WELCOME

2nd World Forum on Urban Forests

2023
Simone Borelli
Urban Forestry Officer, Forestry Division
Food and Agriculture Organization of the United Nations (FAO)
WE INSPIRE PEOPLE TO PLANT, NURTURE, AND CELEBRATE TREES.
WELCOME
LEARN
SHARE
CONNECT
THANK YOU TO OUR CO-ORGANIZERS
THANK YOU TO OUR SPONSORS

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District Department of Transportation

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DAVEY
Proven Solutions for a Growing World

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S bring a Tree

Fill it Forward
2nd World Forum on Urban Forests
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 NASA's Goddard Institute of Space Studies (GISS) in New York.
NOW IS THE TIME FOR TREES
2nd World Forum on Urban Forests 2023
AND
COLLABORATION
ADAPTABILITY
INCLUSIVITY
“CAN’T kills creativity.”

– Camille Paglia
LISTEN
YES, AND
Chief Mark Tayac
Piscataway Indian Nation
Jocelyn Brown-Hall
Director, Liaison Office for North America
Food and Agriculture Organization of the United Nations (FAO)
Earl Eutsler
Associate Director / State Forester
Urban Forestry Division
District Department of Transportation
Nicolaas Verloop
President
International Society of Arboriculture
Maria Chiara Pastore
Associate Professor
Politecnico di Milano
Fabio Salbitano
Associate Professor
University of Sassari
Beattra Wilson
Assistant Director for Urban and Community Forestry
U.S. Forest Service
Joy Columbus
Director
Smithsonian Gardens
Alana Tucker
Program Manager
Arbor Day Foundation
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2023
Brenda Mallory
Chair, CEQ
The White House
Ali Zaidi
Assistant to the President and National Climate Advisor
The White House
WELCOME

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2023
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
LESS THAN 3% CHIMPS DEVELOP Atherosclerotic DISEASE

My family and other animals
Human and Chimp genomes differ by 2.5%
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
ENVIRONMENTAL CHANGES SIGNIFICANTLY AFFECT CHD RISK
MIGRATION TO NEW ENVIRONMENTS

JAPAN

CHD RISK 2X

Am J Epidemiol 110, 514, 1975
Ischemic heart disease mortality

Public Health Nutr 5, 245, 2002
CHANGE IN ENVIRONMENTAL CONDITIONS

Circulation 10,1236, 2004
NEARLY 60 –80% OF CHD IS PREVENTABLE
**Natural Environment**

- **Location**
  - Altitude, Latitude, Longitude

- **Climate**
  - Sunlight, Temperature, Rainfall, Seasons

- **Geography**
  - Land Features, Geology, Terrain
  - Volcanoes, Sand, Dust

- **Pollutants**

**Geosphere**

- Microbes

**Biosphere**

- Plants
  - Animals
  - Forest Fires, Biogenic Emissions
Pollution

Nearly 150,000 cardiovascular deaths in the US
LEADING CAUSES OF DEATH FROM THE ENVIRONMENT

1st
CARDIOVASCULAR DISEASE
4.8 million

2nd
UNINTENTIONAL INJURIES
1.7 million

3rd
CANCERS
1.7 million

4th
CHRONIC RESPIRATORY DISEASES
1.4 million

5th
DIARRHOEAL DISEASES
846,000
Airborne particles act as ersatz microbes that elicit widespread inflammatory responses leading to 8–12 million premature death annually.
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

<table>
<thead>
<tr>
<th>CAC population</th>
<th>Total population, n=151</th>
<th>6-month residential duration, n=73</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>p-value</td>
</tr>
<tr>
<td>CAC-4 (CD31+/34+/45+/AC133*)</td>
<td>-0.705</td>
<td>0.029*</td>
</tr>
<tr>
<td>CAC-5 (CD31+/AC133*)</td>
<td>-0.736</td>
<td>0.001*</td>
</tr>
<tr>
<td>CAC-11 (AC133*)</td>
<td>-0.620</td>
<td>0.005*</td>
</tr>
<tr>
<td>CAC-14 (CD34+/45+/AC133*)</td>
<td>-1.260</td>
<td>0.007*</td>
</tr>
</tbody>
</table>

ATVB 35, 2468, 2015
Young healthy adults (n=72) examined over 3 years during periods of high and low PM$_{2.5}$ levels.
Exposure to PM$_{2.5}$ establishes an anti-angiogenic profile
WT and lung-specific ecSOD Tg mice exposed to concentrated air particles (CAPS) or filtered air for 9 days.

A

Peripheral blood

WT-air

WT-CAP

ecSOD-Tg-air

ecSOD-Tg-CAP

FITC-Sca-1

APC-Flik-1

Flik-1/Sca-1^+ cells per 200 μL blood

[% of control]

WT

ecSOD-Tg

air

CAP

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

INDUSTRIAL POLLUTION, SEWAGE, WASTE, BIOMASS BURNING,
Temperature anomaly (°F), 1981-2010 baseline

1981–1990

2011–2020

FR_5 dynk lqfuhdvhg 64 (vJfhkhshqvwuldbq hdiq kddkh lqfuhdvh kdv ehq vJfh l<98

Hxurshdq sr owrq ri kh hglhurdq zru ksrs vskh kdv lqfuhdvhg kh lbyho ri rqrh diq Eduerq glr lgh50 lrgj

HyhuI lhdur kh dvw 63 lhdw kh hduckf kdp dh vkvfrqvIwhq wI fhhghg kh lerxqgv ri gwudd yduble hI
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

YEARS OF ASH BORER INFESTATION

Am J Prev Med 44.139. 2013
LIVING IN GREEN SPACES AND STROKE SURVIVAL

![Graph showing survival over follow-up days for different NDVI quartiles.](attachment:image.png)
THE US NATIONAL CANCER INSTITUTE'S SURVEILLANCE, EPIDEMIOLOGY AND END RESULTS (SEER) COHORT

Cohort of 5,529,005 individuals. 2,263,874 deaths

Warm Months NDVI

0.83
0.20

All Cancer

Unstratified Full Cohort

Low survivability

Medium survivability

High survivability

Environ Int 157. 2021
PHYSICAL ACTIVITY
Green Spaces Promote Physical Activity
Green Outdoor Spaces Promote Social Interactions and Cohesion
Mental Health

Individuals living in greenspaces report better mental health.
Exposure to Green Spaces Increases Attention
MMUNITY

Plant antigens educate the human immune system
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
Residential Distance to Greenness and Urinary VOC metabolites
Residential Proximity to Greenness is associated with lower arterial stiffness

Indices of Arterial Stiffness

AIX: Augmentation Index
AP: Augmentation Pressure
PP: Pulse Pressure
SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure
SEVR: Sub-Endocardial Viability Ratio
ASSOCIATION OF RESIDENTIAL GREENNESS WITH SYMPATHETIC ACTIVATION
URBAN GREENNESS

ENVIRONMENTAL MEDIATORS

PHYSIOLOGICAL MEDIATORS

CARDIOVASCULAR DISEASE RISK FACTORS

CARDIOVASCULAR DISEASE ↓

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

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

Blood Pressure ↓
Cholesterol ↓
Insulin Resistance ↓
Diabetes ↓
Obesity ↓
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
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.
AIR POLLUTION AND GREENNESS MEASUREMENTS
LOCAL AIR POLLUTION MEASUREMENTS
CARDIOVASCULAR EXAM

Blood Pressure, Lipids, Obesity and Diabetes
Cardiovascular disease risk, biomarkers of cardiovascular injury
TRANSPLANT LARGE TREES
HOW PLANTS CAPTURE PARTICULATE MATTER (PM)

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

a)\' Current Condition

Design Case

Highway

b)\]

Highway

On-road conc. are not shown to highlight downwind conc.

Normalized Concentration

Distance (m)

- No Tree
- Current condition; Inert gas w/ zero deposition
- Current condition; 15 nm particles, high deposition
- Design case; Inert gas w/ zero deposition
- Design case; 15 nm particles, high deposition
ROADSIDE BUFFERS
NEIGHBORHOOD PLANTING
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
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
Portal Entrance
at Muhammad Ali BLVD and 5th Street

Portal Entrance
Miyawaki Forest
Bright Edge
Custom Seatwall
Bioswale
Boardwalk
Improved Sidewalks
Entry Signage
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 worldwide
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