al. 2012)

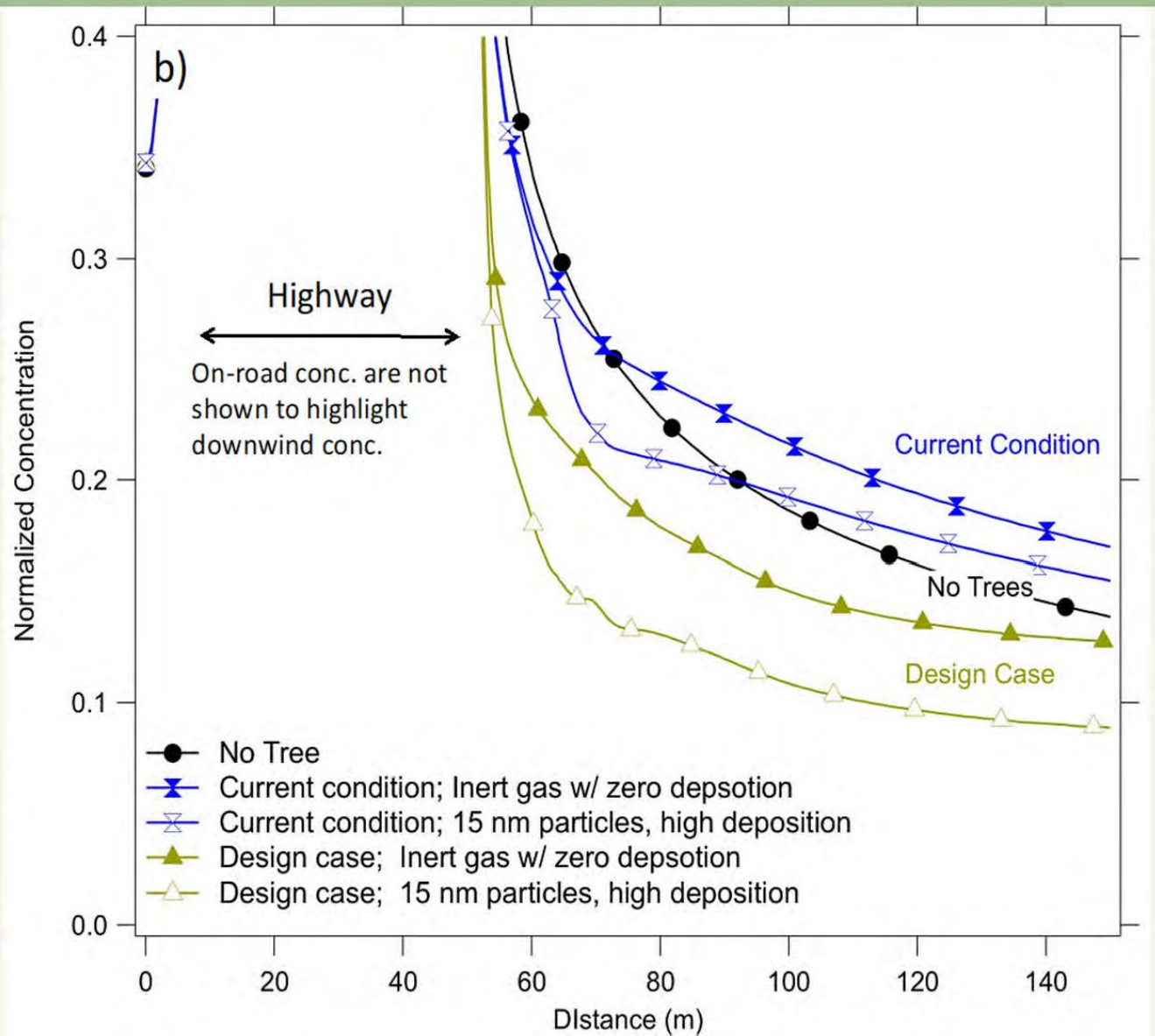
Deposition

The physical capture of particulate matter on the leaves and bark of trees and plants. The greater surface area and the rougher or stickier the leaf and bark, the higher the deposition rate (Fuller 2009).

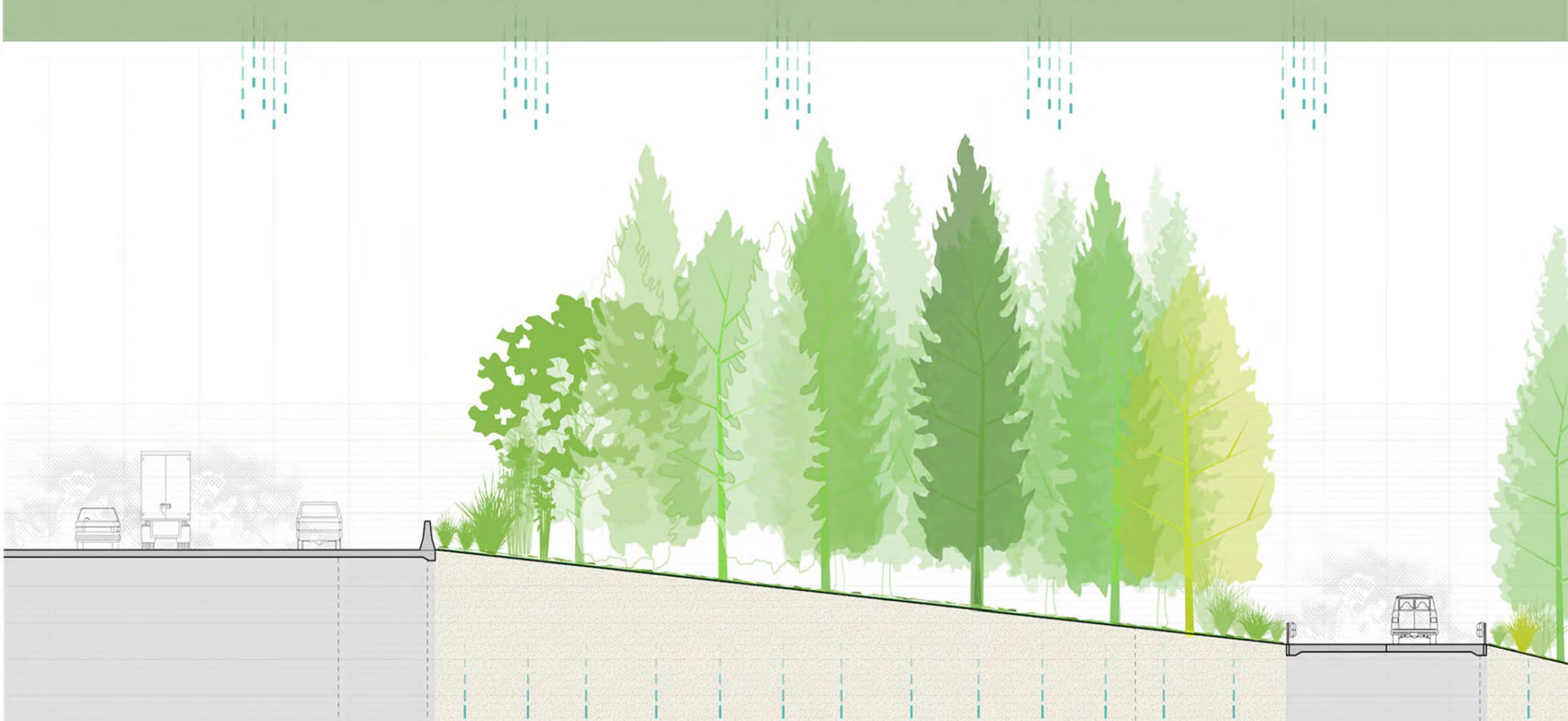
Vegetated barriers are most effective if planted close to the pollution source in highly polluted areas.

DESIGNING BUFFERS

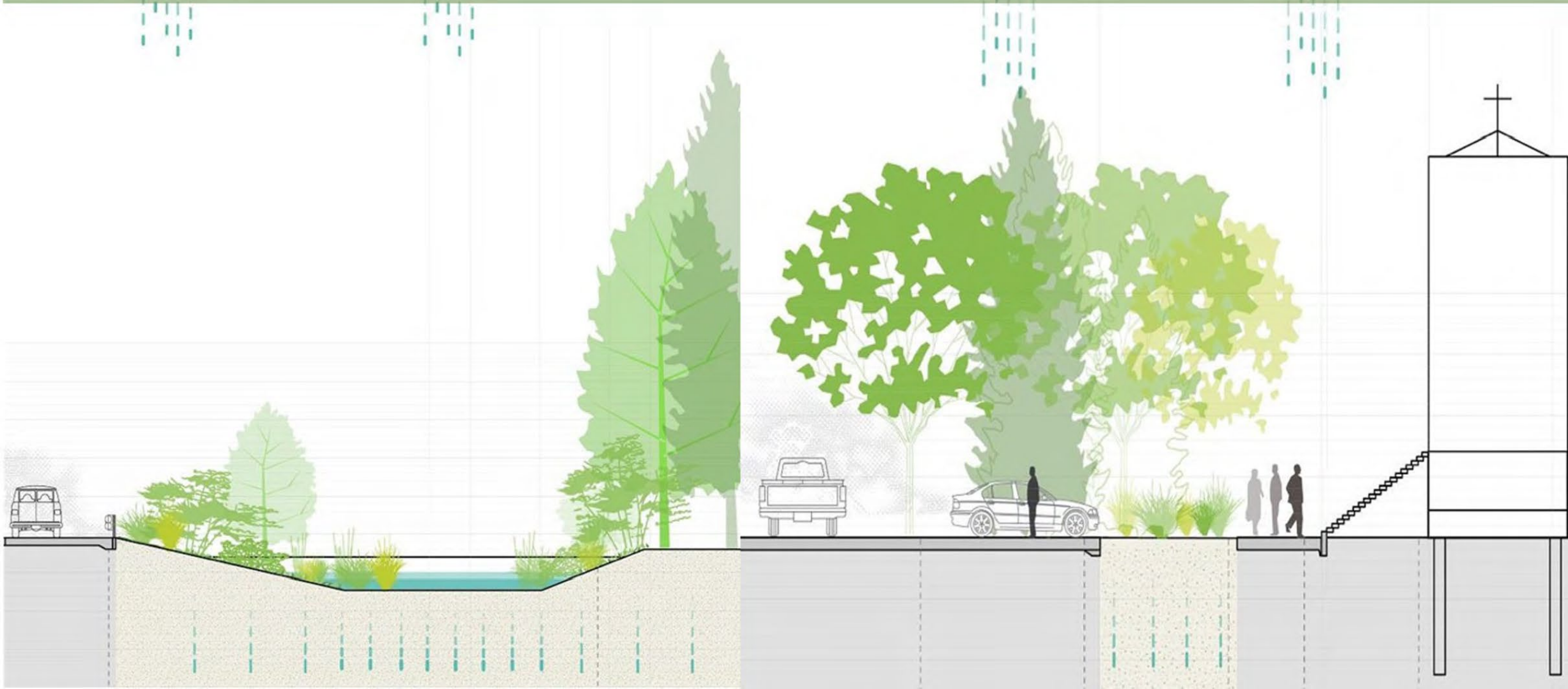




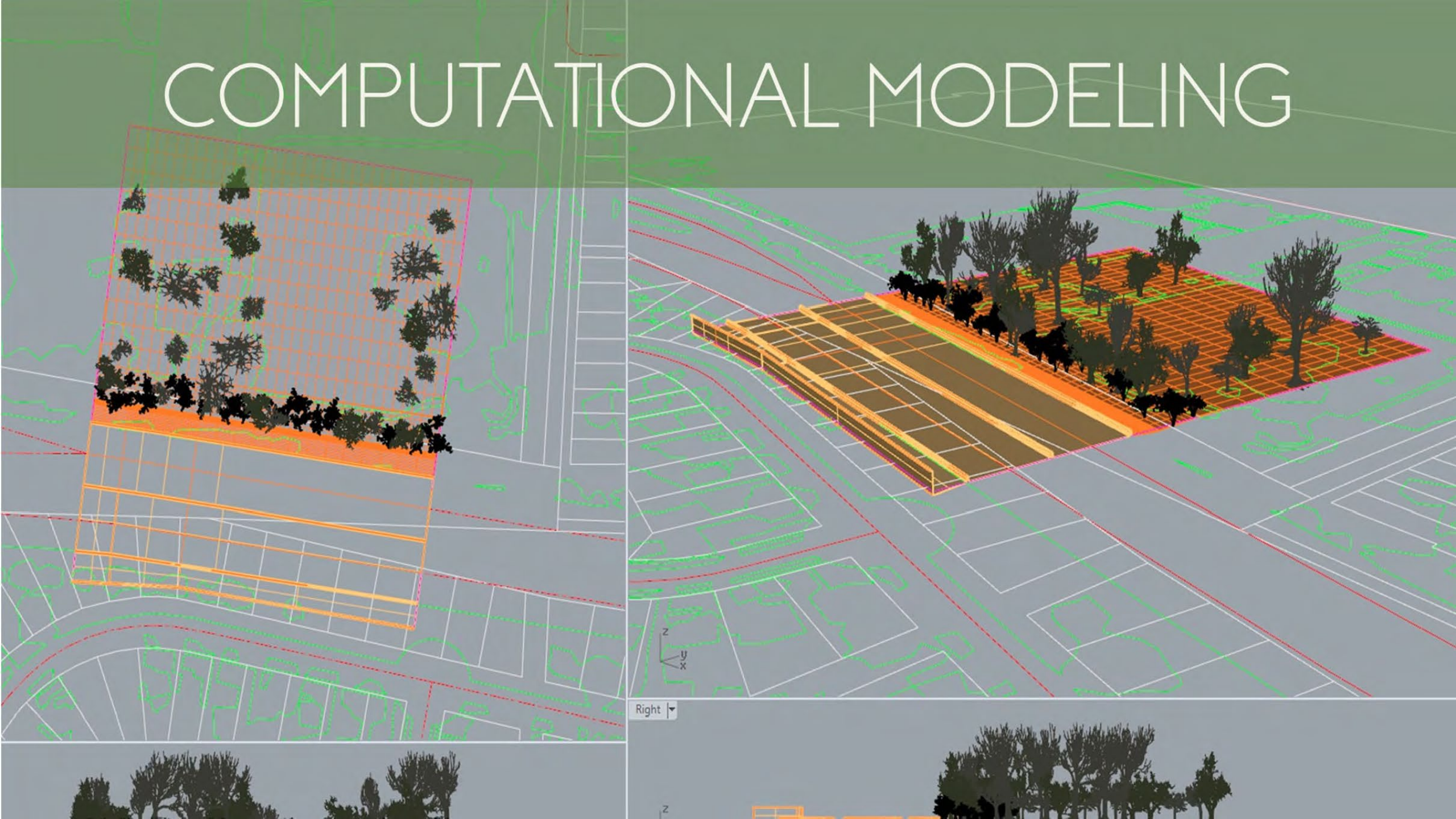
ROADSIDE BUFFERS

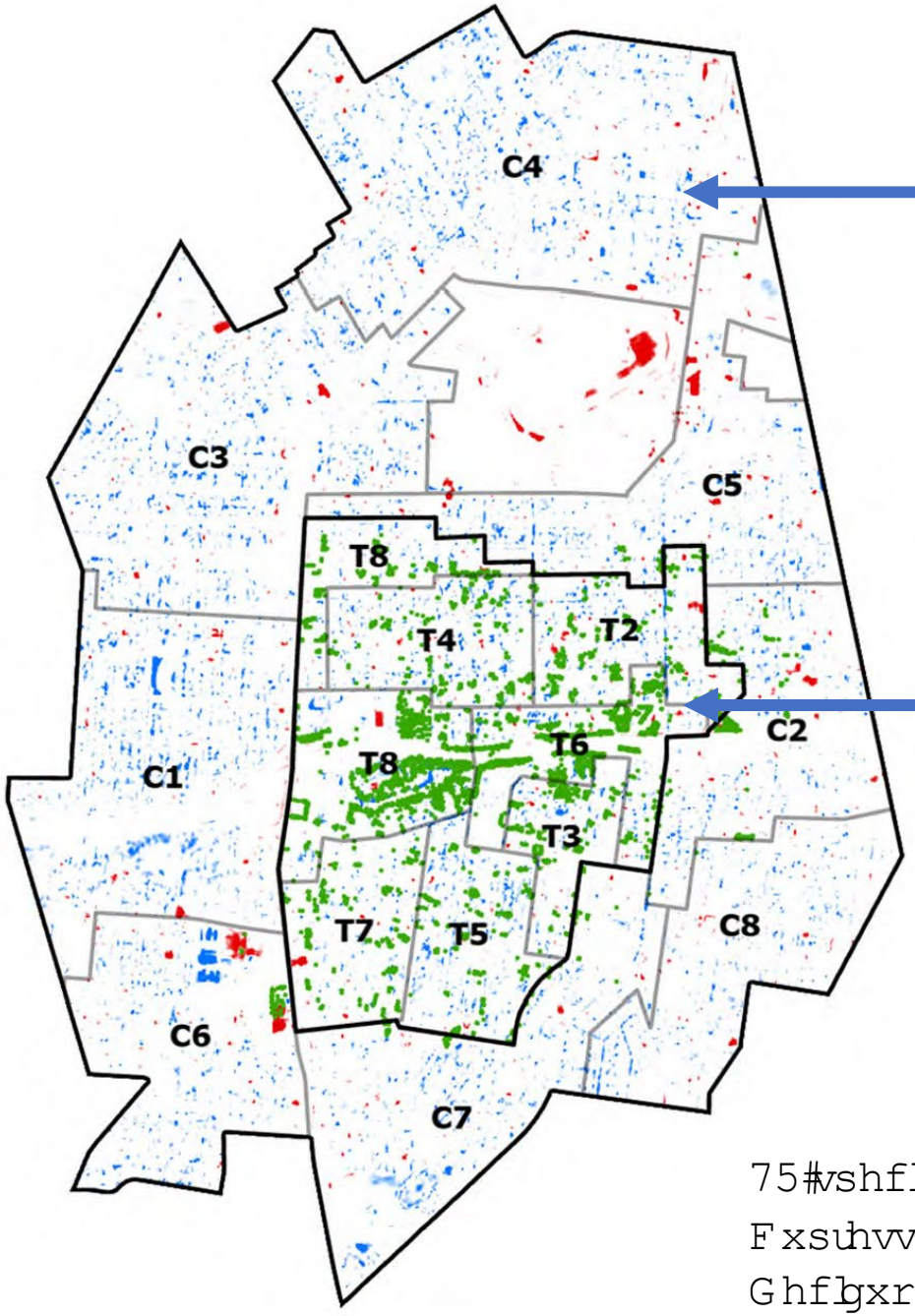


NEIGHBORHOOD PLANTING



COMPUTATIONAL MODELING





F#Fxvwhuv#, 53/#47;##Wuhhv

W#Fxvwhuv#, 9/43;##Wuhhv

.##;/758#Hyhujuhhq#Wuhhv
963#Ghflgxrxv#Wuhhv

75#vshflhv#ri#hyhujuhhq#wuhhv#urp #8#gliihuhqw#dp lbhv#Slqdfhdh/#
Fxsuhvvdfhdh/#Wd{dfhdh/#Dtxlrddfdh/#P djqroddfhdh,
Ghflgxrxv#, grjzrrg/#rdn/#vhuylfheh uI

What will we learn?

How to plant trees in urban locations to maximize the removal of air pollutants

How neighborhood greenness affects health

Do greenspaces reduce mental stress and increase social cohesion

Do trees in a neighborhood affect crime rates, property values, storm water runoff, energy use and heat islands in the city

WUDJHU#

PIFURIRUHVW


Trager
MicroForest
Project
MANHATTAN
GRILL
ONE
WAY
429


Lawn
Concrete Mix Pavement
Concrete Pavers
Granite Benches
444 Metro Building
Mulch Bed
Brick Pavement
Lawn Area
Granite Bench
Concrete Mix Pavement
Mulch Bed
Mulch Bed
Mulch Bed
City of Louisville
0.643 Acres
Brick Sidewalk
Bike Rental Rack
Bus Stop
W Muhammad Ali Blvd

Site Plan

This site plan looks to maximize: nature within the urban realm; vibrancy of place; and public interaction with people and nature. The plan provides a central boardwalk that surrounds a Miyawaki Forest located within the center of the site. The MicroForest has three entrance points to manage and control access into the site. These entrances vary from a portal, to an active plaza, to a potential pop-up structure. The site's street facing edges enhance the urban experience by providing seat walls, lighting and a forest experience along city sidewalks. Key elements on the site include:

- A portal entrance
- Central boardwalk
- Miyawaki Forest
- Educational Signage
- Pop-up Structure with an outdoor courtyard
- Bioswale bumpout areas to enhance the urban edge

Gresham Smith

Pop-Up Structure and Streetscape

at Muhammad Ali BLVD and Armory PL

Gresham
Smith

Portal Entrance

at Muhammad Ali BLVD and 5th Street

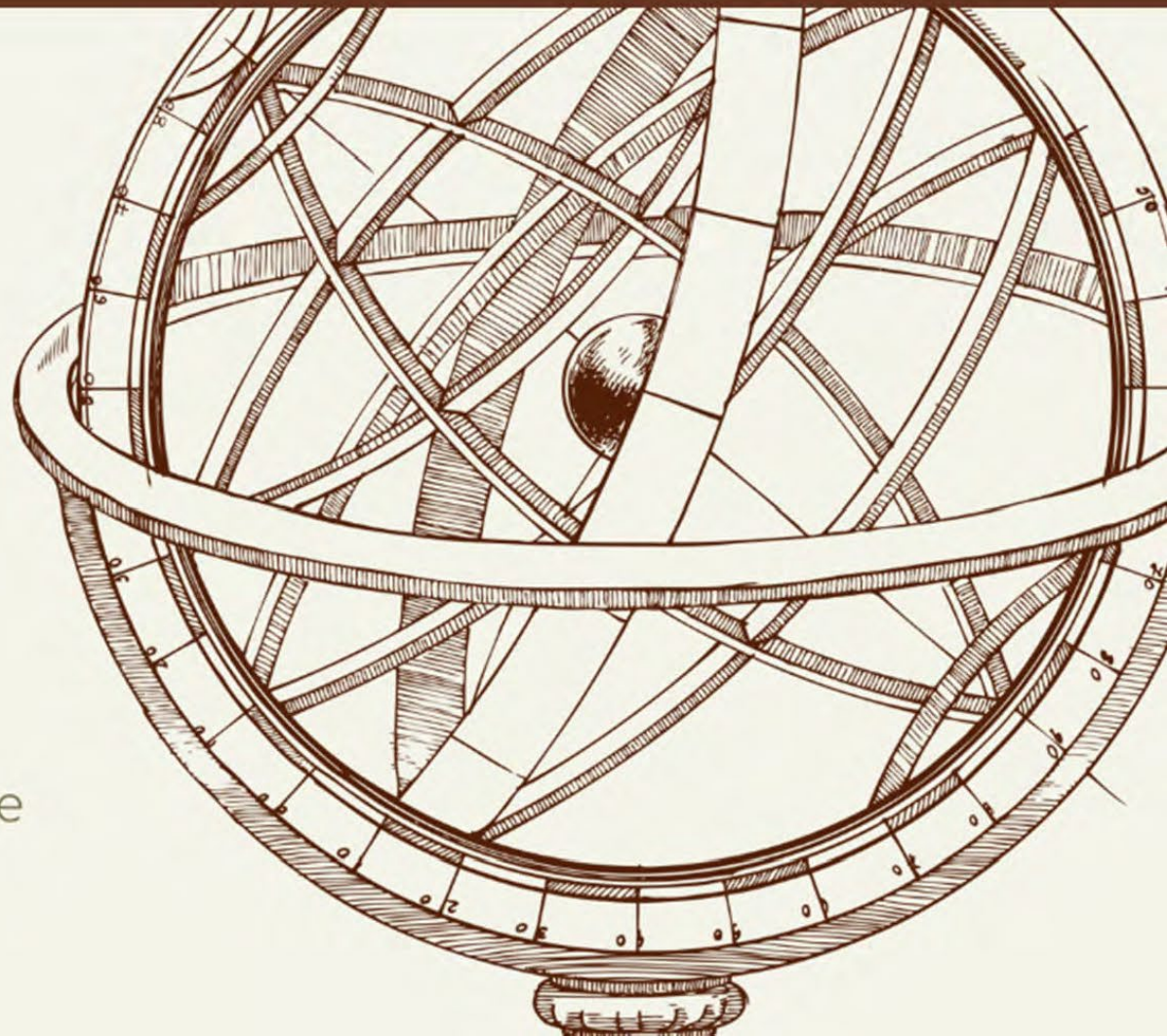
Creating Healthier Cities of Tomorrow

New ways to prevent heart disease

New way to decrease air pollution

Development of new urban policies, guidelines building codes

A new model of healthy urban living that could be replicated world wide



WELCOME

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

Ming Kuo

University of Illinois

World Forum on Urban Forests

WELCOME

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests