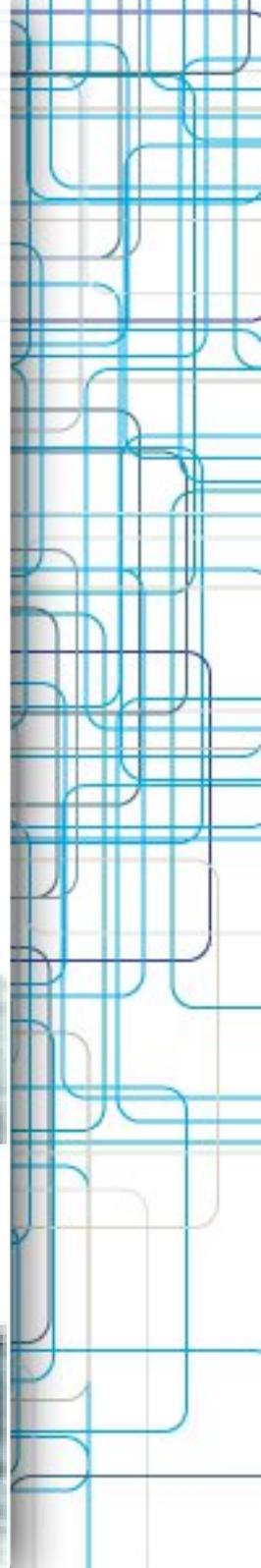


# How We Imagine A Sustainable Future

Considering global land management challenges while inspiring change in urban greenspace.



# Lesson 7 Agenda

## How We Imagine A Sustainable Future

### Introduction

Houseplants, Nature and *Ecotherapy*

### Global Greenspace Challenges

Land Use: *Urban Sprawl*  
*Deforestation*

### Q&A Intermission

### Sustainable Land Use and Greenspace Solutions

Improved Land Use: *Agroforestry*  
Cities of The Future

### Debate and Q&A





# Eco-Therapy

☰ LATEST OBSESSIONS FEATURED

QUARTZ

EMAILS EDITIONS

TREES PLEASE

## The Japanese practice of ‘forest bathing’ is scientifically proven to improve your health

October 12, 2016



By **Ephrat Livni**

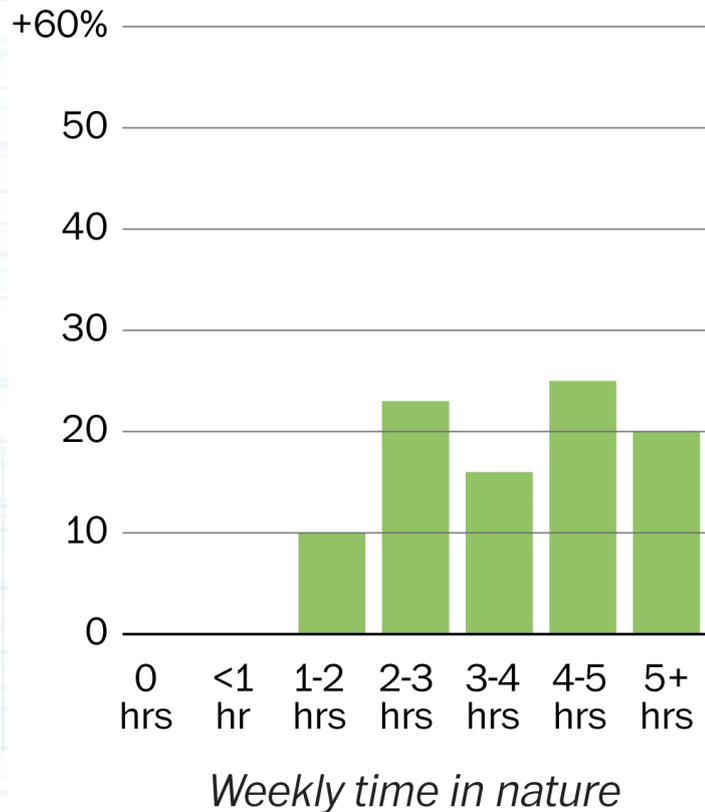
Senior reporter, law & politics, DC.

“Nature deficit disorder” is a modern affliction. With more people living in cities and using electronic devices for hours everyday, many of us are experiencing a nature deficit. “Forest Bathing” – shinrin-yoku – is the practice of cleansing one's mind in nature. [https://greatergood.berkeley.edu/article/item/why\\_forest\\_bathing\\_is\\_good\\_for\\_your\\_health](https://greatergood.berkeley.edu/article/item/why_forest_bathing_is_good_for_your_health)

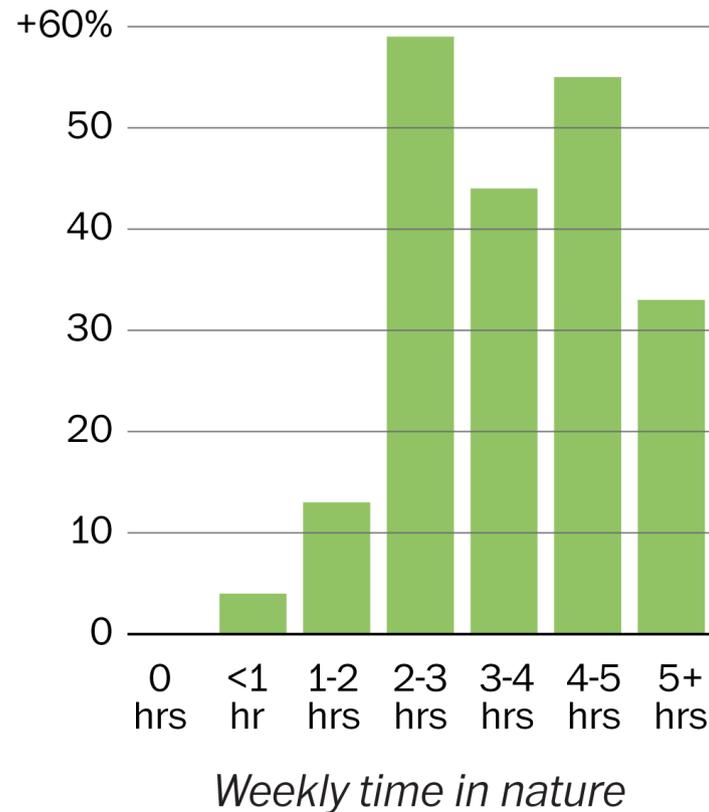
# Go outside

Increased likelihood of reporting happiness and good health for people who spend time in nature, relative to those who don't spend any time in nature at all

## Happiness

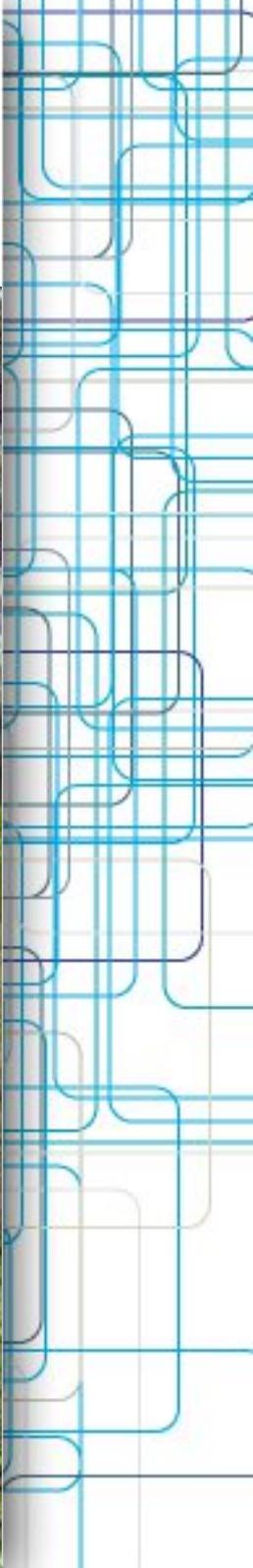


## Good health

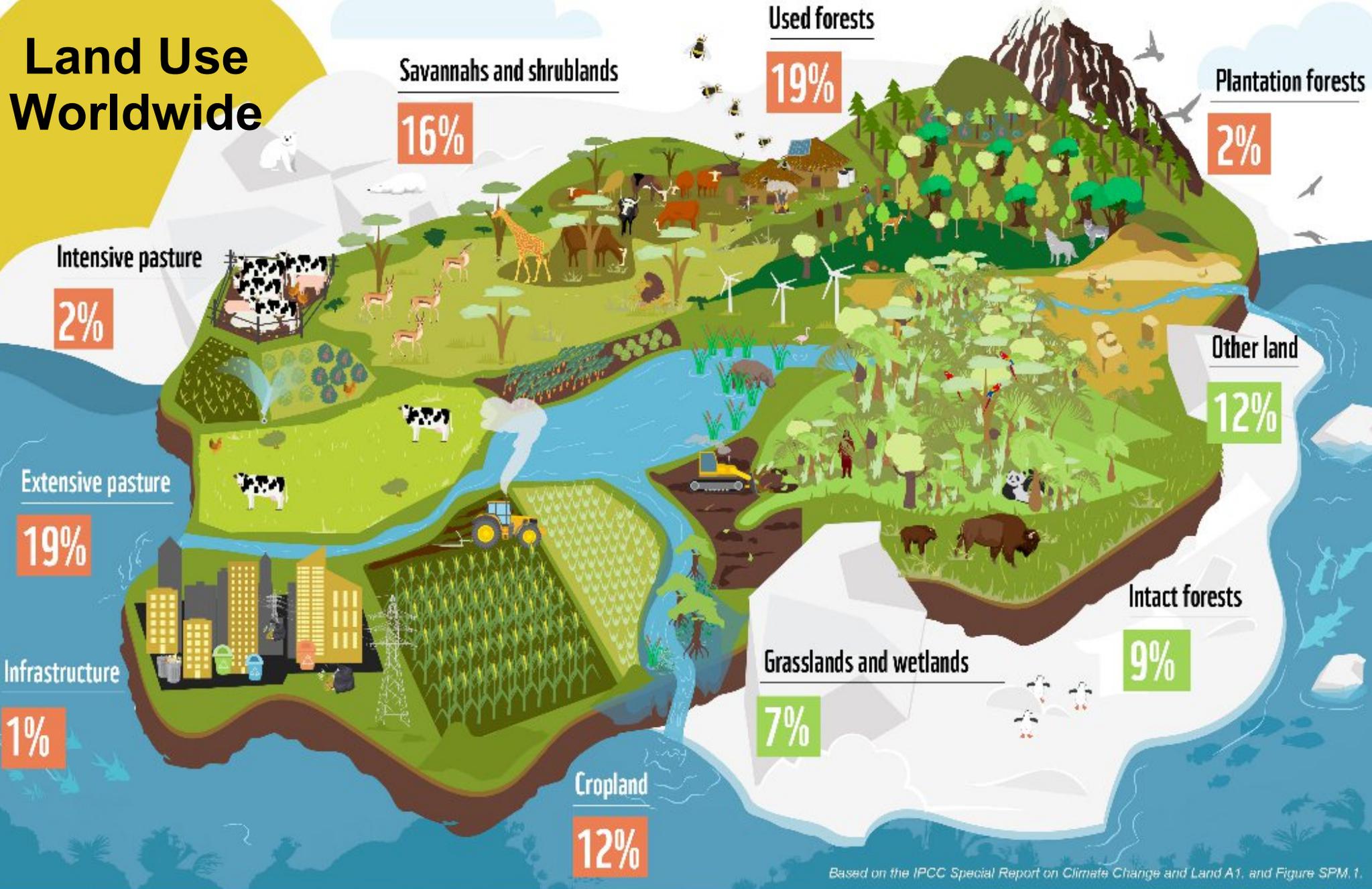


*Note: Figures are adjusted for respondents' urbanicity, neighborhood greenspace, neighborhood characteristics, air pollution, sex, age, socio-economic status, restricted functioning, physical activity, employment status, relationship status, ethnicity, children in household, dog ownership and year.*

# Global Greenspace Challenges



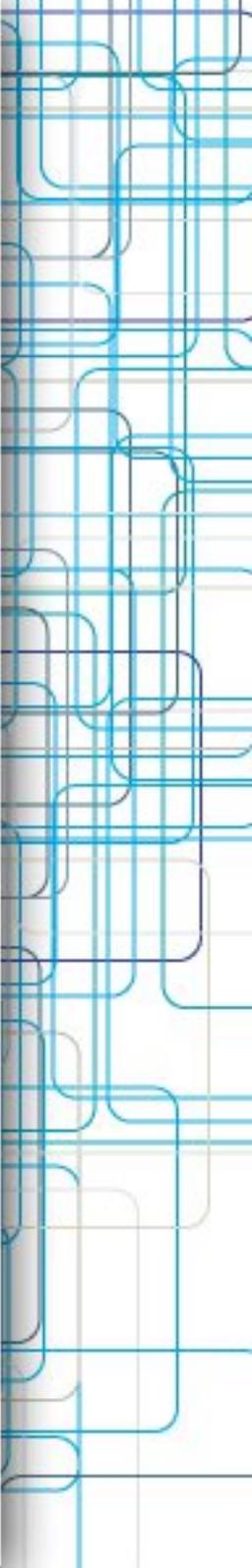
# Land Use Worldwide



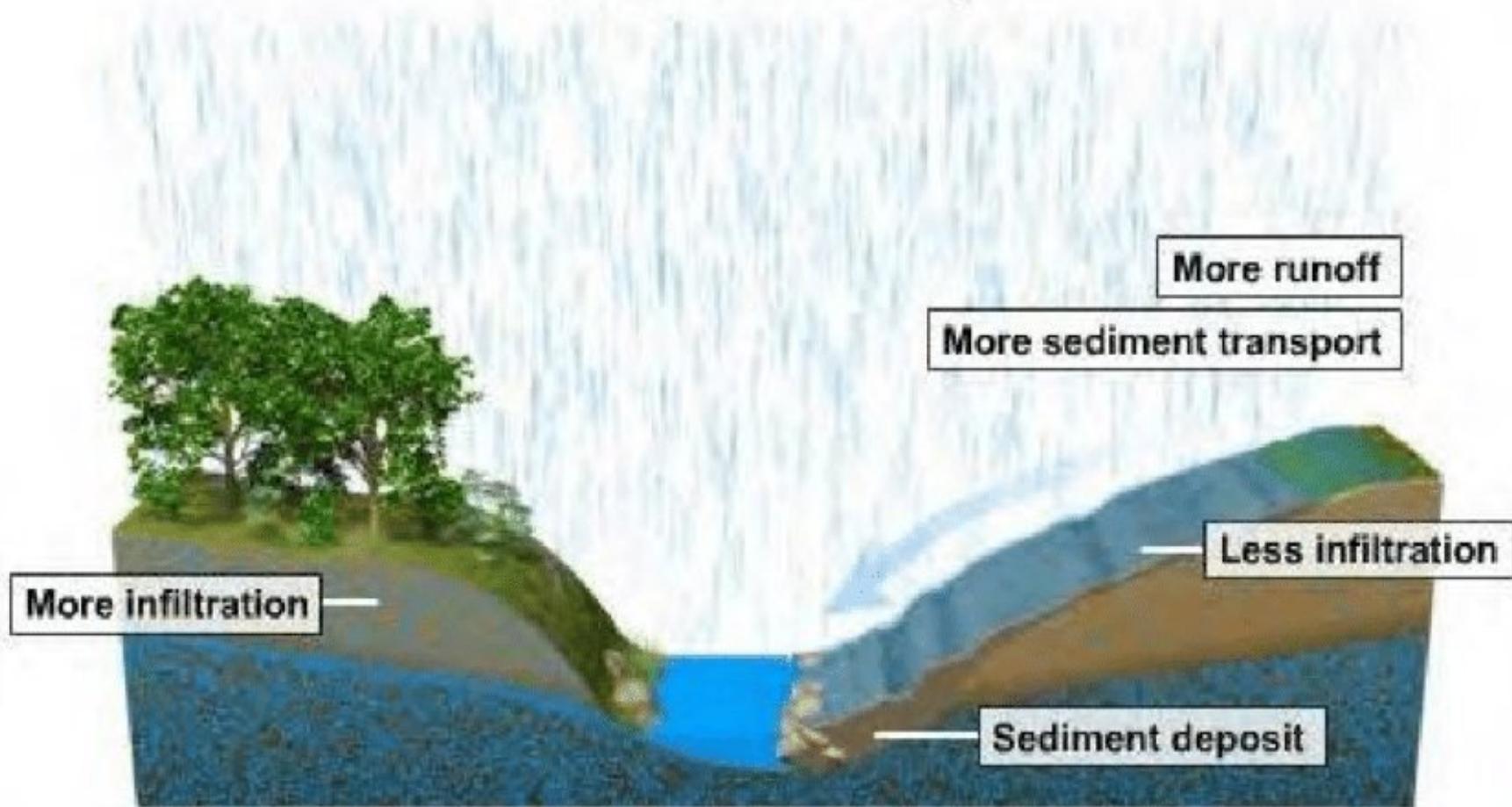
Based on the IPCC Special Report on Climate Change and Land A1, and Figure SPM.1.

33% of all land on earth is dedicated to pasture and cropland.  
Only 28% of ice-free land is left unaffected by humans...

# Urban Sprawl



## Influences of Deforestation on Runoff, Groundwater, and Sediment Transport

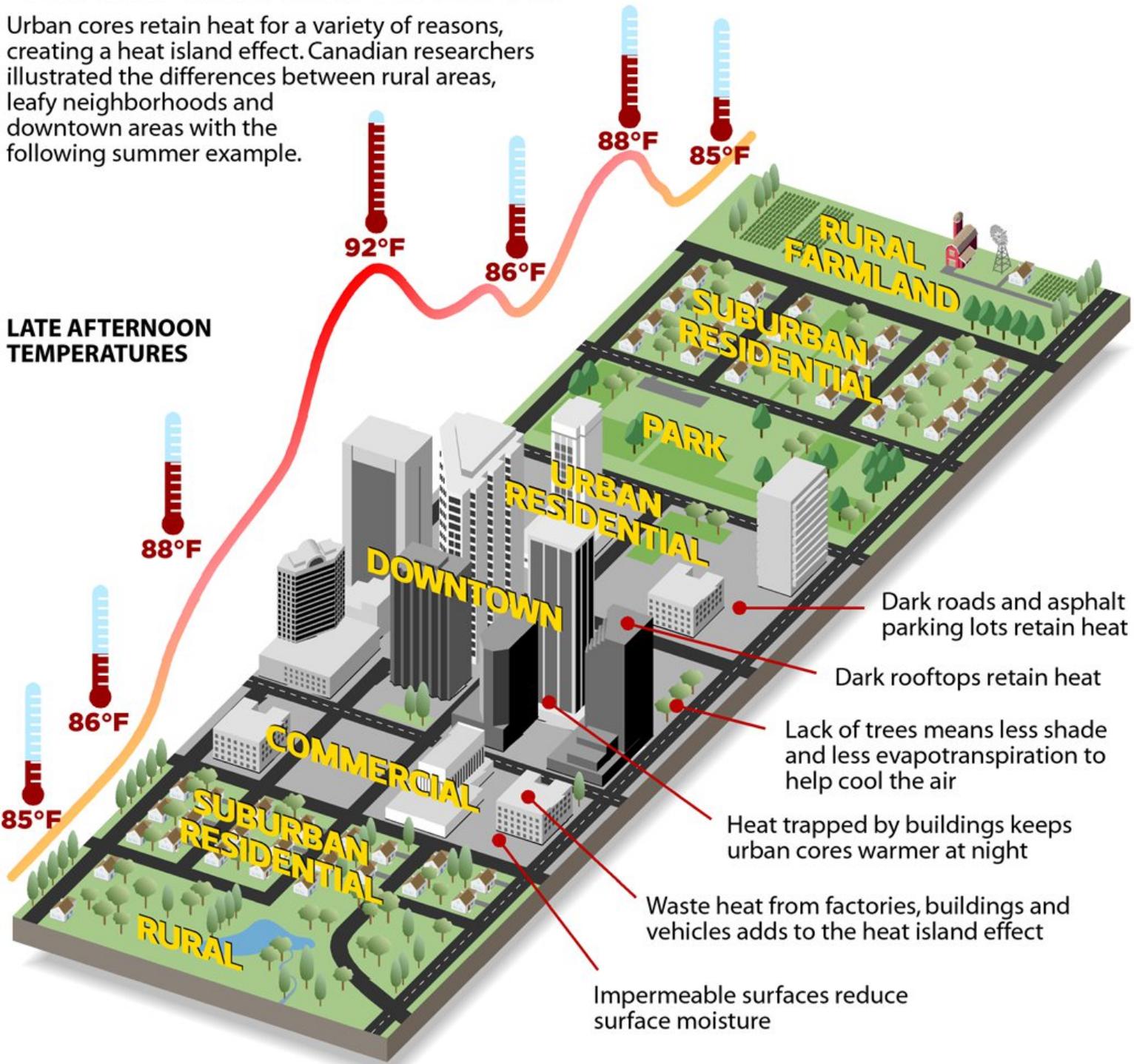


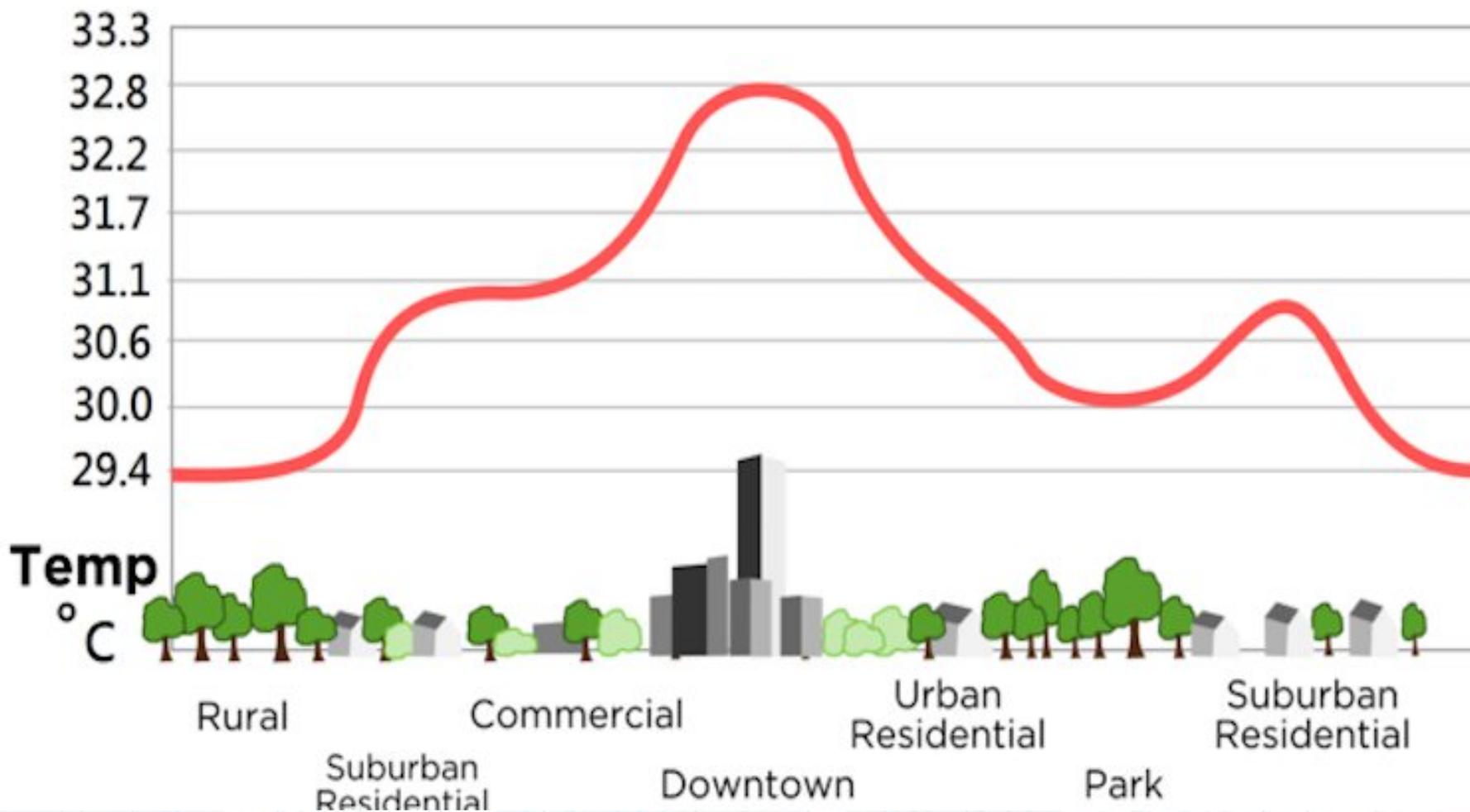
©The COMET Program

Trees are needed for soil retention and water absorption for aquifers

# Urban Heat Island Effect

Urban cores retain heat for a variety of reasons, creating a heat island effect. Canadian researchers illustrated the differences between rural areas, leafy neighborhoods and downtown areas with the following summer example.





The annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C). Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water pollution.

<https://www.epa.gov/heat-islands>

# Suburban vs Urban Areas



Much of the issue with urban sprawl is the result of encroaching suburbs, inefficient suburban design, popularized in the 50's after the war and expanding during the Mall Trend of the 80's.

# Suburban

City's Annual Cost, per Household



(Total)



Solid Waste  
**\$185**



Parks & Recreation  
**\$129**



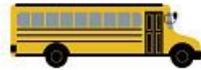
Police  
**\$360**



Fire Department  
**\$406**



Governance  
**\$297**



School Bussing  
**\$87**



Transportation  
**\$171**



Libraries  
**\$72**



Transfers to Provinces  
eg. School Boards  
**\$435**



Culture / Economy  
**\$36**



Roads  
**\$280**



Water  
**\$197**



Sidewalks & Curbs  
**\$194**



Storm & Waste Water  
**\$613**

# Urban

City's Annual Cost, per Household



(Total)



Solid Waste  
**\$185**



Parks & Recreation  
**\$69**



Fire Department  
**\$177**



Governance  
**\$158**



Police  
**\$192**



Libraries  
**\$38**



Transportation  
**\$91**



School Bussing  
**\$13**



Transfers to Provinces  
eg. School Boards  
**\$232**



Culture / Economy  
**\$19**



Roads  
**\$26**



Sidewalks & Curbs  
**\$27**

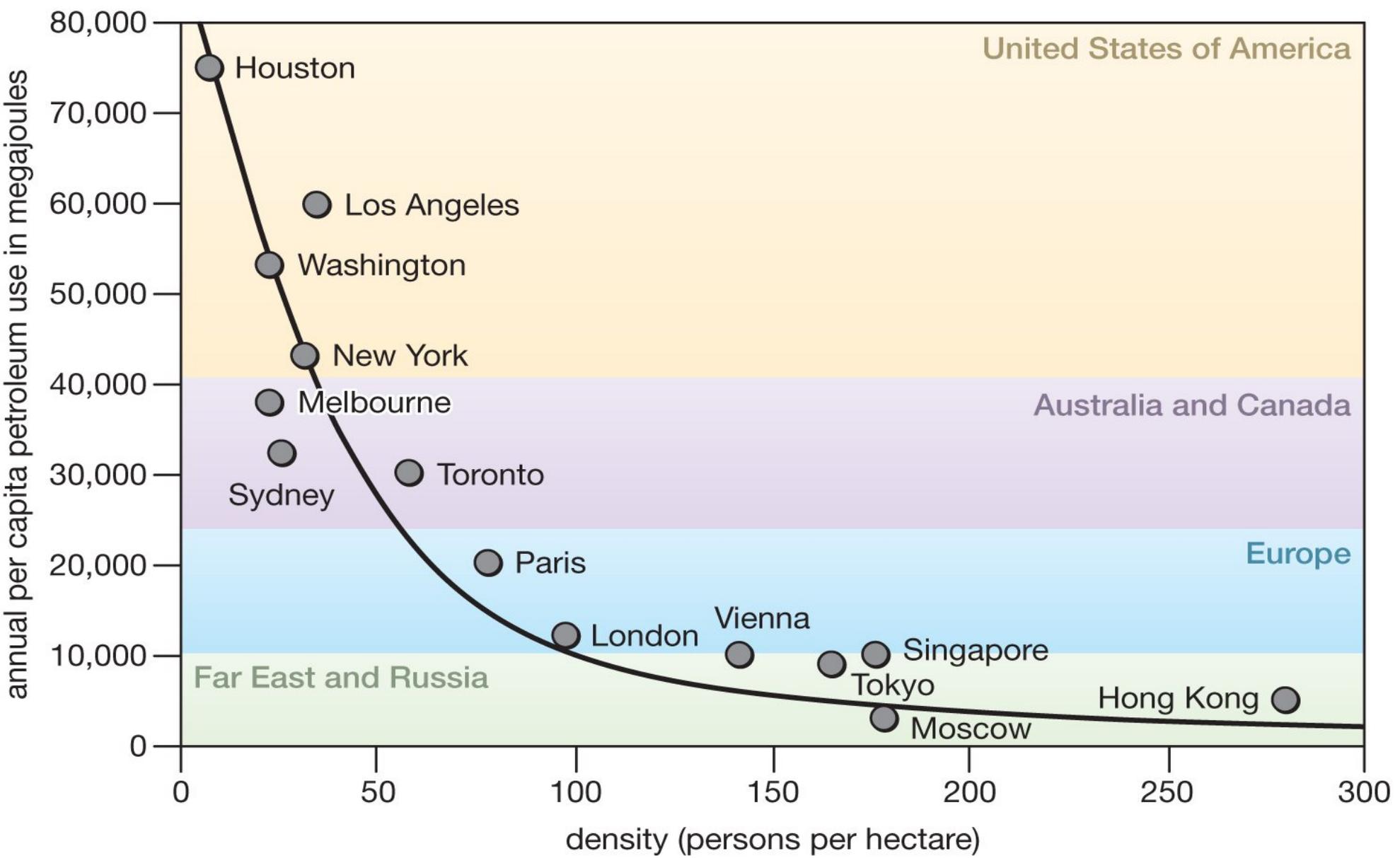


Storm & Waste Water  
**\$147**



Water  
**\$42**

# Relationship between petroleum use and population density



Source: Andrew Wright Associates (1980), small section taken from Urban Task Force Partnership, "Towards an Urban Renaissance" (1999). © U.K. Department of the Environment, Transport, and the Regions (1999).

...lacking correlation between population density, city efficiency is highly dependent upon urban design: parking, greenspace, etc.

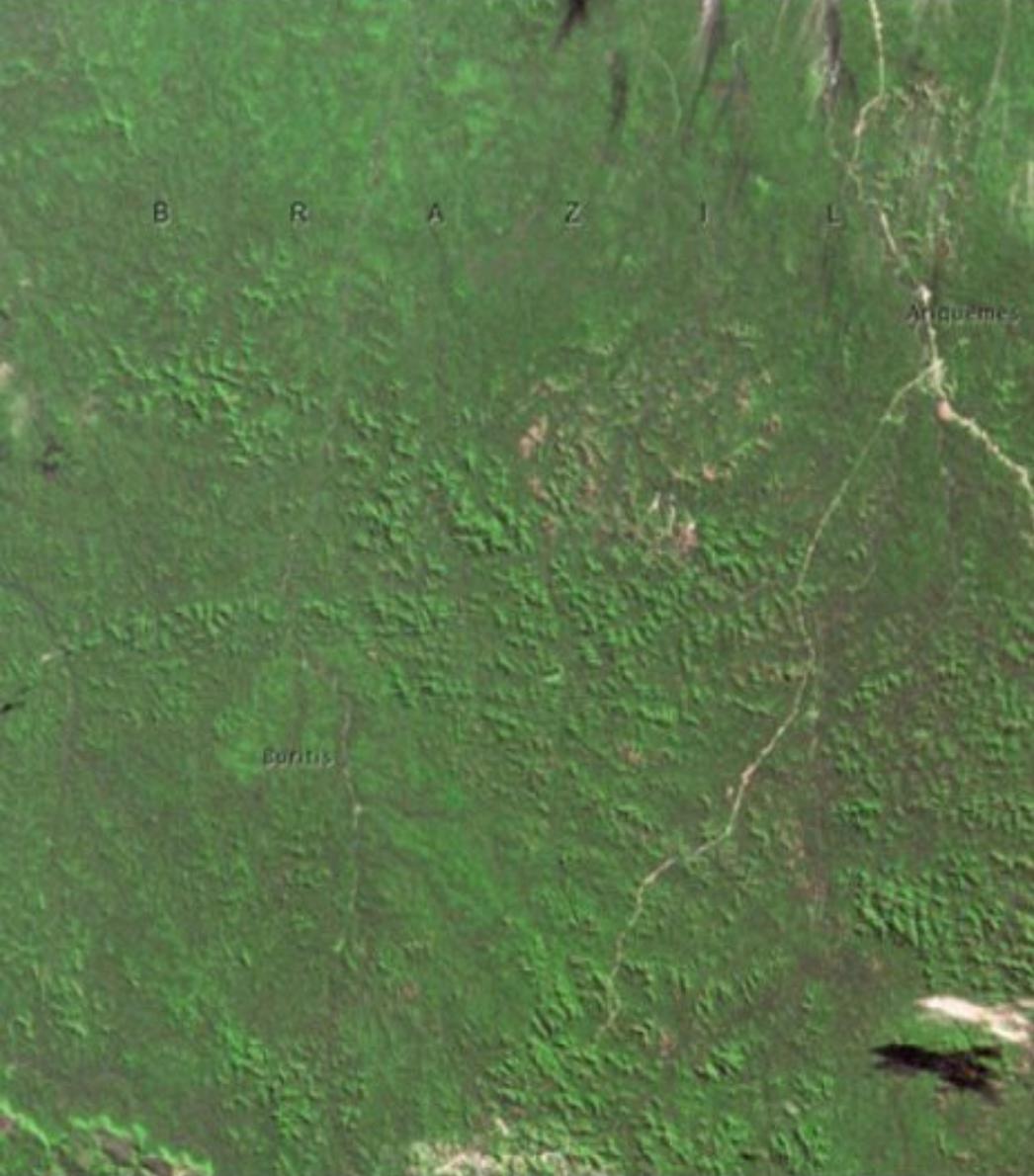
# Deforestation



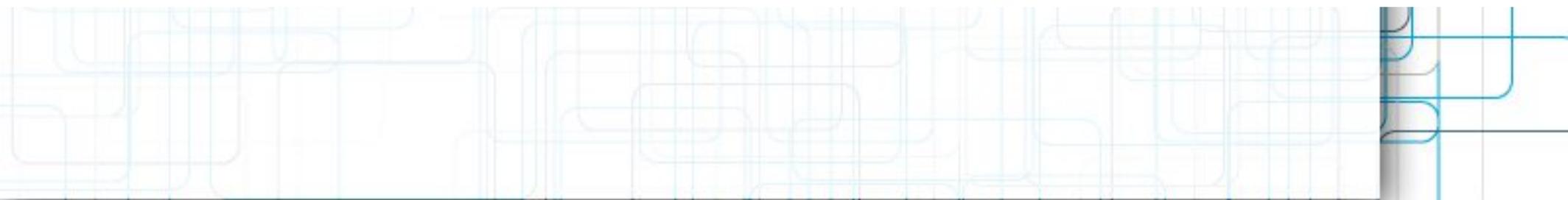


Deforestation is directly related to climate change. The world's 1.9 billion acres of temperate forests are a net-*Carbon Sink*. Restoring these temperate forests can sequester 19.42–27.85 gigatons of atmospheric carbon.

<https://drawdown.org/solutions/temperate-forest-restoration>

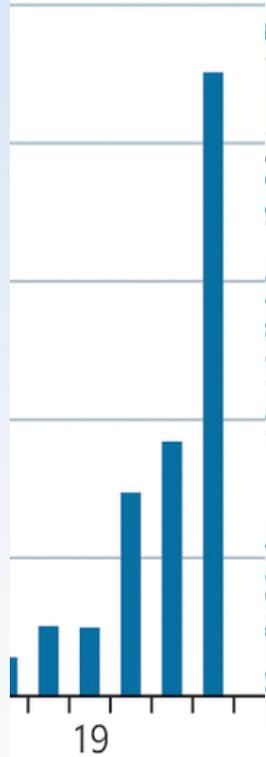
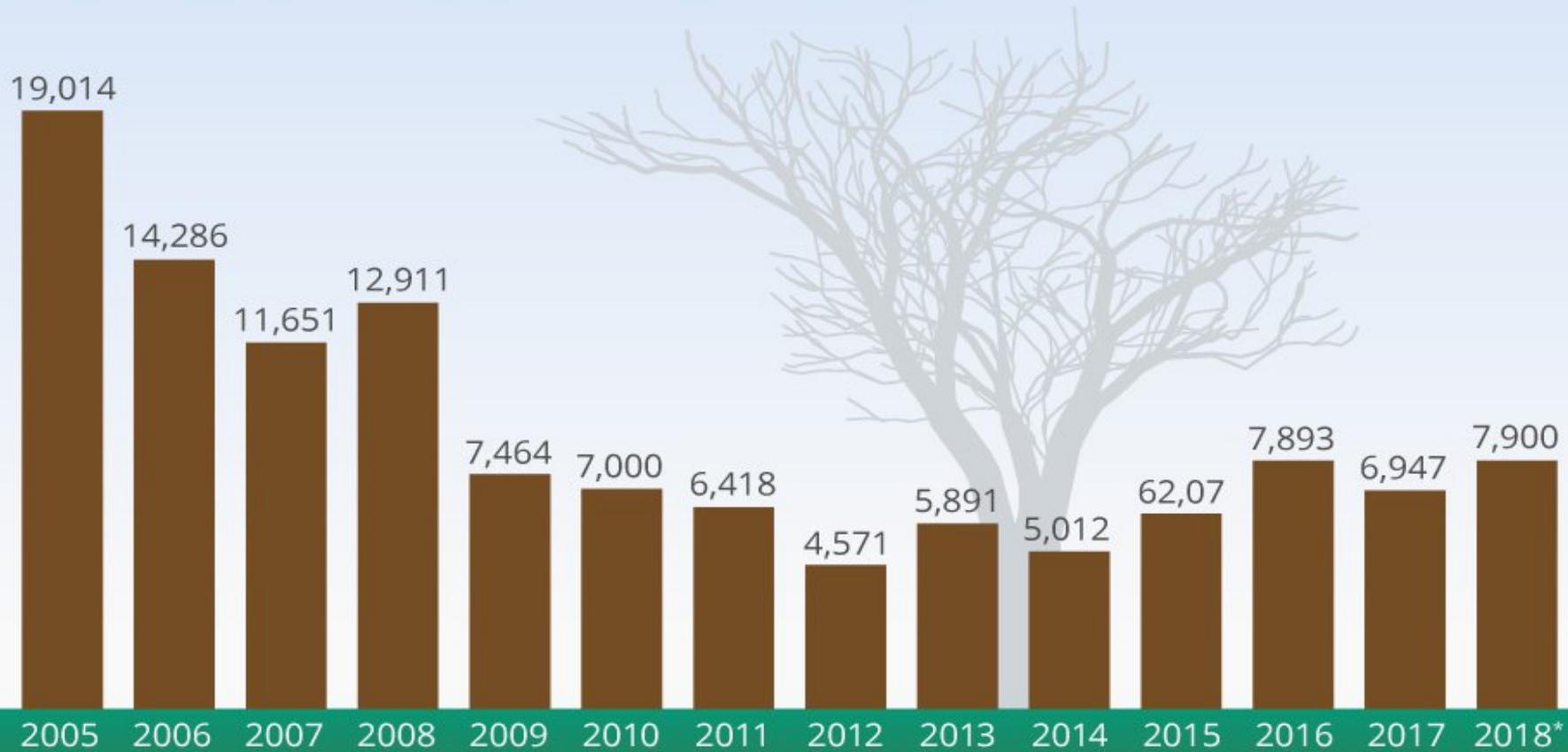


Forests in Rondonia, Brazil. June, 1975 — August, 2009.



# Brazil Sees Worst Deforestation In A Decade

Estimated deforestation in the Brazilian Amazon (km<sup>2</sup>)



\* Year from August 2017 to July 2018

@StatistaCharts

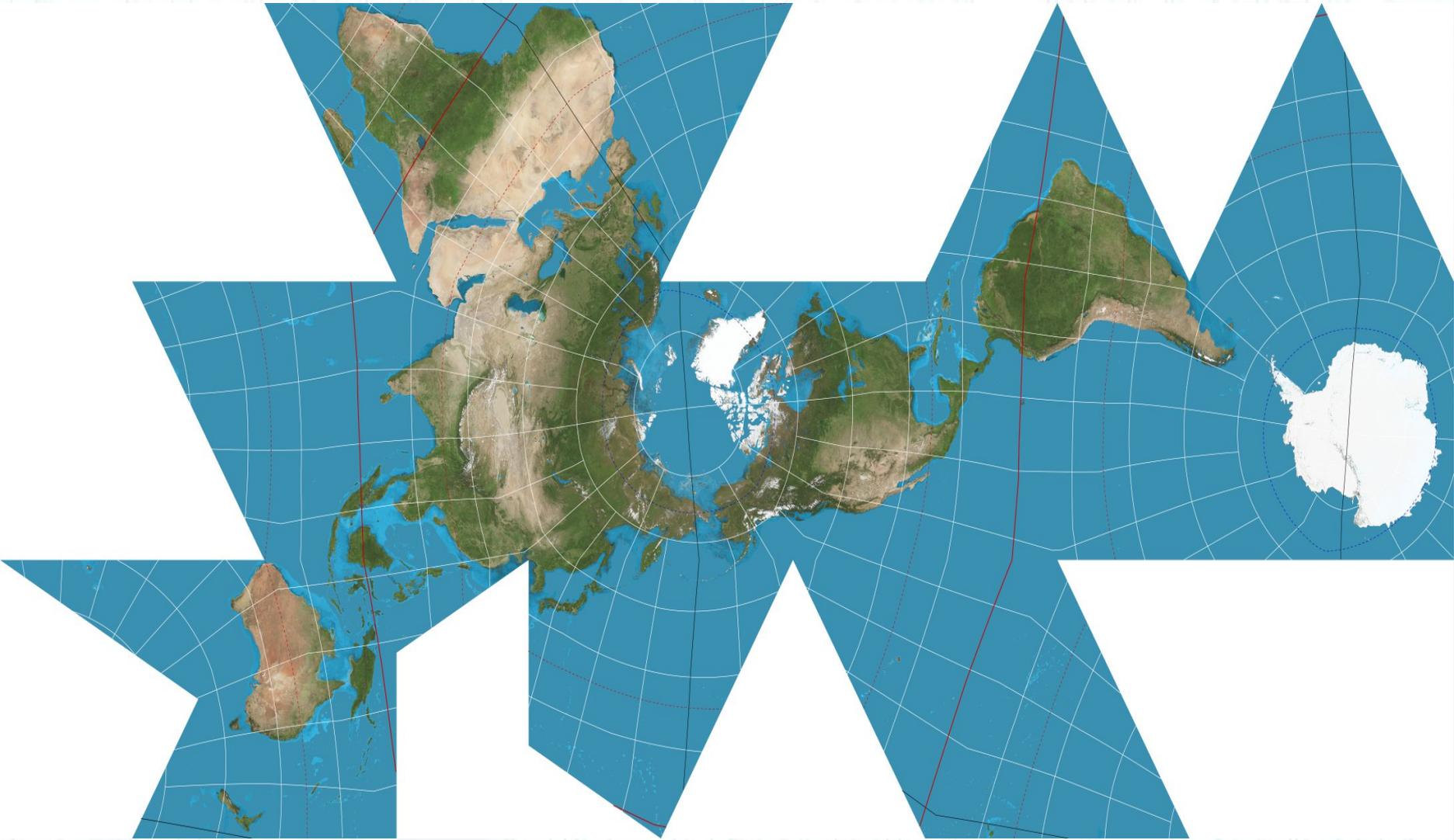
Source: Instituto Nacional de Pesquisas Espaciais

statista

Brazil's recent spike in deforestation, mostly by burning, is directly related to a shift in government policy, allowing the practice to meet rising global demands for meat production.

# Sustainability: Land Use and Greenspace

Using land to sequester carbon, feed us and improve our mood.



\*Dymaxion Map from the Buckminster Fuller Institute



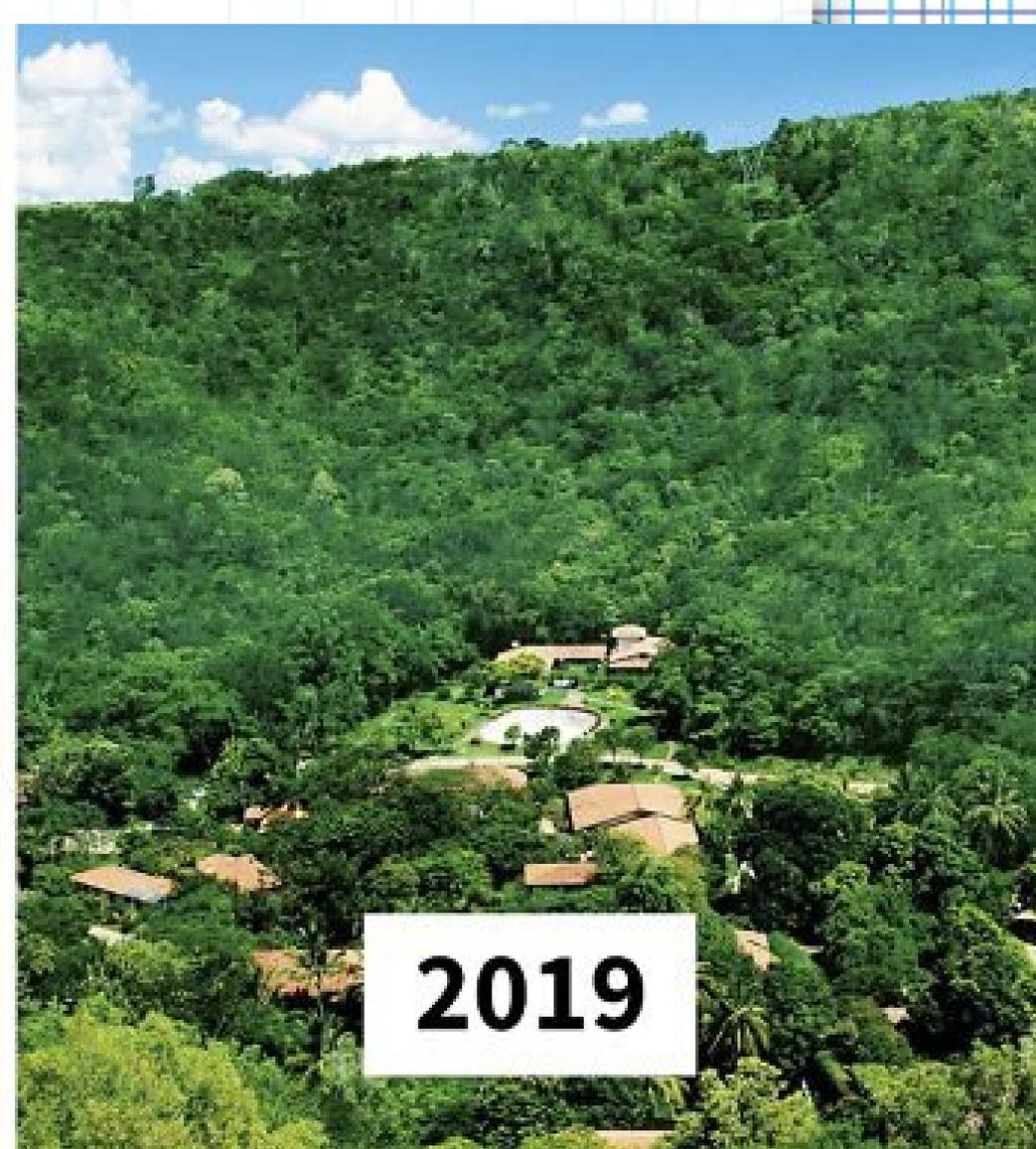
**Amazon emergency: reforestation in action!**

28/08/2019 - Anne-Lise de Reforest'Action

<https://drawdown.org/solutions/indigenous-peoples-forest-tenure>

<https://drawdown.org/solutions/forest-protection>

<https://drawdown.org/solutions/tropical-forest-restoration>



One couple in Brazil replants entire forest in under 20 years!



**BEFORE**



**AFTER**

Jadev Payeng of India, singlehandedly planted an entire forest, which is now a refuge for wildlife like elephants and tigers.

- Tree genetic diversity is vital in landscape restoration efforts



*Mahogany seedlings in a tree nursery, Colombia, to be used with native tree species in forest restoration efforts in Cuturú, Cauca, Antioquia. Credit: Bioversity International/E.Thomas*

Tree populations need genetic variation for survival, good growth and viability in the long term. It enhances resistance to acute and chronic stressors, such as pests and diseases, and the effects of global warming. It is also fundamental in **forest restoration** efforts to ensure that the trees planted today will become the healthy forests of tomorrow.

**Remember,  
Polyculture!**

# Agroforestry

## FOREST CARBON CYCLE

Mitigating the effects of climate change through forest management

CARBON

CARBON

Trees absorb carbon from the air

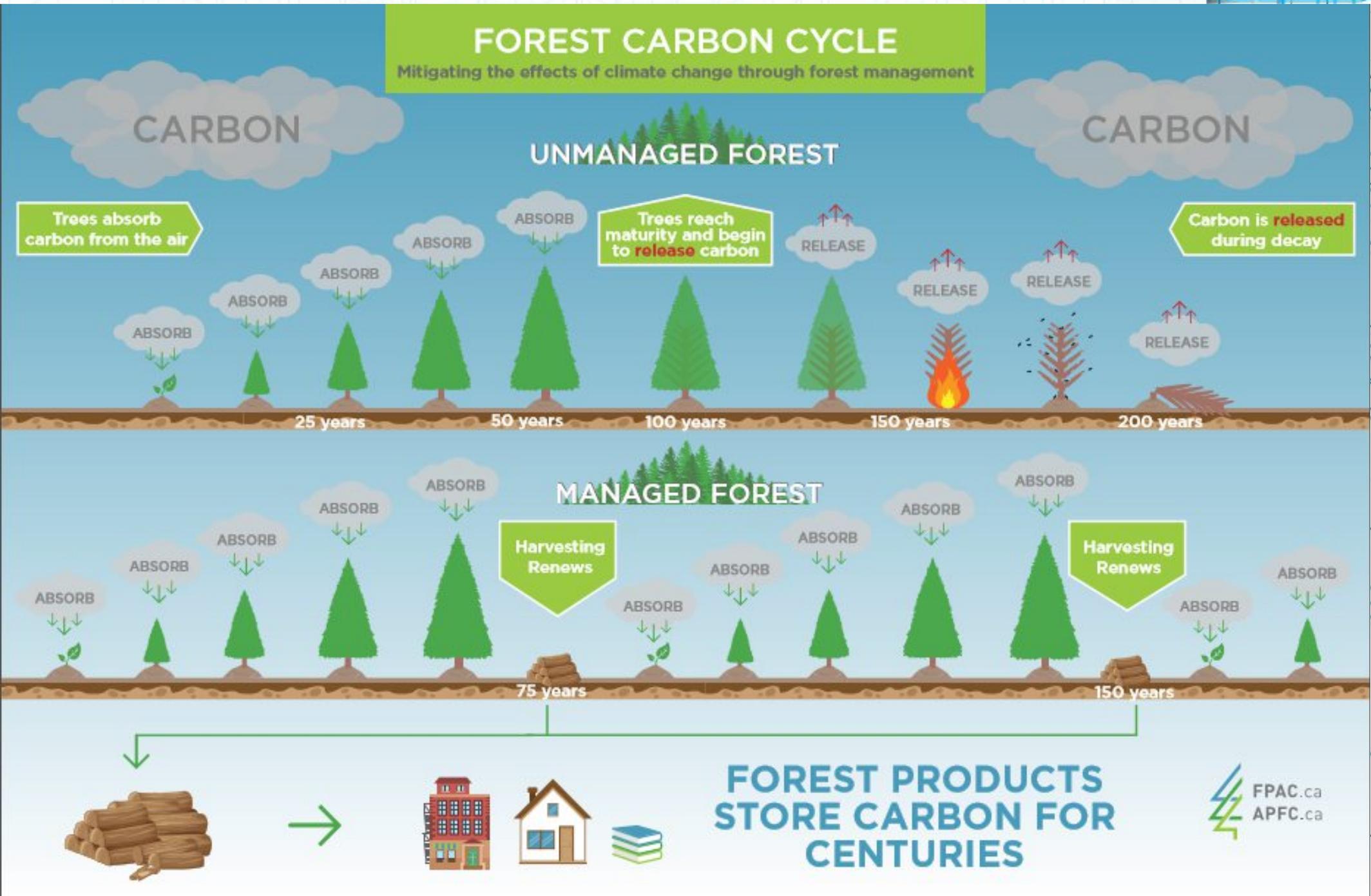
Trees reach maturity and begin to release carbon

Carbon is released during decay

### UNMANAGED FOREST

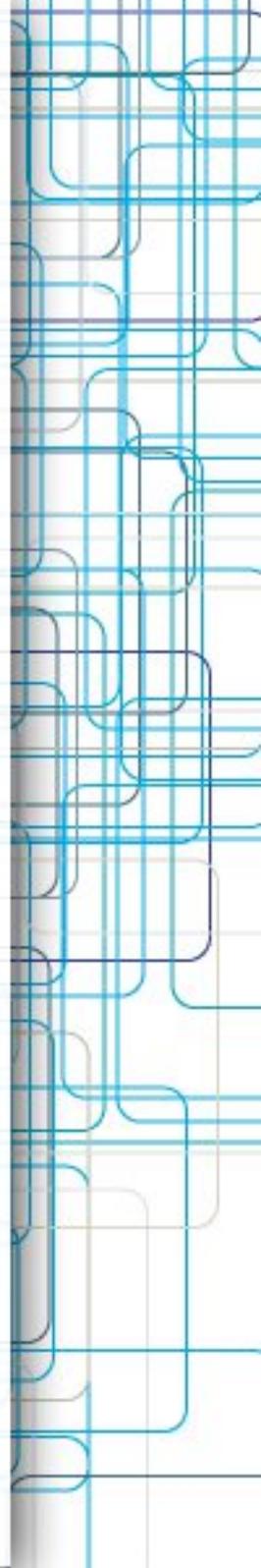
### MANAGED FOREST

FOREST PRODUCTS STORE CARBON FOR CENTURIES





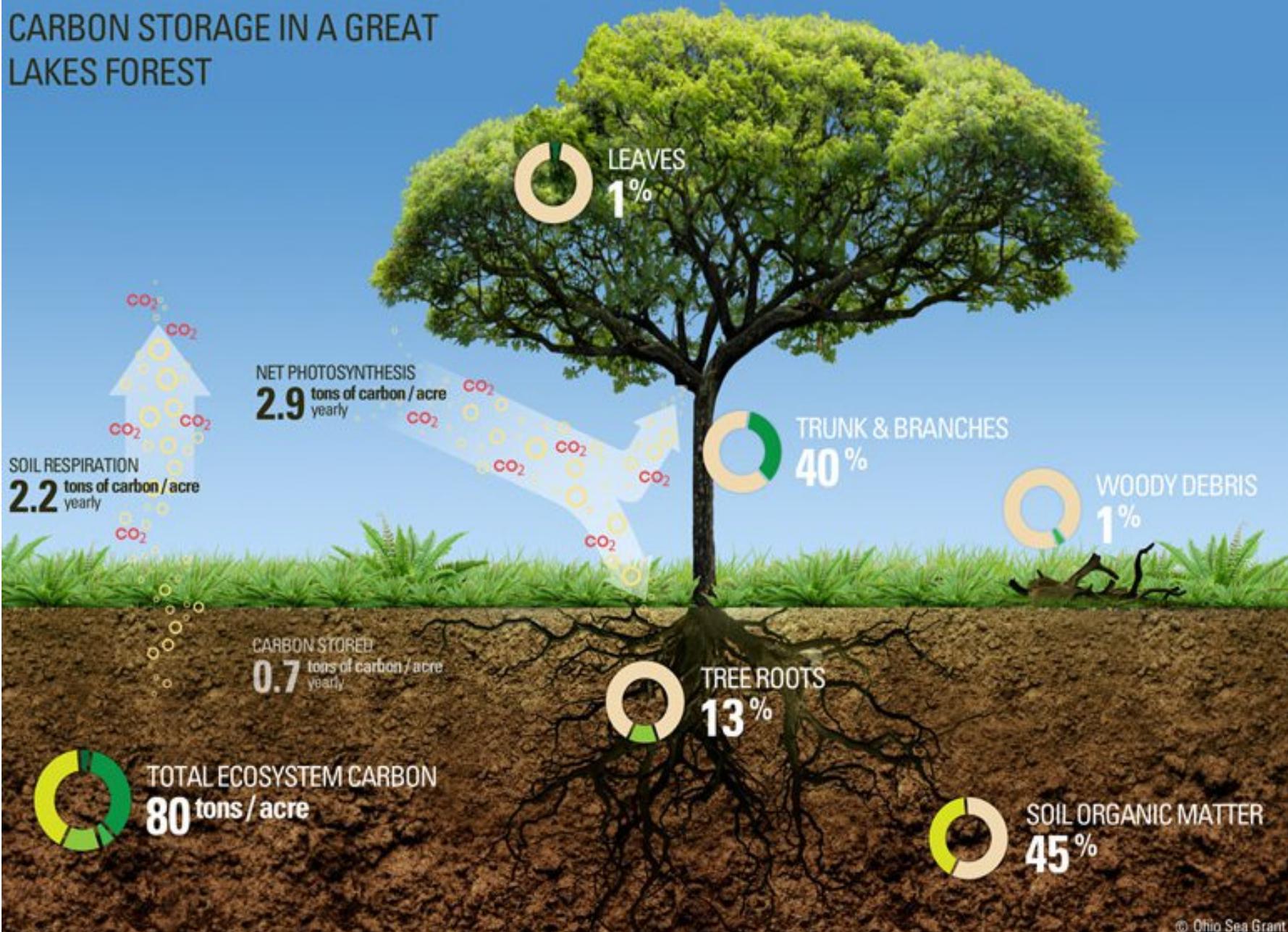
Every day, a 40 foot tree takes in 50 gallons of dissolved nutrients from the soil, raises this mixture to its topmost leaves, converts it into 10 pounds of carbohydrates and releases about 60 cubic feet of pure oxygen into the air. Every. Day.

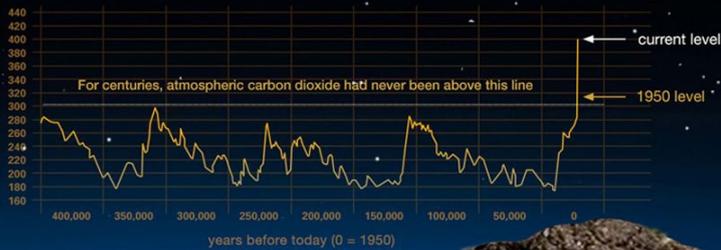


# Carbon Sequestration: How It Works

## WHERE DOES CARBON GO?

### CARBON STORAGE IN A GREAT LAKES FOREST





## CARBON FARMING WITH HEMP

Industrial hemp has been proven to absorb more CO<sub>2</sub> per hectare than any forest or commercial crop and is therefore the ideal carbon sink. One hectare (2.5 acres) of hemp can absorb 12 tonnes of CO<sub>2</sub> per harvest.

After deducting crop management inputs we are sequestering at least 8 tonnes of carbon per 1 hectare. 8 tonnes corresponds to

driving 25 000 miles with a car



production of 16 000 plastic bottles

**hemprefine**

decortication technology for northern latitudes

[www.hemprefine.fi](http://www.hemprefine.fi)

[info@hemprefine.fi](mailto:info@hemprefine.fi)

[facebook.com/hemprefine](https://facebook.com/hemprefine)

In northern climate hemp is often winter-retted and harvested in spring. Hemp covers soil for 11 months a year. Tall standing crop protects soil from erosion, improves soil tilth, supplies nitrogen, increases the winter survival of mycorrhiza and helps to manage soil-borne diseases.

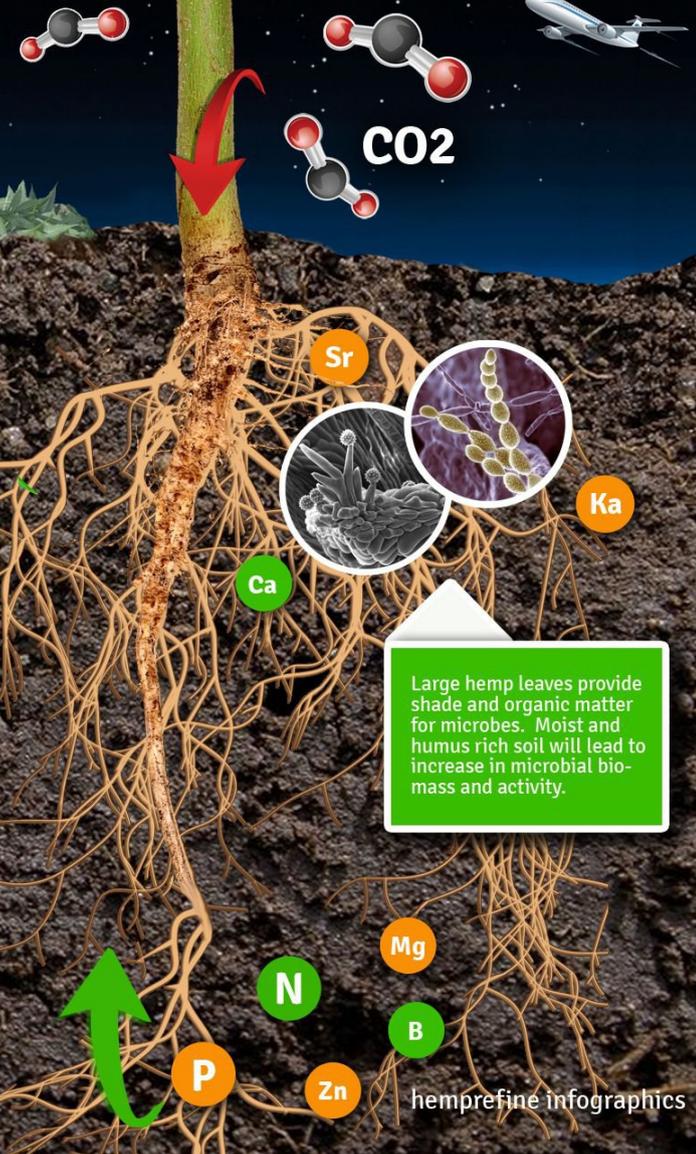
1.67 to 2.46 tonnes of CO<sub>2</sub> absorbed per hectare is left in situ due to leaf mulch dropping on the field during the autumn.

As a low fertiliser and zero pesticide/herbicide crop, with little management input, the carbon emissions of hemp cultivation is well below the average.

Hemp replaces highest CO<sub>2</sub> producing raw materials including oil, cement, aluminium and steel.

According to field trials total root biomass is about 3.2 tonnes per hectare which is highest for any annual plant. This converts to 1.5 tonnes of carbon.

Hemp has deepest known root system of annual plants. It can dig into +2 meters depth and bring nutrients to top layers of soil to other plants in rotation.



Large hemp leaves provide shade and organic matter for microbes. Moist and humus rich soil will lead to increase in microbial biomass and activity.

hemprefine infographics

There are many methods to sequestering carbon from the atmosphere. Hemp is one of the fastest growing and absorptive crops, making it our most viable option. In northern climates, hemp covers soil for 11 months a year, protecting land from erosion, increases survival of mycorrhizal and helps retaining nutrients. Hemp can absorb up to 2.46 tonnes of CO<sub>2</sub> per hectare

# HEMP IS THE STRONGEST NATURAL FIBRE IN THE WORLD.

IT'S KNOWN TO HAVE OVER 50,000 DIFFERENT USES!

## TEXTILES

- Clothing
- Diapers
- Handbags
- Denim
- Shoes
- Fine Fabrics

## INDUSTRIAL TEXTILES

- Rope
- Canvas
- Tarps
- Carpeting
- Netting
- Caulking
- Moulded Parts

## PAPER

- Printing
- Newsprint
- Cardboard
- Packaging

## FOODS

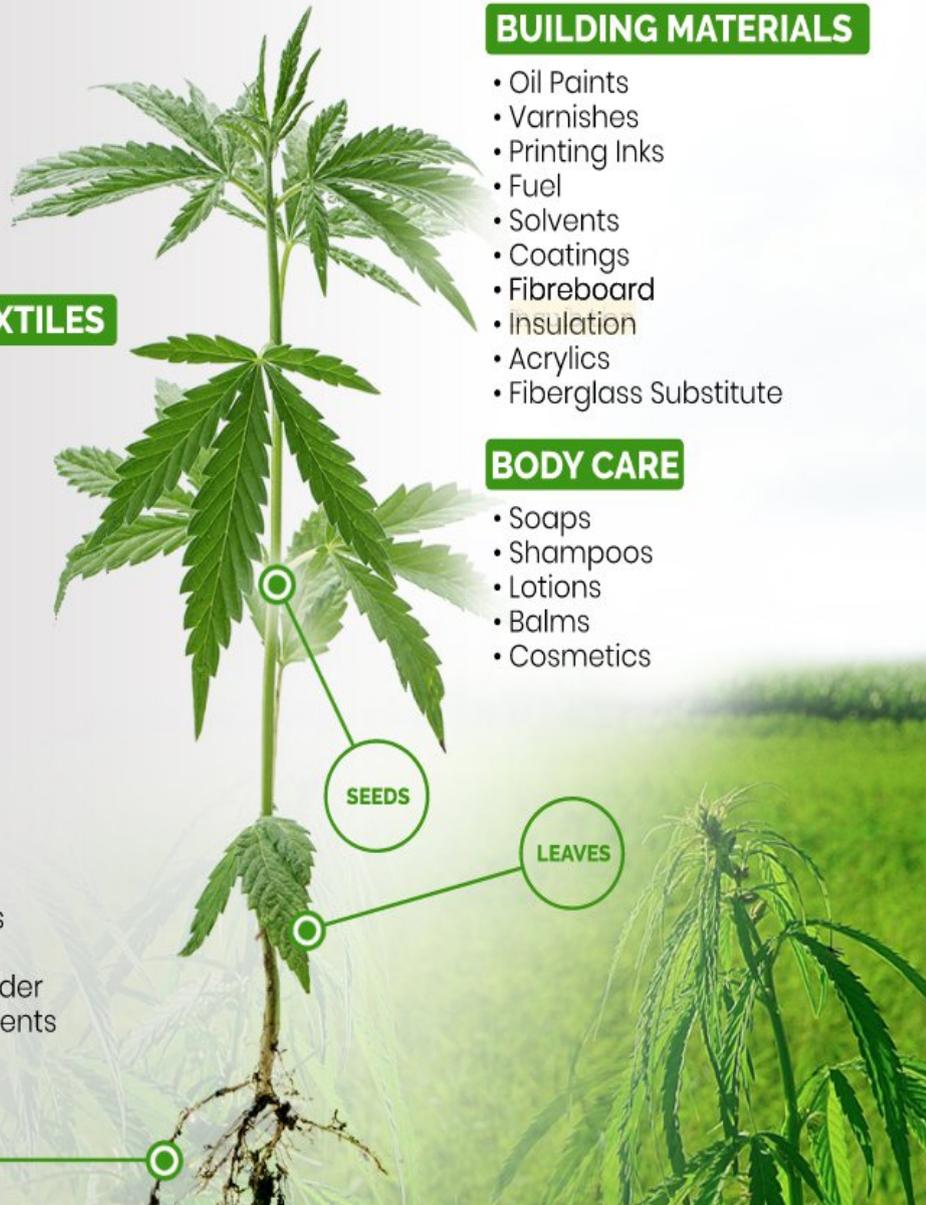
- Hemp Seed Hearts
- Hemp Seed Oil
- Hemp Protein Powder
- EFA Food Supplements

## BUILDING MATERIALS

- Oil Paints
- Varnishes
- Printing Inks
- Fuel
- Solvents
- Coatings
- Fibreboard
- Insulation
- Acrylics
- Fiberglass Substitute

## BODY CARE

- Soaps
- Shampoos
- Lotions
- Balms
- Cosmetics



In addition to having many, many applications for producing goods, Hemp is one of our best options for Drawdown, or capturing carbon from the atmosphere.

# Trees and Climate Change

Source: Arbor Environmental Alliance

The amount of CO<sub>2</sub> absorbed by an acre of trees annually equals to the amount released by a car driving for **26000** miles.



**48** lb. of CO<sub>2</sub> can be absorbed by a tree per year.

**6-19** degree fahrenheit will be reduced due to cooling effect

# Carbon Sinks

A forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.

**TREES PROVIDE US WITH MANY BENEFITS OVER AND ABOVE SHADE, FRUIT AND NUTS AND CLEAN AIR;**

**TREES DECREASE NOISE POLLUTION**

**TREES HELP SETTLE DUST**

**TREES SEQUESTER CARBON DIOXIDE**

**TREES IMPROVE THERMAL EFFICIENCY**

**TREES COOL DOWN THE SURFACE TEMPERATURE OF THE EARTH**



**TREES PREVENT FLOODING**

**THEY PROVIDE A HABITAT FOR LOCAL INSECTS, BIRDS AND WILDLIFE**

**INCREASE VALUE OF HOUSES AND BUILDINGS**

**TREES HAVE BEEN LINKED WITH DECREASED RATES OF DEPRESSION, ANXIETY AND CRIME**



# Trees Offset Atmospheric Carbon, Reduce Noise Pollution and much more...

**20,000**  
*gallons* PER DAY

An acre of maple trees can put as much as 20,000 gallons of water into the air each day.

**DAVEY**   
Proven Solutions for a Growing World

A single tree produces approx. 260 lbs of oxygen per year, meaning two mature trees provide enough oxygen for a family of four.

-CarbonDay.com

Reduce noise ~~by~~ BY **50%**

Trees muffle urban noise almost as effectively as stone walls. A properly designed buffer of trees and shrubs can reduce noise by about 5-10 decibels.

-USDA National Agroforestry Center

enough  OXYGEN for a Family of 4

Controls SOIL erosion

In 50 years one tree produces \$31,250 worth of oxygen, provides \$62,000 worth of air pollution control, recycles \$37,500 worth of water and controls \$31,250 worth of soil erosion.

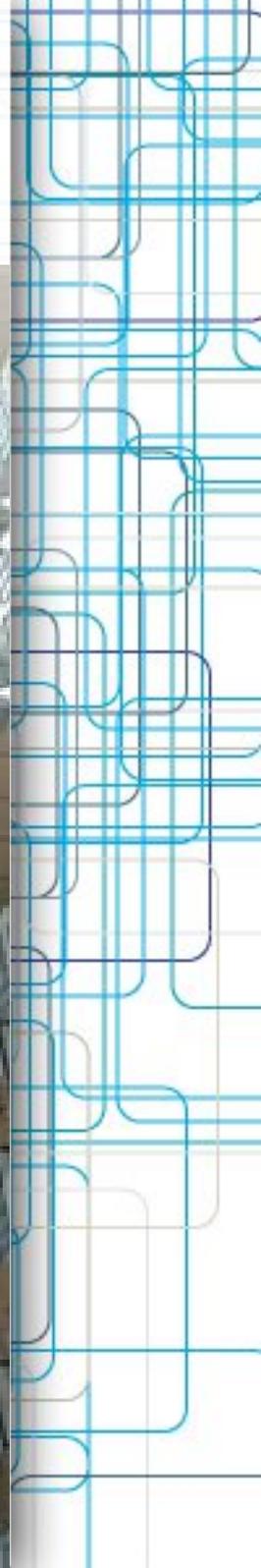
-USDA Forest Service

one person causes **10 TONS** OF CO<sub>2</sub> PER YEAR

One person causes about 10 tons of carbon dioxide to be emitted a year. One tree removes about 1 ton of CO<sub>2</sub> per year, and 1 acre of trees absorbs 26 tons of CO<sub>2</sub> per year.



# Cities of The Future



# The Venus Project

Beyond Politics, Poverty and War



# Resource-Based Economy

Based directly on finite and renewable resources, harking back to *subsistence*, the origin of the word, 'economy'.

## ECONOMICS

Production & Resourcing  
Exchange & Transfer  
Accounting & Regulation  
Consumption & Use  
Labour & Welfare  
Technology & Infrastructure  
Wealth & Distribution

Organization & Governance  
Law & Justice  
Communication & Movement  
Representation & Negotiation  
Security & Accord  
Dialogue & Reconciliation  
Ethics & Accountability

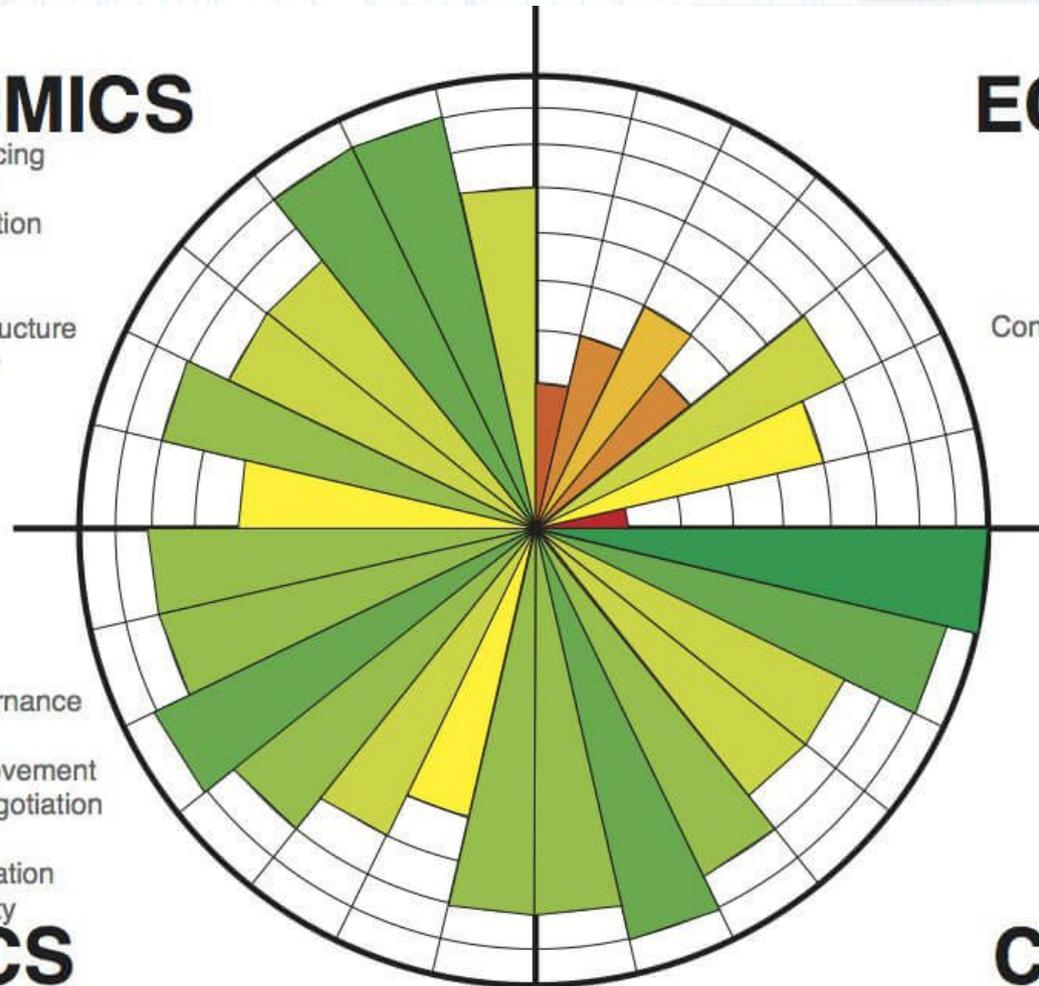
## POLITICS

## ECOLOGY

Materials & Energy  
Water & Air  
Flora & Fauna  
Habitat & Food  
Place & Space  
Constructions & Settlements  
Emission & Waste

Engagement & Identity  
Recreation & Creativity  
Memory & Projection  
Belief & Meaning  
Gender & Generations  
Enquiry & Learning  
Health & Wellbeing

## CULTURE





Jacque Fresco, founder of The Venus Project



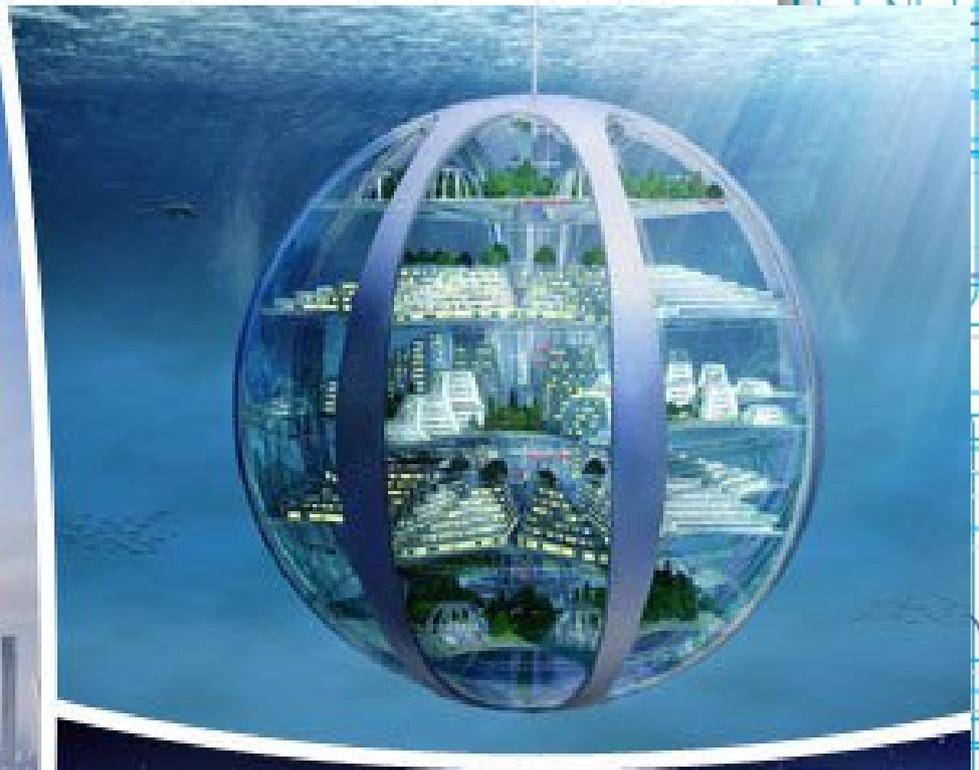
Jacque Fresco's home



Zero Waste Future House Models, Venus Project



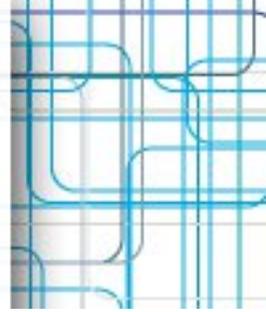
Sustainable City designs, Venus Project



Dream big with your head in the clouds, while also keeping your feet planted deep in the mud.

# Is Arcology Practical?

Sustainable design may not be scalable to entire city-states but we can still achieve more manageable solutions...



See also: Masdar City, The Shimizu Pyramid, Crystal Island, Dongtan and others...





57 West in New York City by the Bjarke Ingels Group



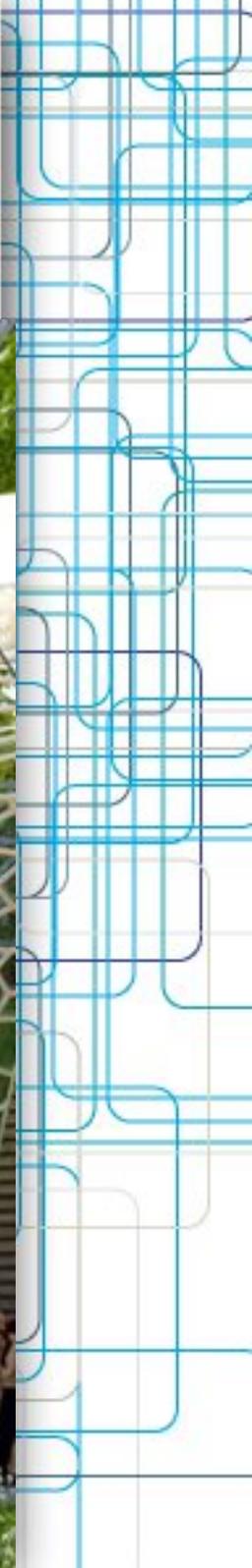
King St. West in Toronto, CA by the Bjarke Ingels Group



...proposed design by the Bjarke Ingels Group

# Modern Inspiration

Indoor Gardens, Living Walls, Green Roofs and Modern Parks  
...We have the technology.



# Indoor Greenspace



Houseplants improve your mood (anxiety and concentration) and purify the air, reducing indoor air pollution.

# HOUSE PLANTS 101

Sunlight + Water Chart



GOLDEN POTHOS ☀☀☀ ●



ALOE ☀ ○



SUCCULENT ☀☀ ●



AIR PLANT ☀☀ ●



SNAKE PLANT ☀ ●



FERN ☀☀☀ ●

### WATER SUPPLY

Water Often ☀☀☀

Medium Water Needs ☀☀

Minimal Water Needs ☀

### SUN EXPOSURE

Full ○

Partial ●

Low ●

*Lulus*

# Best Indoor Plants That Purify The Air Around You



Spider Plant (Chlorophytum Comosum)

Golden Pothos (Epipremnum pinnatum)



Chrysanthemum (Chrysanthemum Indicum)

Peace Lilly (Spathyphylum)



Chinese evergreen (Dieffenbachia seguine)

Areca Palm (Dypsis lutescens)



Aloe vera (Aloe barbadensis mill)

Gerbera Daisy (Gerbera Jamesonii)



Rhapis Palm (Rhapis excelsa)



English Ivy (Hedera helix)



Snake Plant (Sansevieria laurentii)



*CareJoy*

# Vertical Gardens





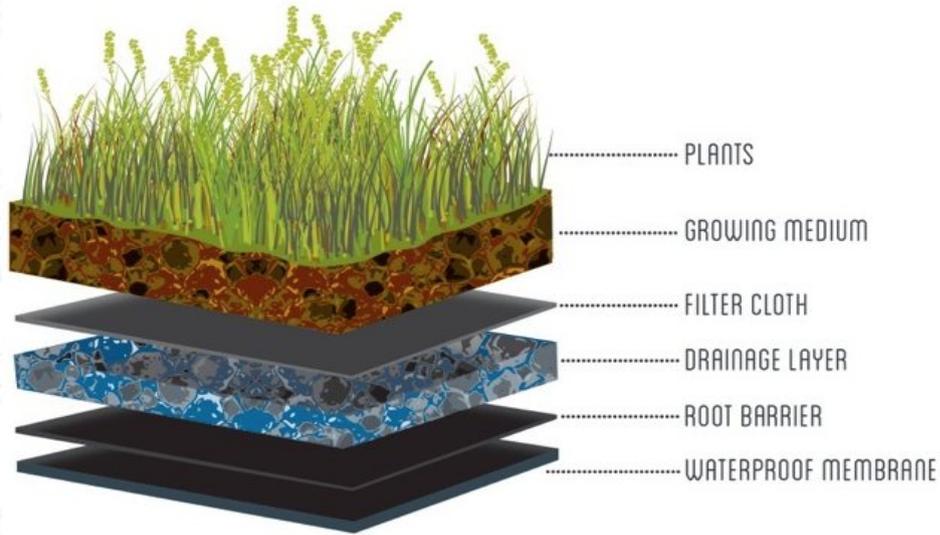
## Living Walls

One of the largest interior gardens in the world, The Calyx Royal Botanical Garden by Gsky Plant Systems in Sydney, AUS.



# Green Roofs

How replacing a conventional roof with grasses, sedums or vegetables can reduce carbon footprint and beautify an urban area.



# Earthships





Made mostly from repurposed car tires and wine bottles mixed with cob, Earthships are Zero Waste. These structures rely on Geothermal for heating and solar for any power needs.



Earthship in Columbus, OH made entirely from earthen cob and recycled materials

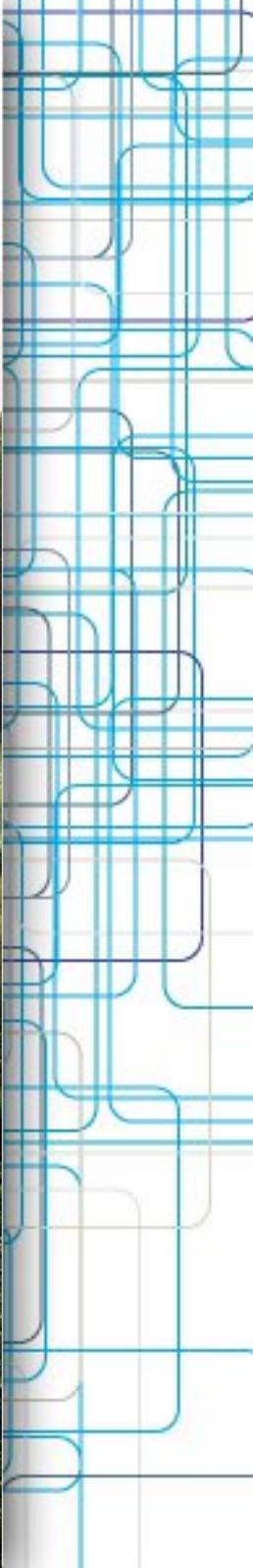




**Honorable Mention:** The Mushroom House – Cincinnati, OH

# Eco-Villages

More than just temporal communities!





In 2004, Imago, an ecological education organization in Price Hill in Cincinnati, OH brought 17 residents together to start an Ecovillage, an intentional community that invests in urban farming, reducing emissions and more!

# LEED Certification: Beyond Aesthetics



LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world. Available for virtually all building types, LEED provides a framework for highly efficient, and cost-saving green buildings, helping solve climate change.

<https://drawdown.org/solutions/net-zero-buildings>

The Vertical Forest,  
an apartment high  
rise in Milan, was  
completed in 2014.  
Architect: Stefano Boeri





Created by biologist and botanist Ignacio Solano of Paisajismo Urbano, in collaboration with green roof design firm Groncol, the vertical garden project features over 115,000 plants of 10 different species.



One Central Park in Sydney, AUS is the world's tallest vertical garden, designed by Jean Nouvel and Patrick Blanc.



Park  
Royal  
Tower in  
Singapore  
by  
architects  
of WOHA.



Solar-powered “Super-Trees” at the Gardens By The Bay in Singapore





Not all dreams come true but some surely do...