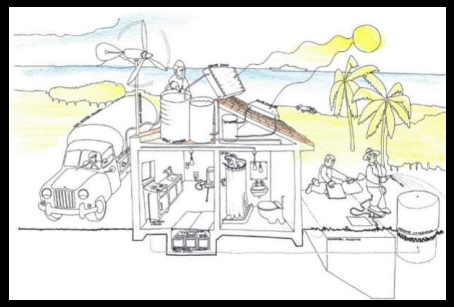
Foster + Partners

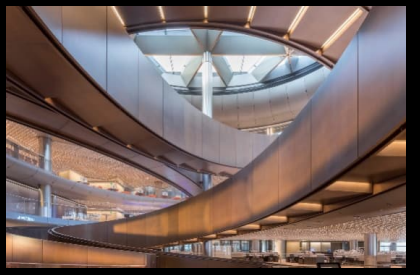
Nova Building Expo: The Net-zero Carbon Transition

Near-Zero emission and resilient building

Over 50 years of innovation and sustainability

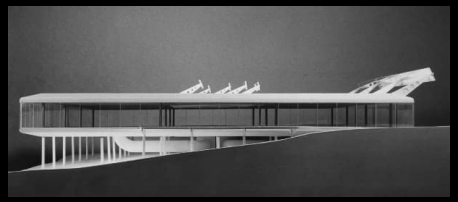












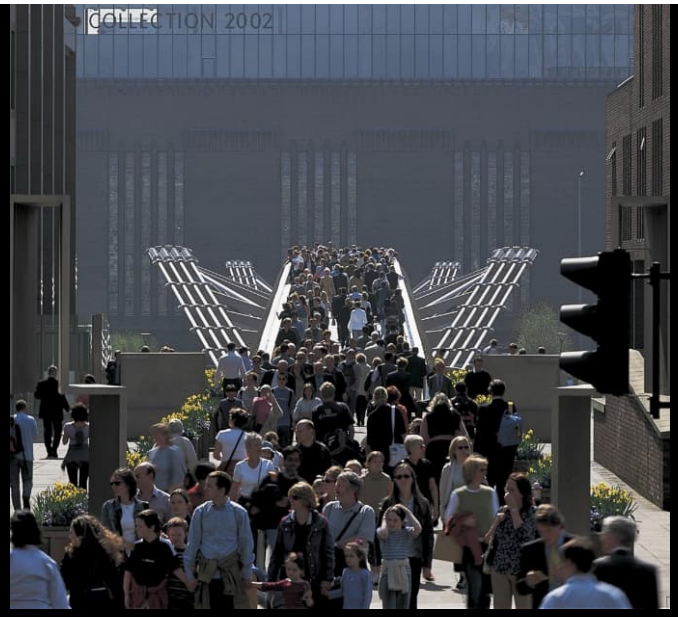


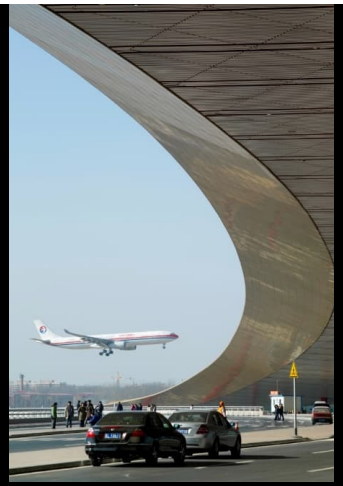




1970 — 1980 — 1990 — 2000 — 2010 — 2020

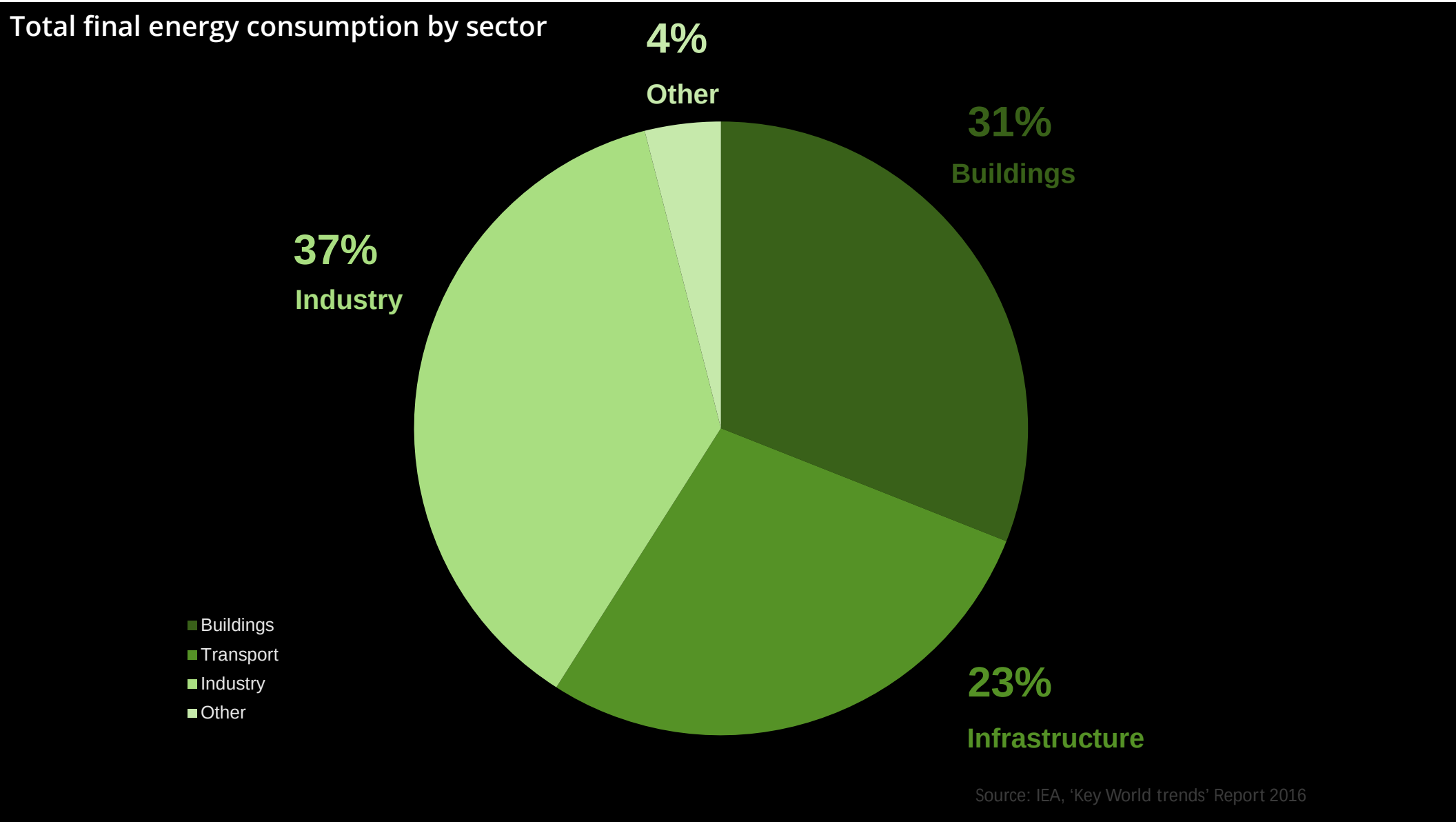
BUILDINGS





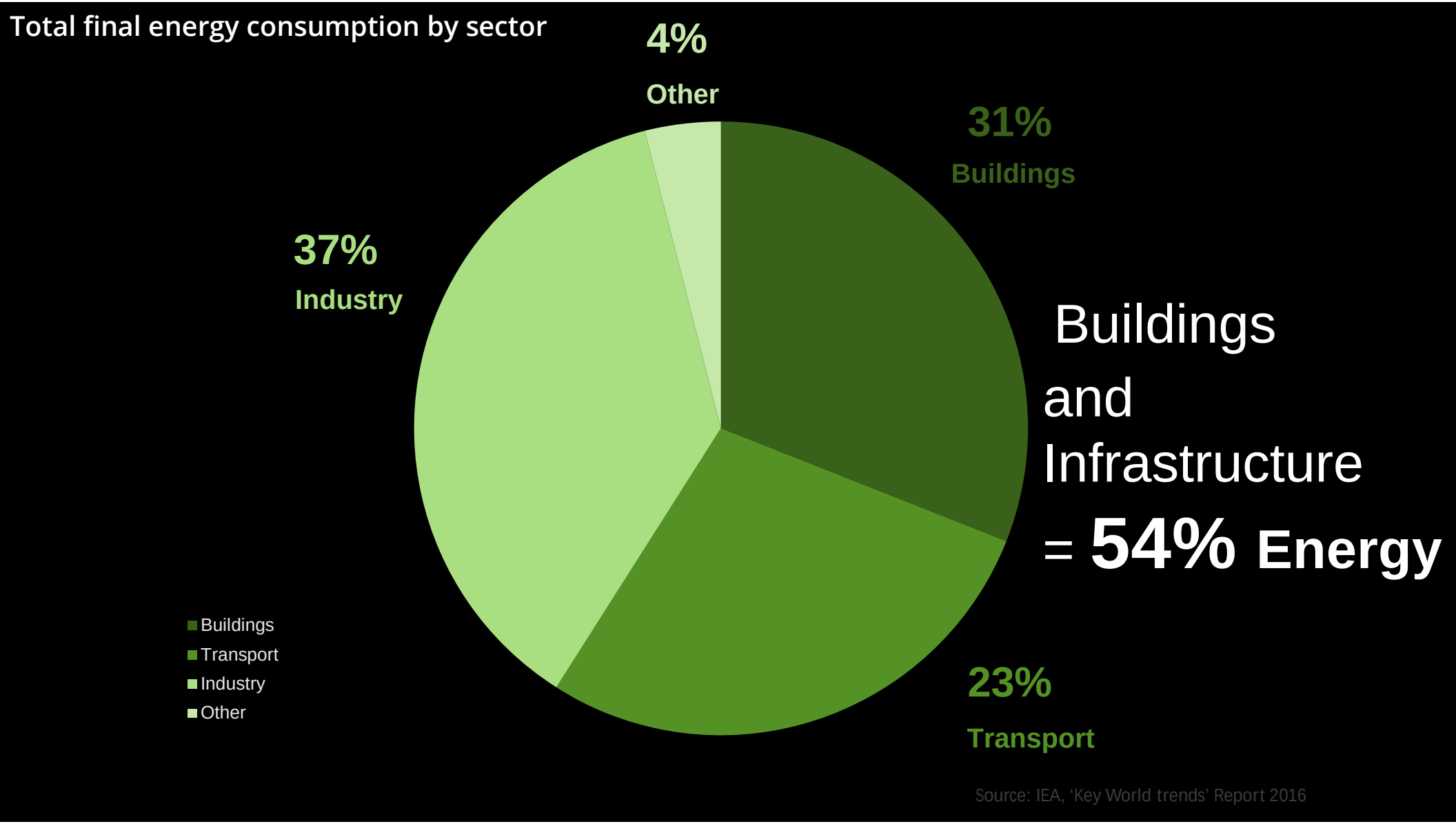
INFRASTRUCTURE

Total final energy consumption by sector



Source: IEA, 'Key World trends' Report 2016

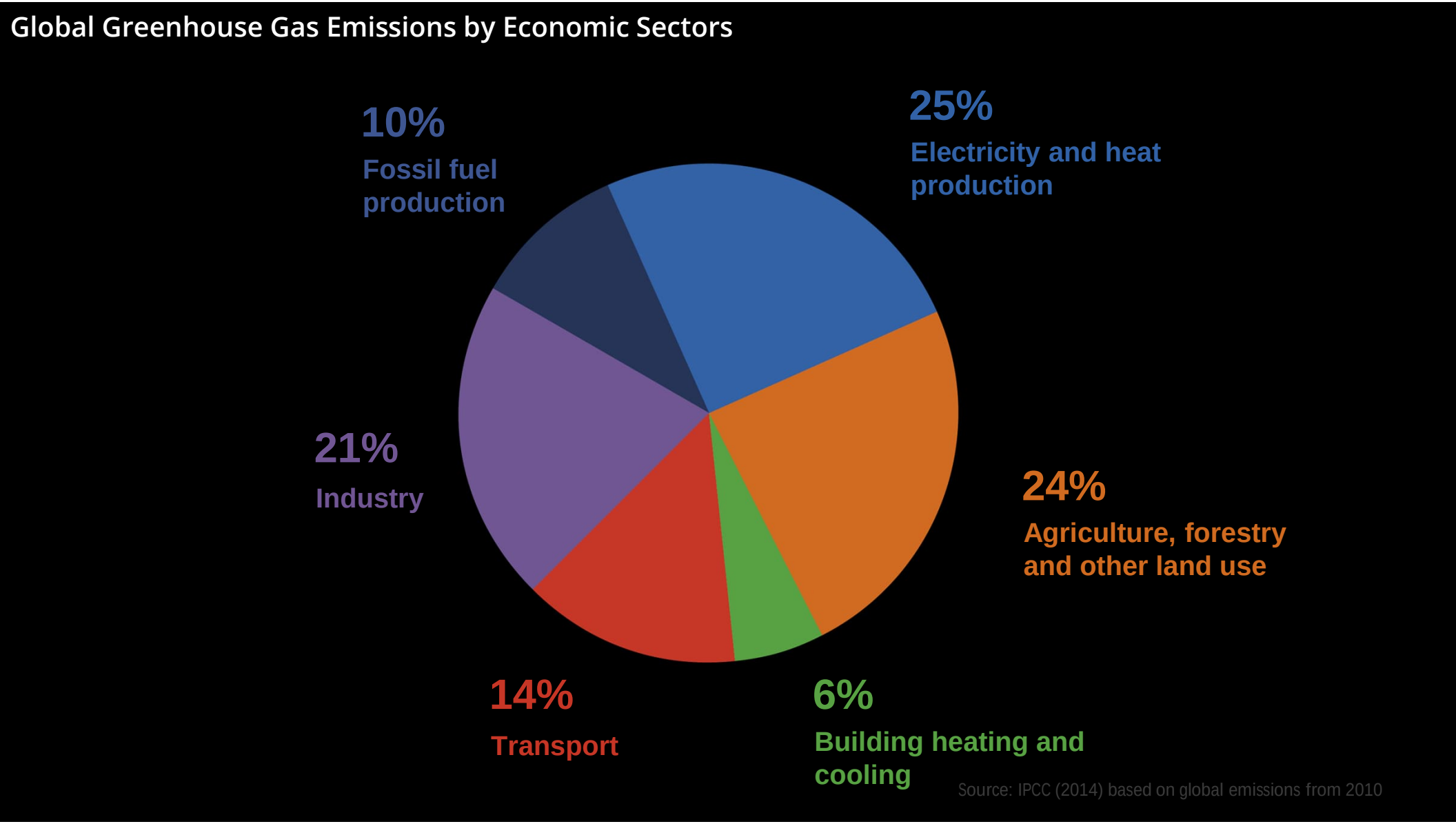
Total final energy consumption by sector



Buildings and Infrastructure = **54% Energy**

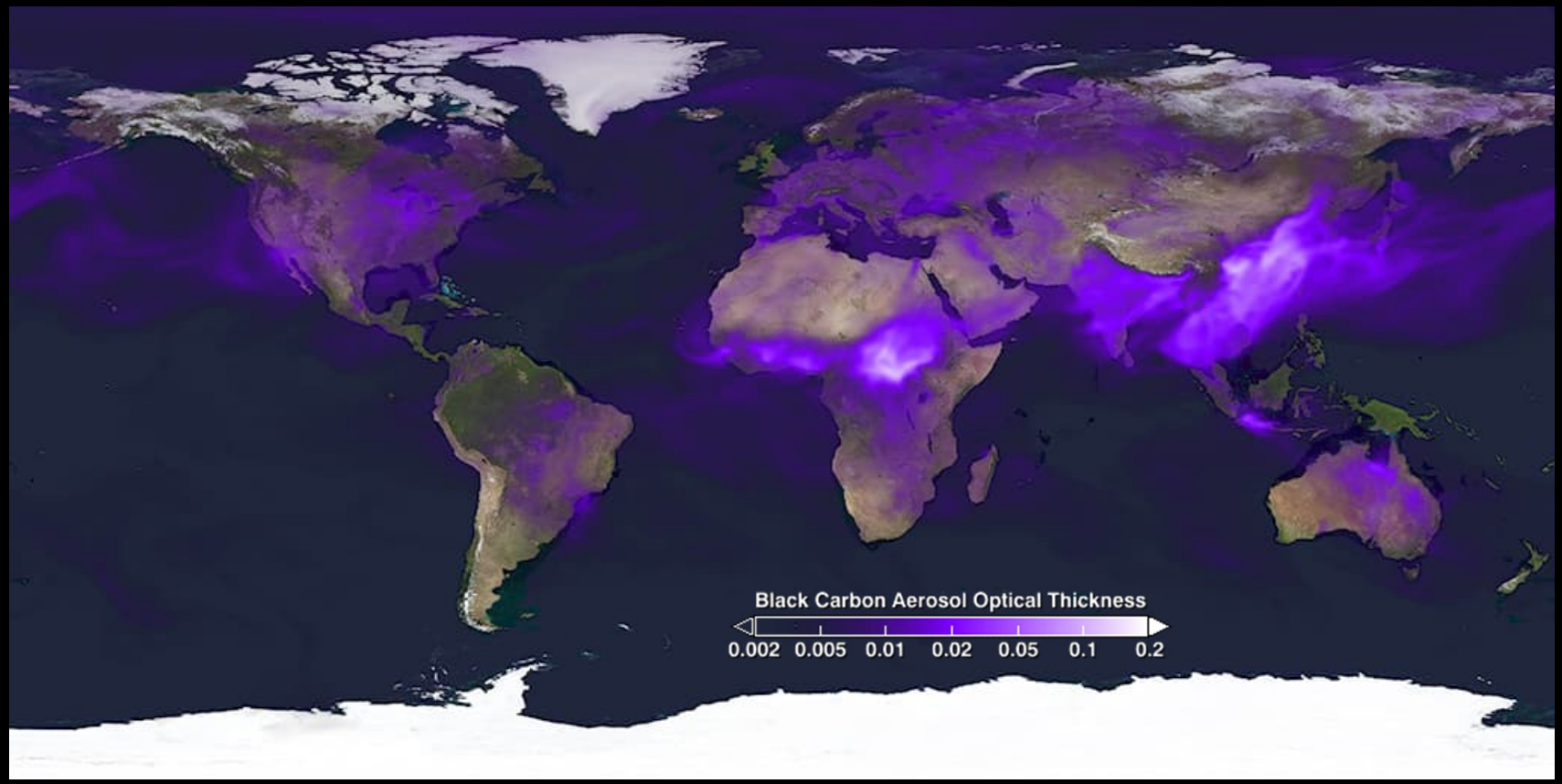
Source: IEA, 'Key World trends' Report 2016

Global Greenhouse Gas Emissions by Economic Sectors



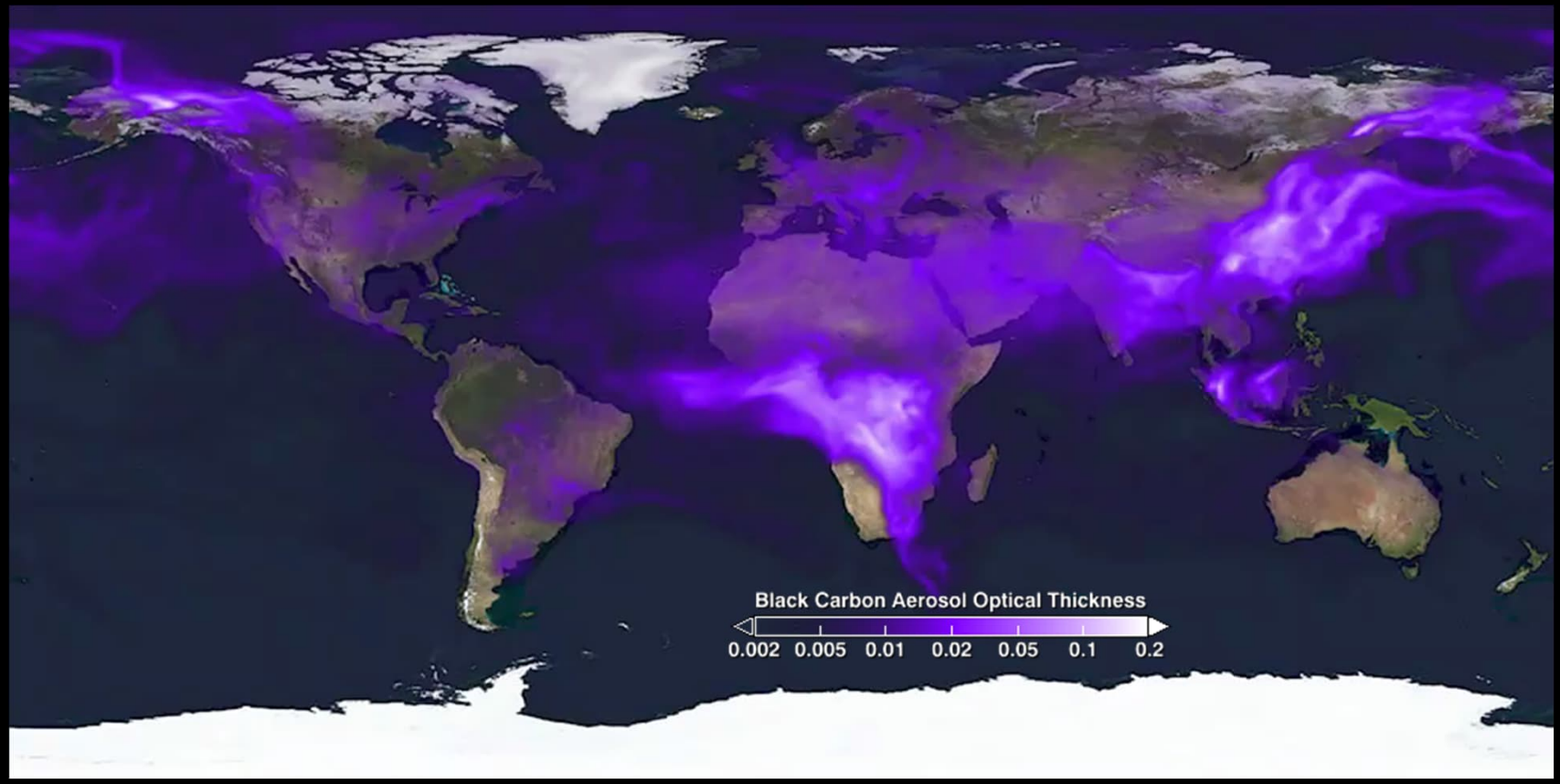
Source: IPCC (2014) based on global emissions from 2010

Black Carbon Emissions, Gigagrams



Source: Climate Reanalyzer, Climate Change Institute,
University of Maine, using data from the National Centers for Environmental Prediction Global Forecast System

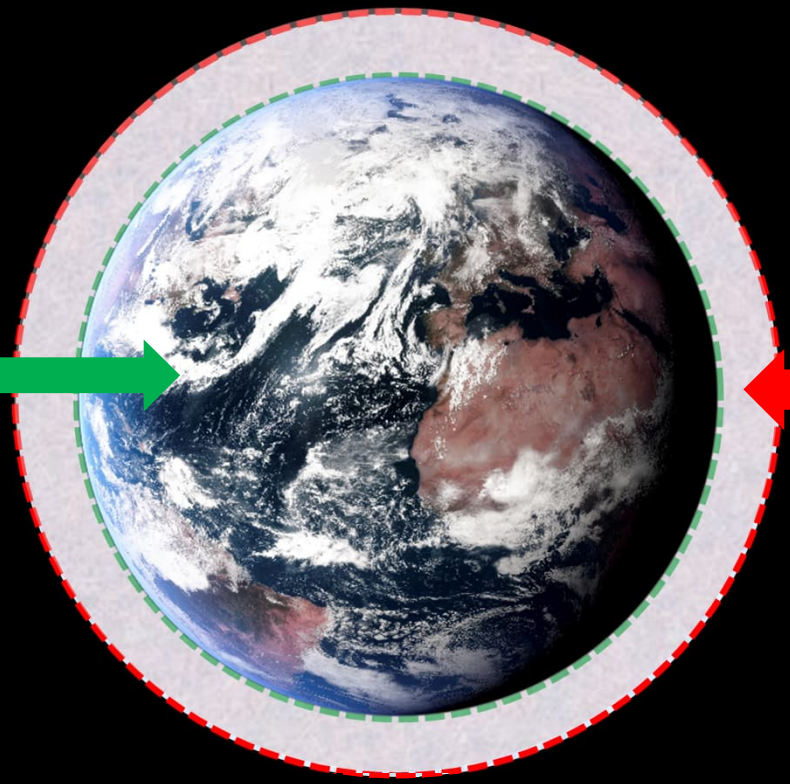
Black Carbon Emissions, Gigagrams



Source: H. Mitchell, W. K. Lau for NASA, 2009

The Fundamental Science – Ecological footprint and carbon must balance

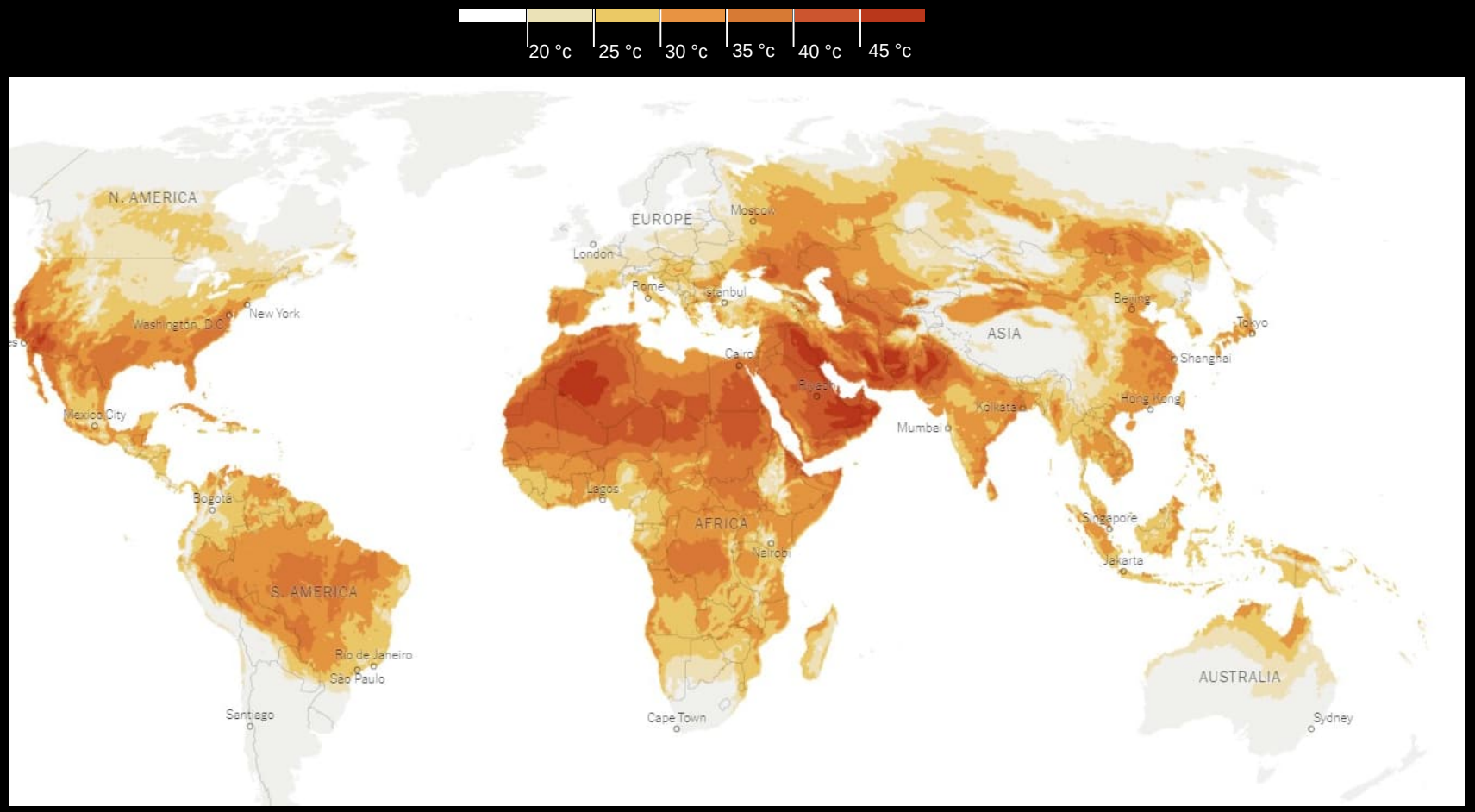
Absorption
in
Eco footprint



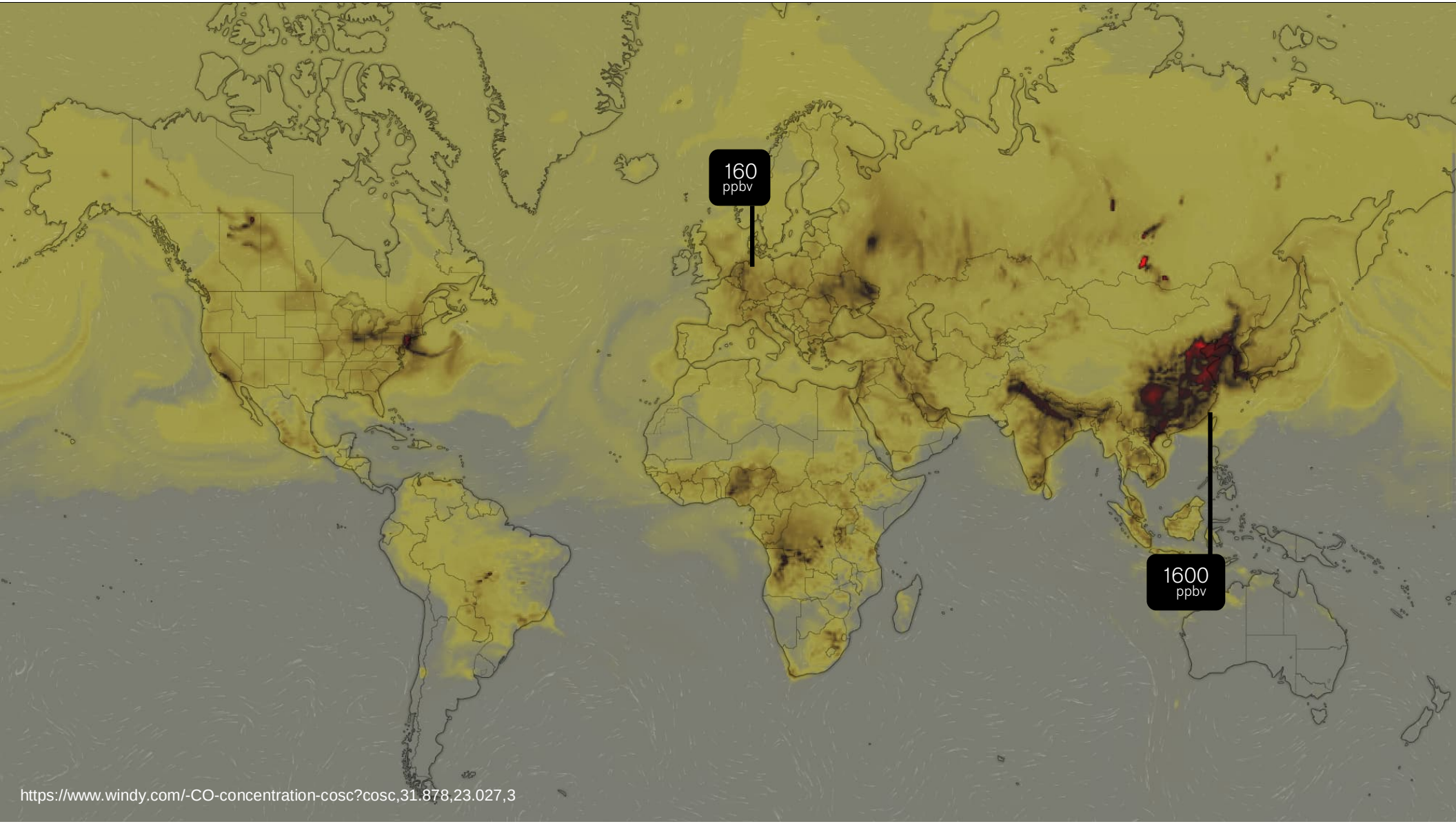
Emissions
in
Carbon

If Eco Footprint is more than 1 planet
Carbon causes climate change!

Global Heat Tracking, Climate Change Institute



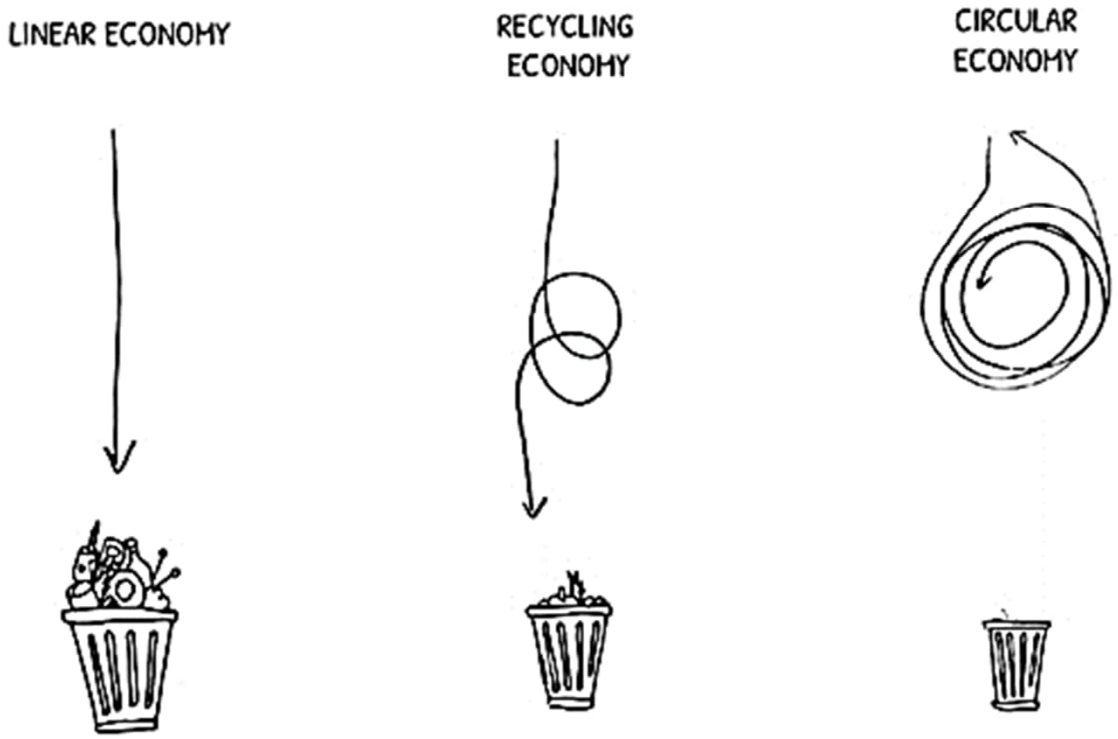
Source: University of Maine, using data from the National Centers for Environmental Prediction Global Forecast System


160
ppbv
1600
ppbv
https://www.windy.com/-CO-concentration-cosc?cosc,31.878,23.027,3

First Global Urban Planning Conference
New York 1898

“After three days of brainstorming and debate that went nowhere, attendees of the conference, frustrated and resigned, called it quits on what had been planned as a 10-day affair. Participants had hoped to hammer out a solution to the horse problem and its smelly attendant consequences, but instead, seeing no way out of the morass, they disbanded and went home.”

Linear Economy vs Circular Economy



Moving beyond the **TAKE · MAKE · WASTE** approach to resources in the built environment

Electric Deliveries 1950

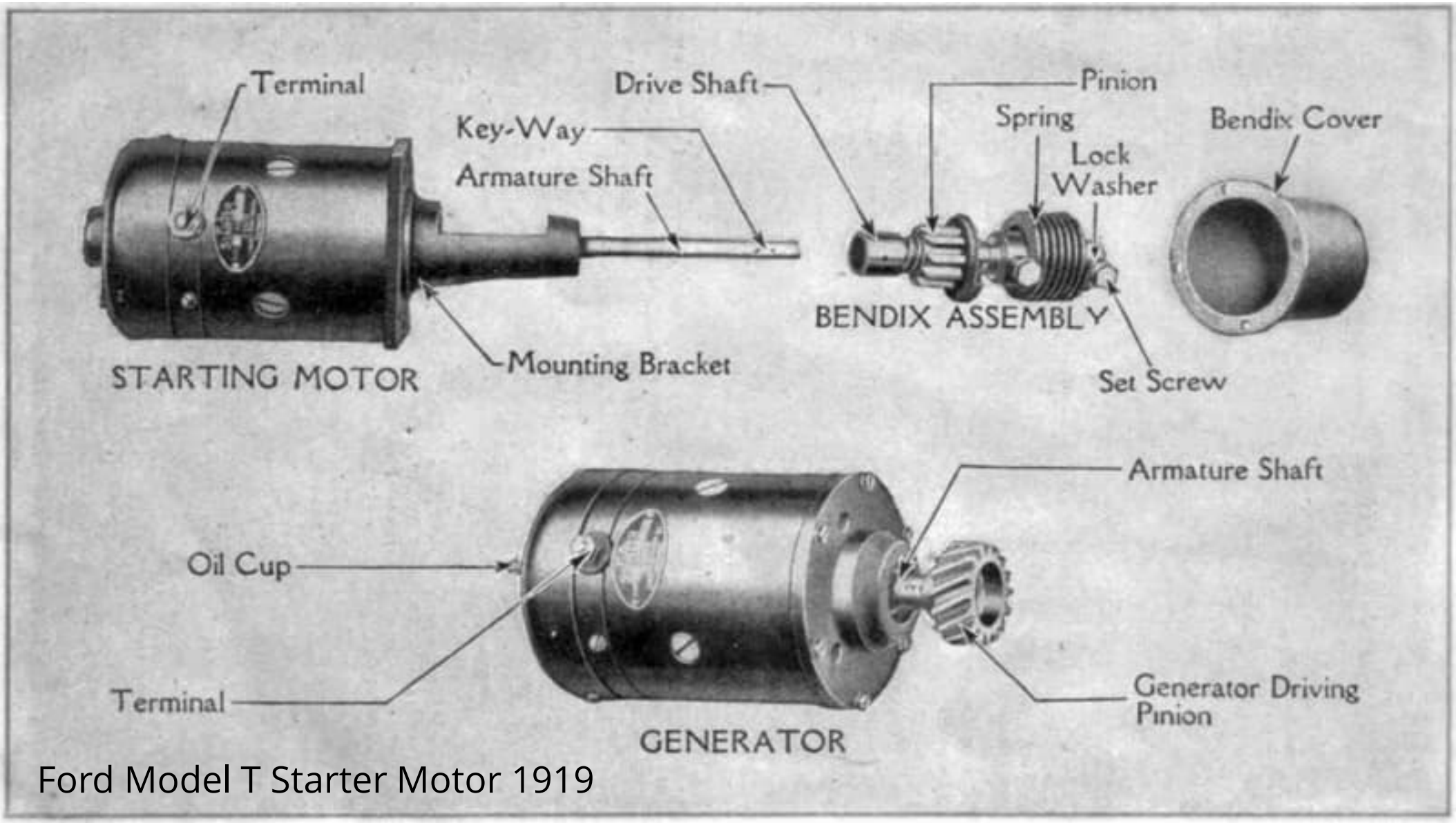

Milk Delivery 1880


Bottle Recycling 1910


Paper Bags 1912

Lessons from the past

In the early 1900's milk was delivered by electric vehicles in recycled bottles and groceries in paper bags.
This was a world without lobbyists

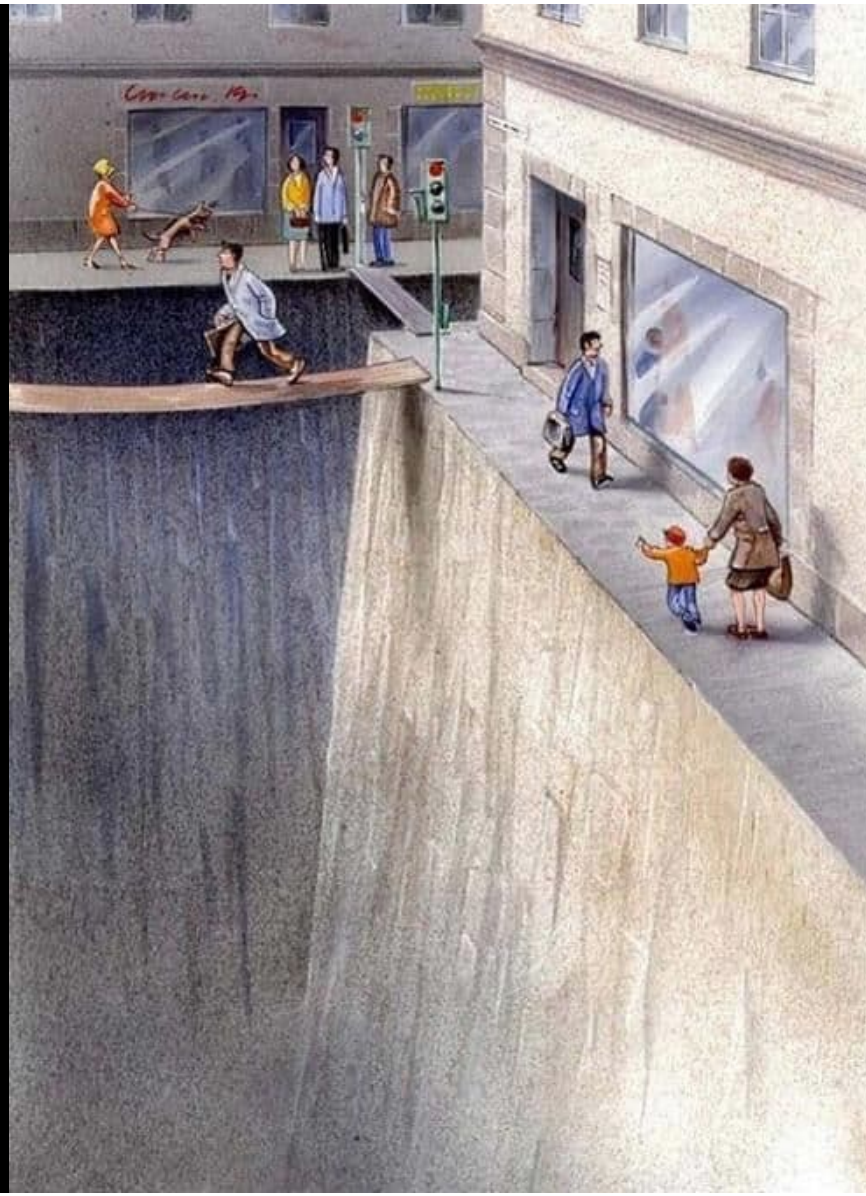


Ford Model T Starter Motor 1919


1958 Los Angeles

1955 Los Angeles

“Depicting roads as chasms and crosswalks as rickety planks spanning them shows just how lopsided the proportions of a normal urban street corner really is."— Vox, image Karl Jilg, 2021



Electric Deliveries 1950

Milk Delivery 1880

Bottle Recycling 1910

Paper Bags 1912

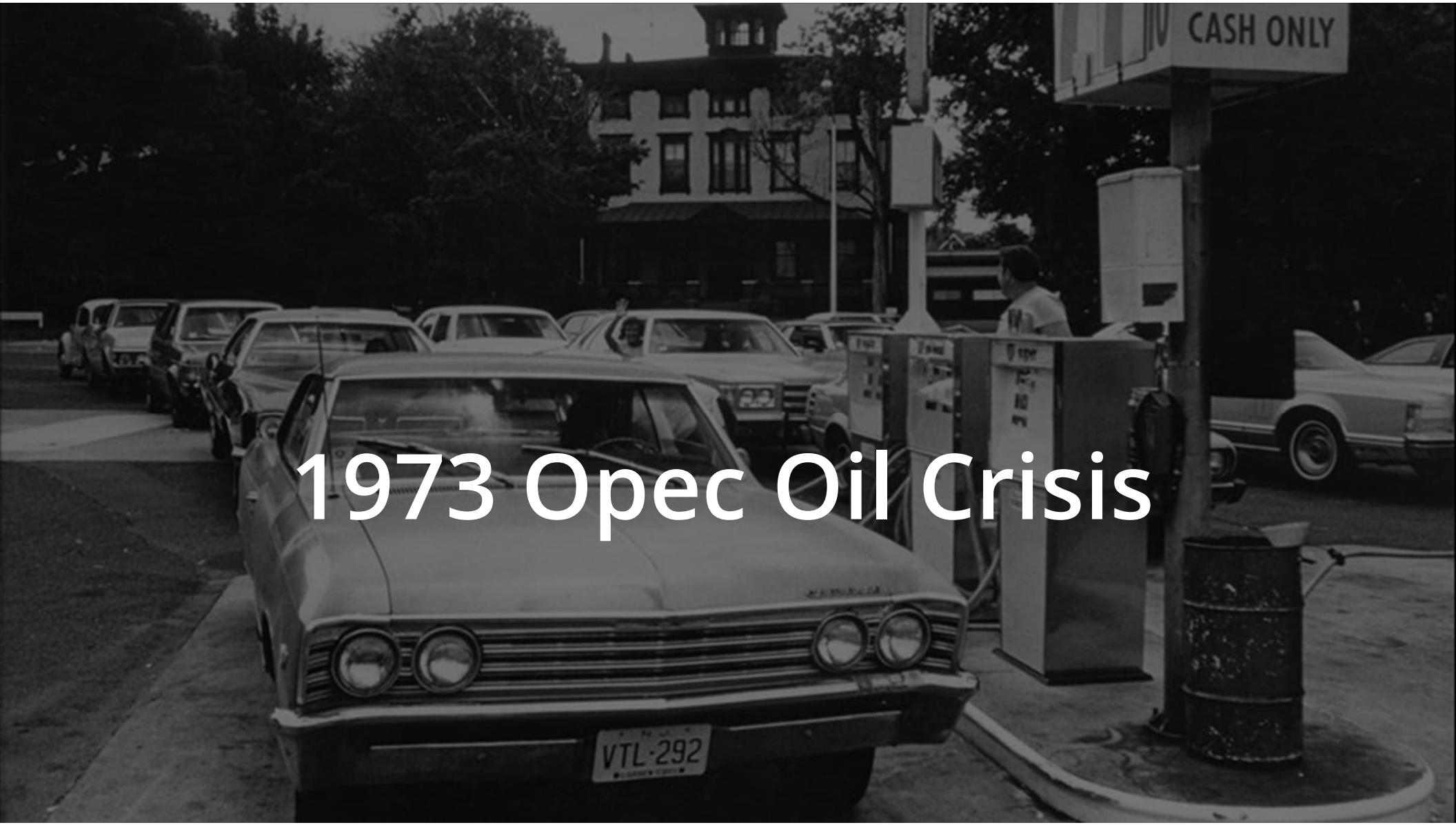
1990 Plastic Milk Bottles

Single use Bottles 1950

Plastic Bags 1970


Subtropical
Convergence Zone
Western Garbage
Patch
Eastern Garbage
Patch

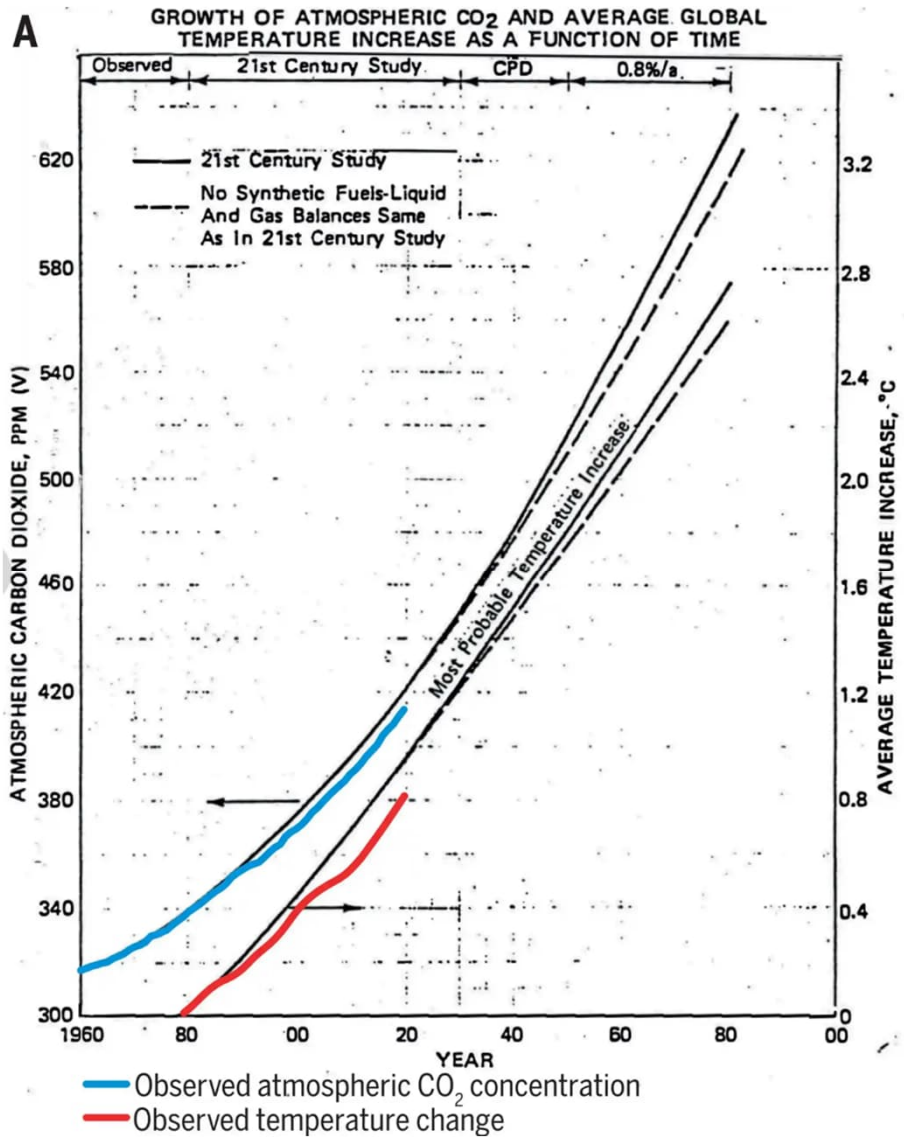

MORE THAN 2X
THE SIZE OF TEXAS
ROADRUNNER
MODERN WASTE + RECYCLING



1973 Opec Oil Crisis


FUEL SHORTAGE
IS GOING TO GET
THE WORLD BACK
ON ITS FEET

A



EXXON RESEARCH AND ENGINEERING COMPANY

P.O. BOX 51, LINDEN, N.J. 07036

PRODUCTS RESEARCH DIVISION
J.F. BLACK
Scientific Advisor

June 6, 1978

The Greenhouse Effect

Ref. No: 78PR 461

Mr. F. G. Turpin, Vice President
Exxon Research and Engineering Co.
Petroleum Staff
P. O. Box 101
Florham Park, NJ 07932

Dear Frank:

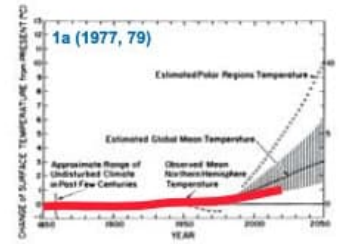
The review of the Greenhouse Effect which I presented to the Exxon Corporation Management Committee last July used only vu-graphs, without a prepared text. Last month, I had the opportunity to present an updated version of this talk to PERCC. The attached text was dictated shortly afterward to satisfy requests for a written version of the talk from people who had not heard the presentation last July. Also attached is a summary.

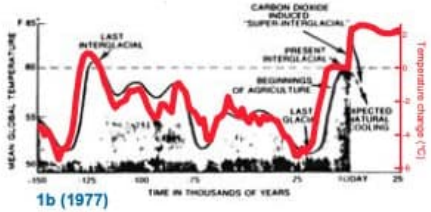
Sincerely,

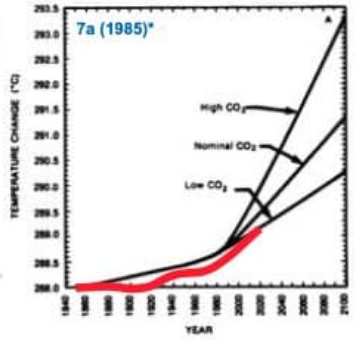
J. F. BLACK

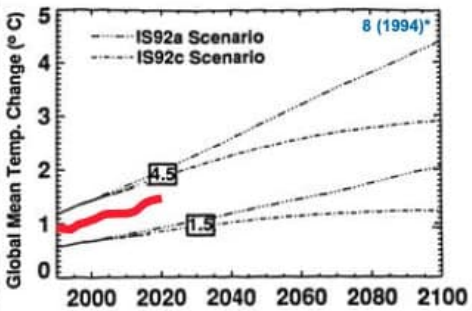
JFB/mbh
Attachments: Summary
Text
Vugraphs

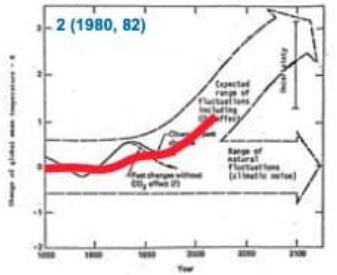
CC: Messrs. N. Alpert
W. M. Cooper, Jr.
E. E. David
E. J. Gornowski
R. L. Hirsch
F. A. L. Holloway
P. J. Lucchesi
L. E. Swabb, Jr.

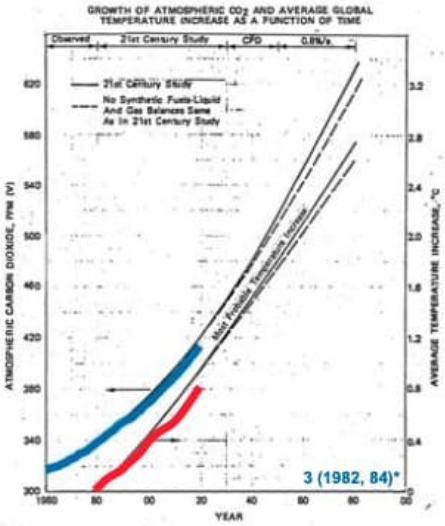


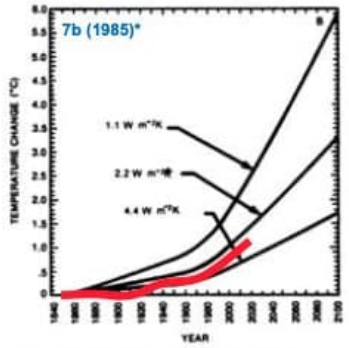


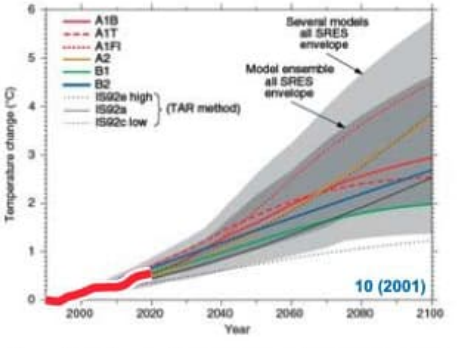


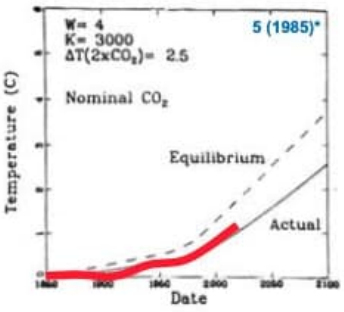


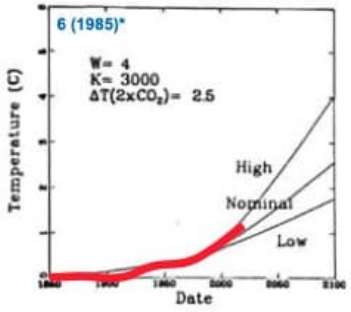


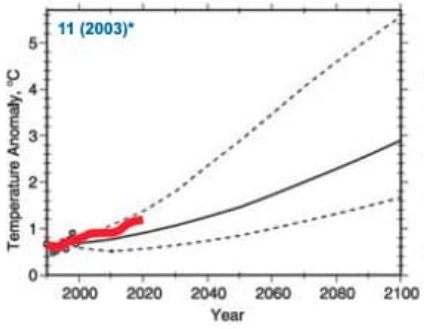


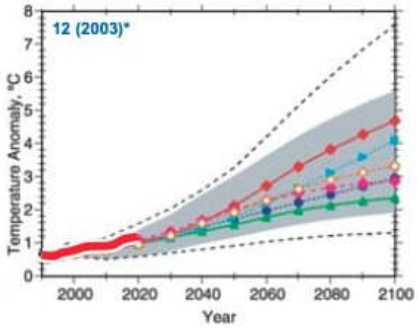








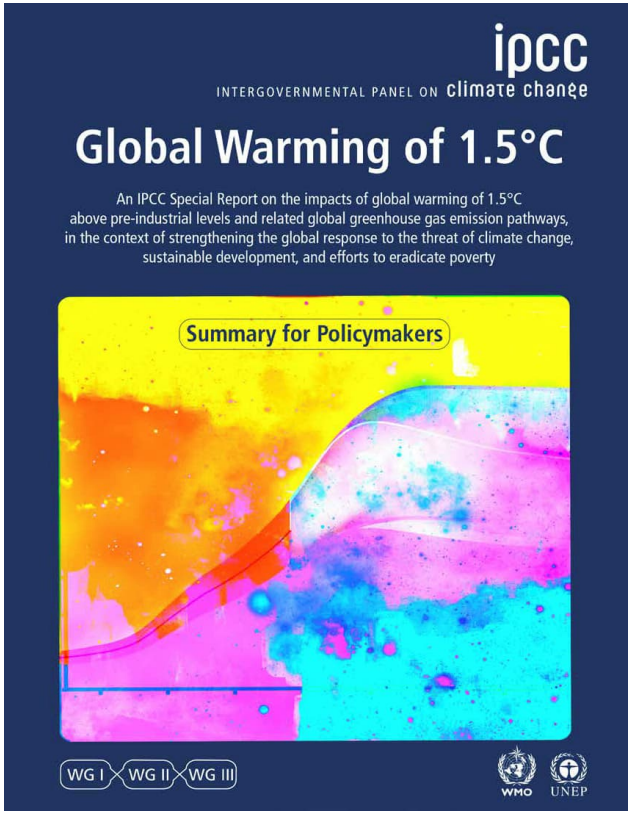




Observed temperature change

Observed atmospheric CO_2 concentration

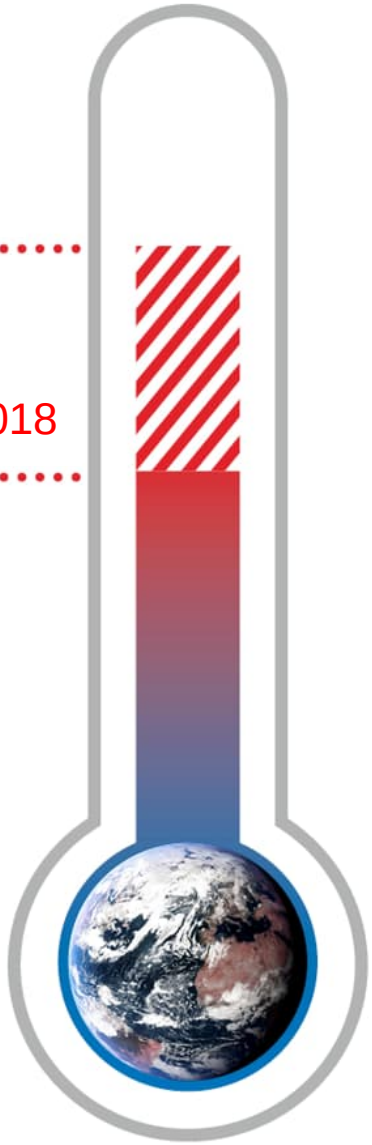
Paris Agreement target of 2.0°C is not enough



We need to limit global warming to 1.5°C

2.0°C 2015

1.5°C 2018

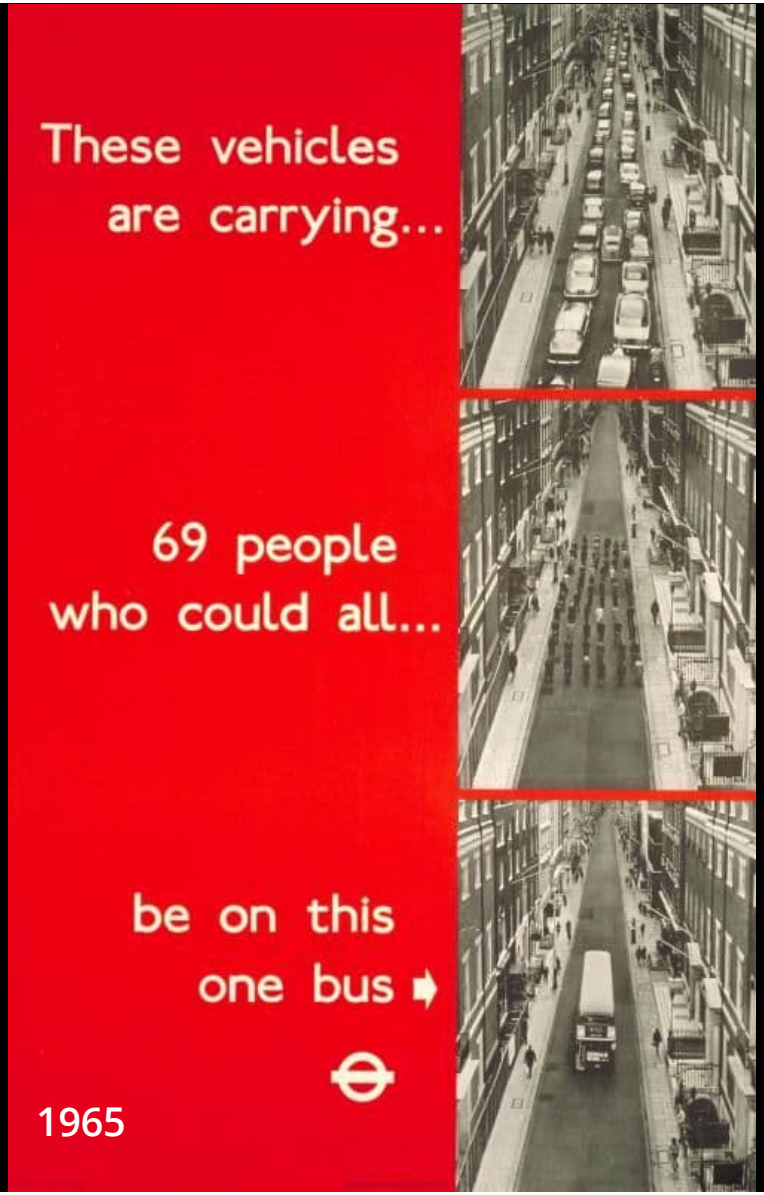


Growing Up with Carbon.....

Net Zero and Infrastructure

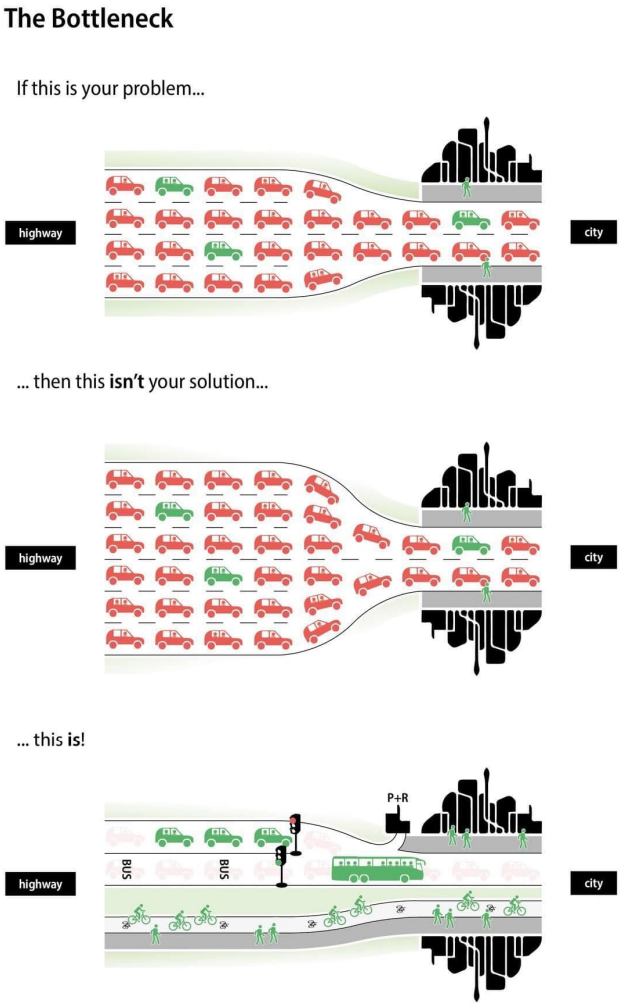
Zero emission cars are not the answer

The answer is in decreasing the need to travel or by using more efficient ways to move people

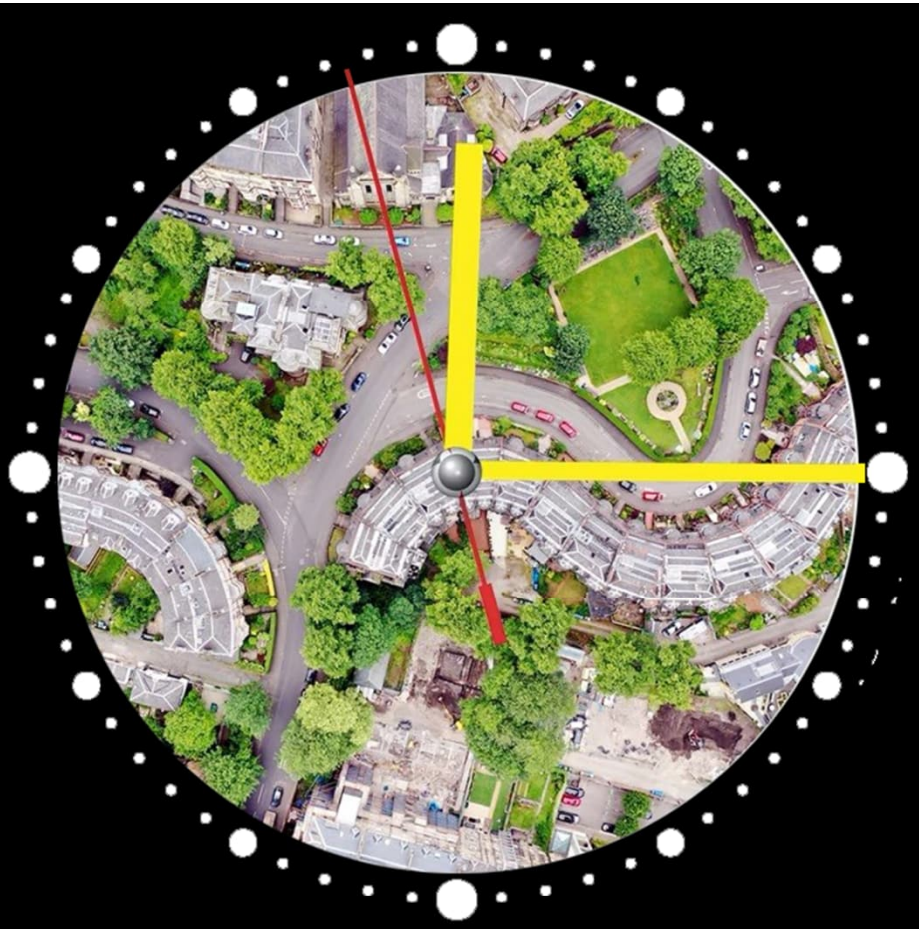

These vehicles
are carrying...
69 people
who could all...
be on this
one bus
1965

42 Cars

“Adding car lanes to deal with traffic congestion is like loosening your belt to cure obesity." — Lewis Mumford, 1955



Original: Verkade, T. (2020, June 25). De oplossing voor het fileprobleem: nu hebben we hem echt!. De Correspondent.
Enhanced by: **@Jtrace_a_stras** ( )



The 15 minute City

Sustainable and Local Food

Understand the Rainfall

Develop Buildings

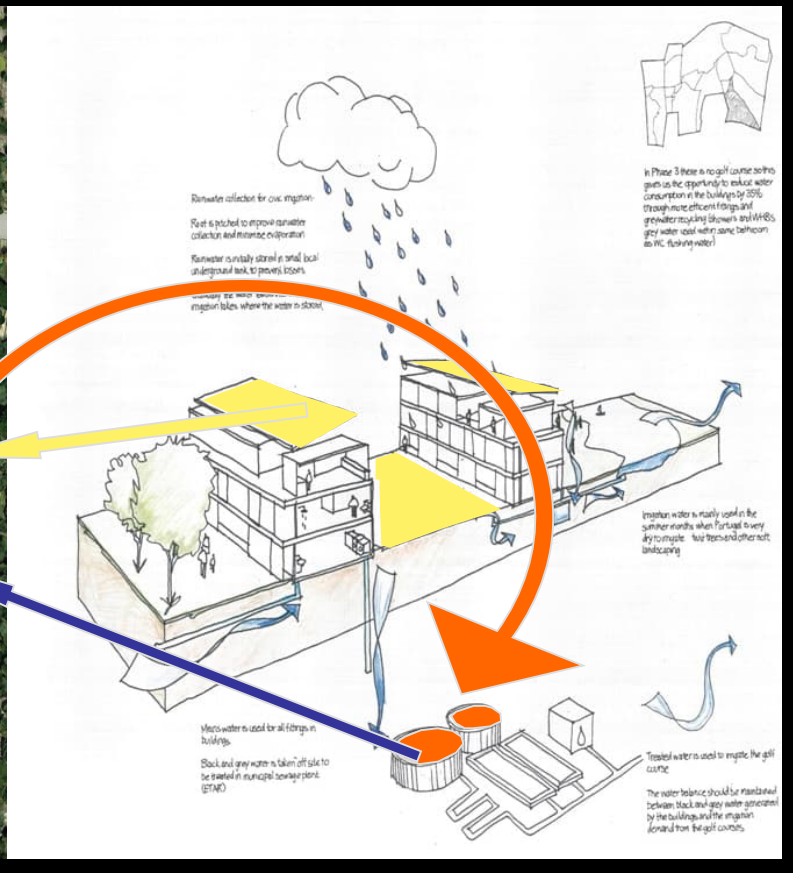
Develop Catchment area

Develop storage volume

Understand crop yield

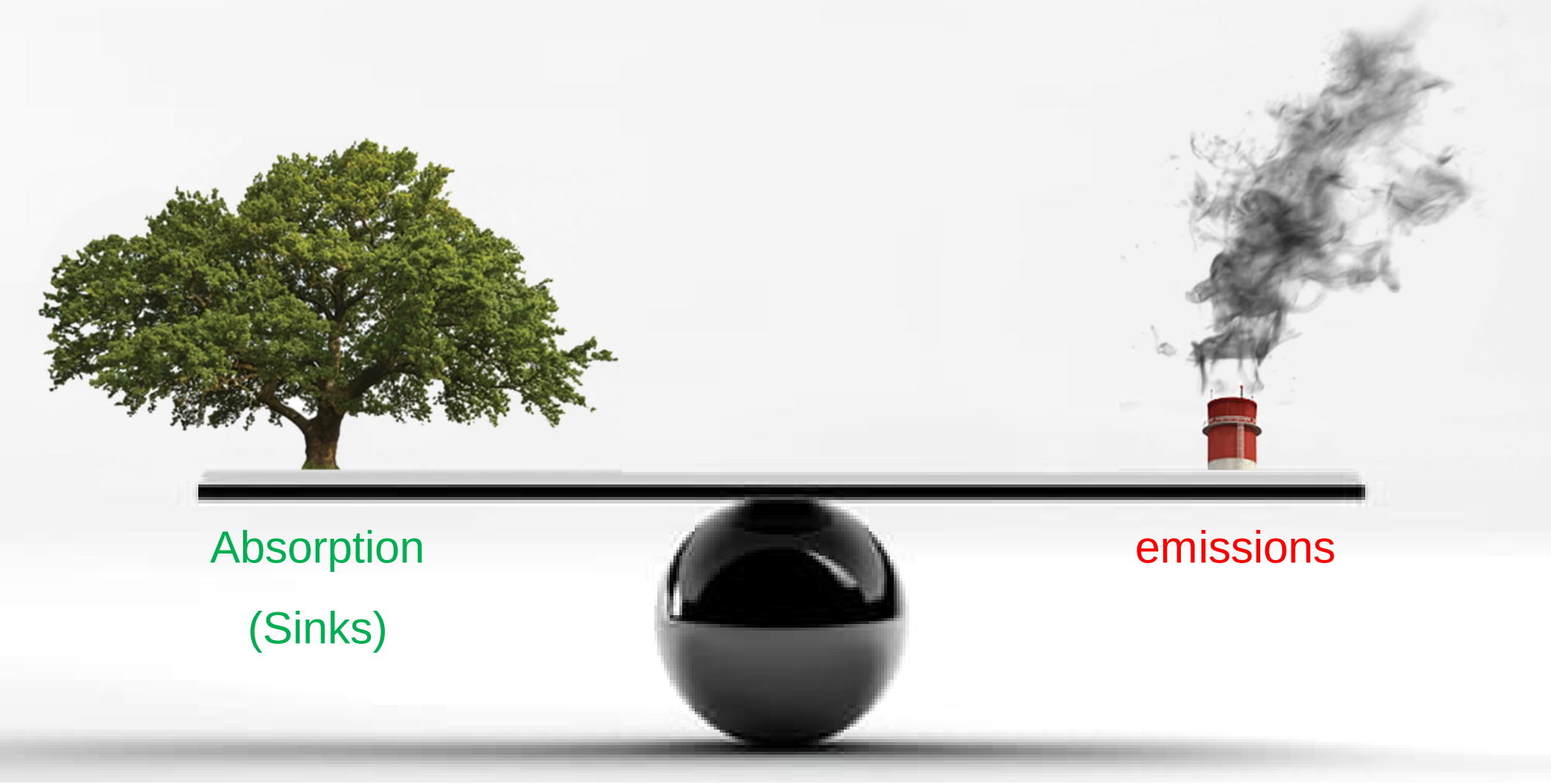
Develop cultivation area

Eat the salad!

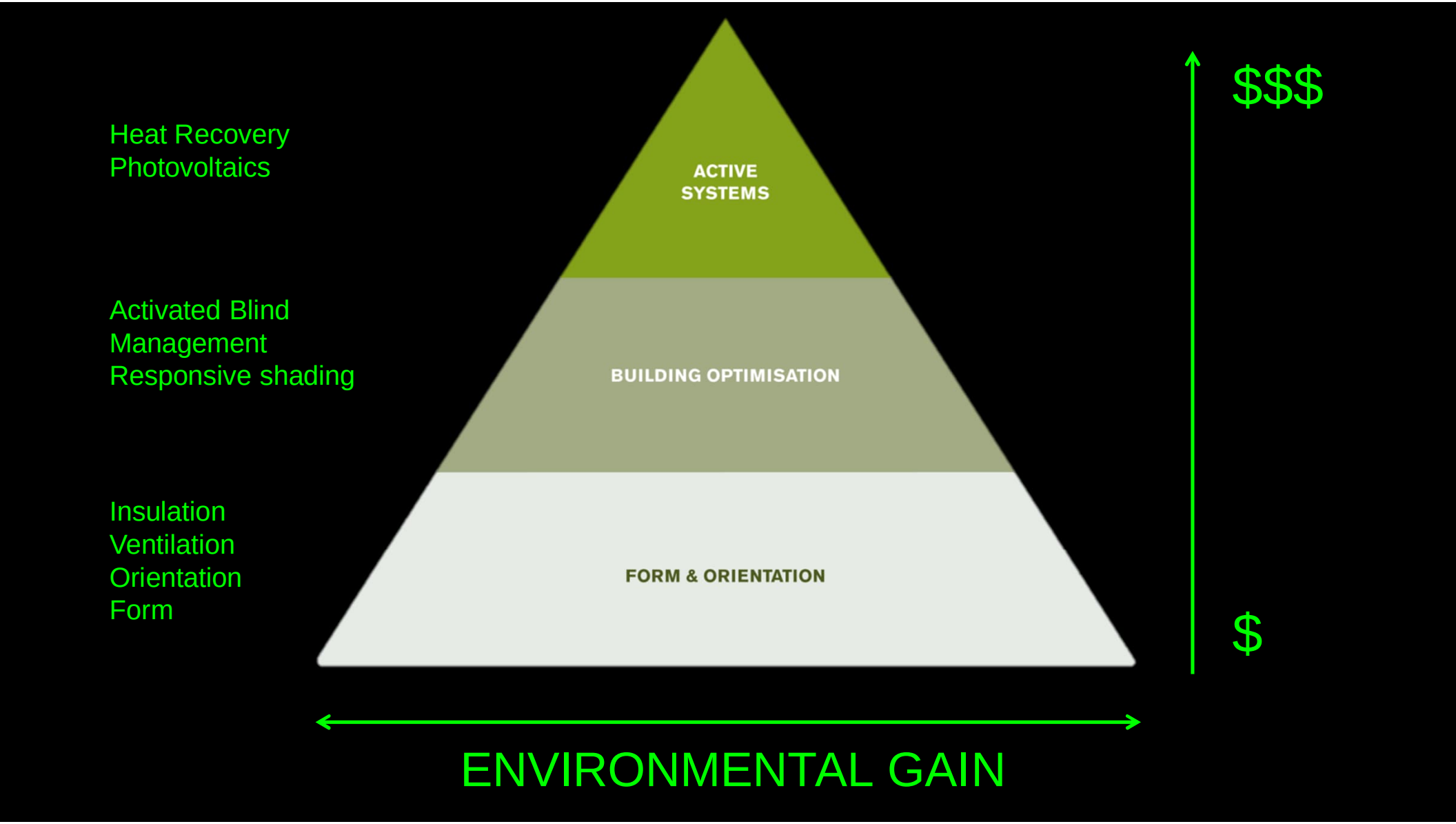


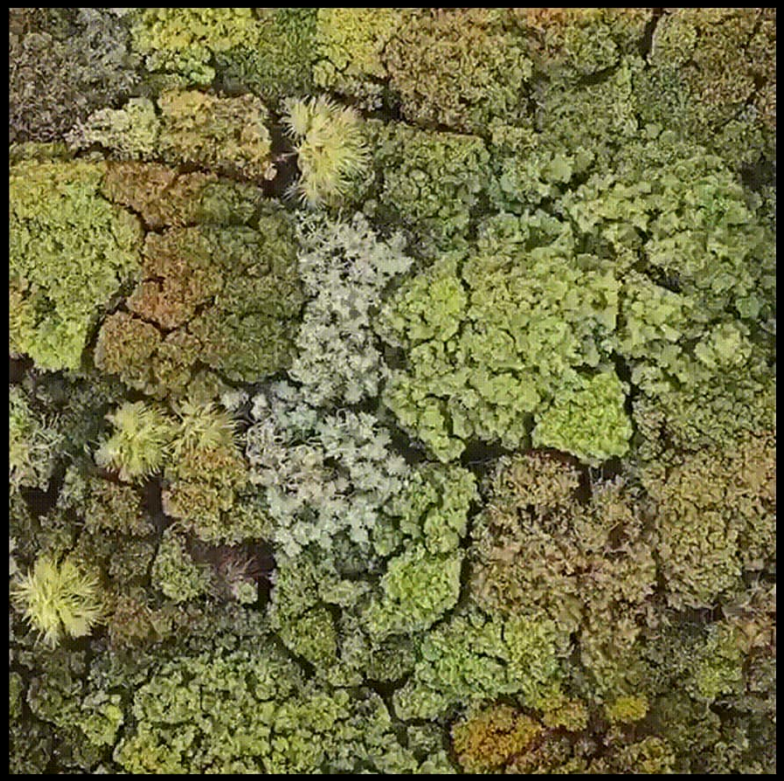
Hydroponics

Achieve balance by 2050



The pandemic, Global warming and loss of farmland


Heat Recovery
Photovoltaics
Activated Blind
Management
Responsive shading
Insulation
Ventilation
Orientation
Form
ACTIVE SYSTEMS
BUILDING OPTIMISATION
FORM & ORIENTATION
$$$
$
ENVIRONMENTAL GAIN



Crown Shyness

44

different variations of green.


Willis Faber, Ipswich 1971

Net Zero and Density

Cities need to become denser to achieve net zero

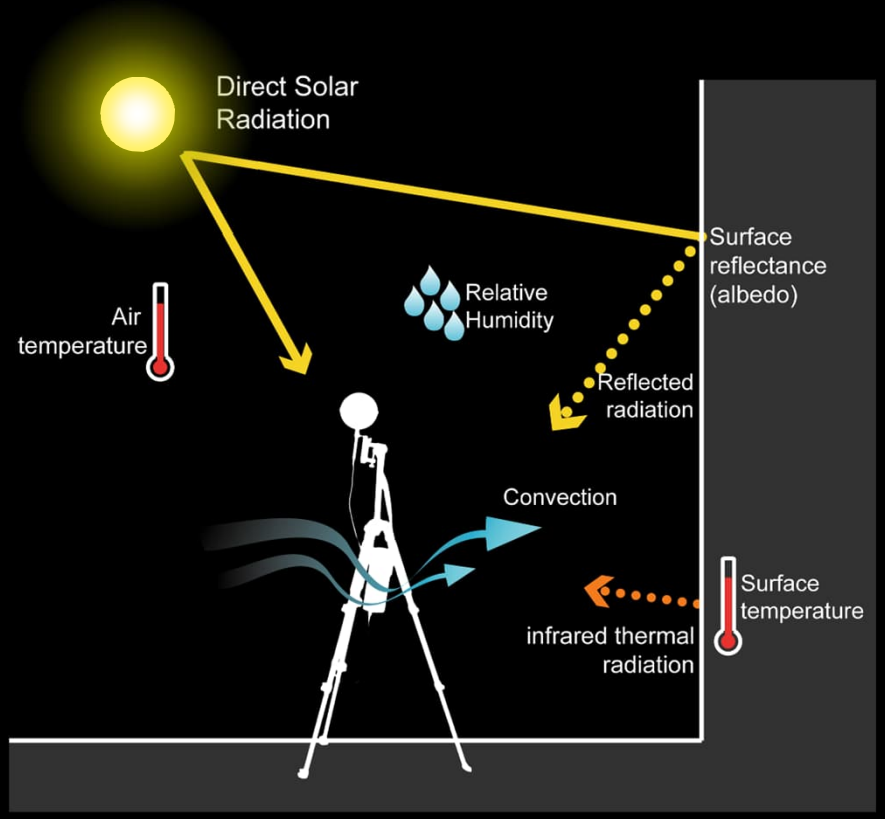
Site – Scale comparison

MASDAR - 13,500 People / km2

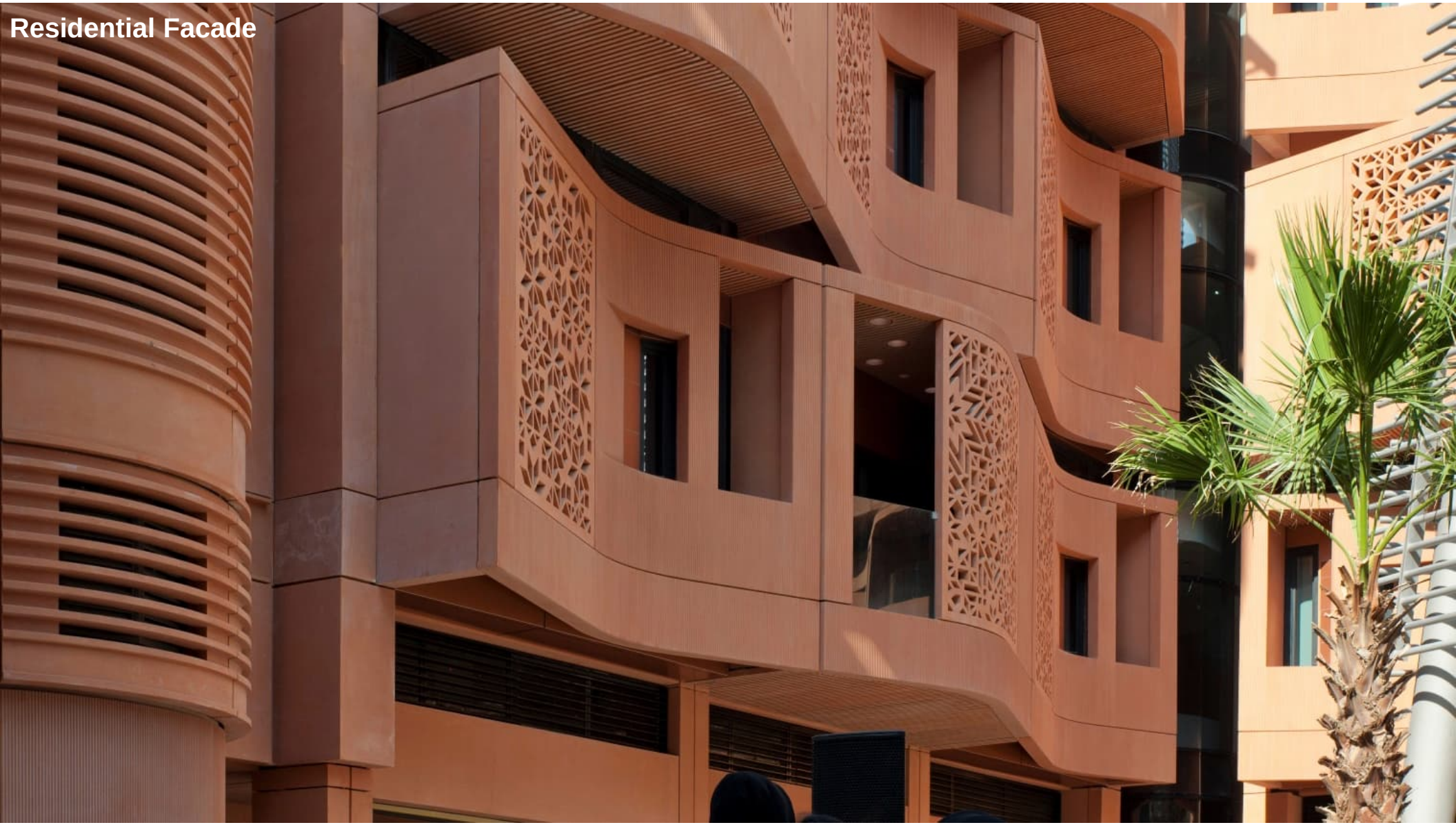
Venice - 11,500 people / km2

PRT / FRT

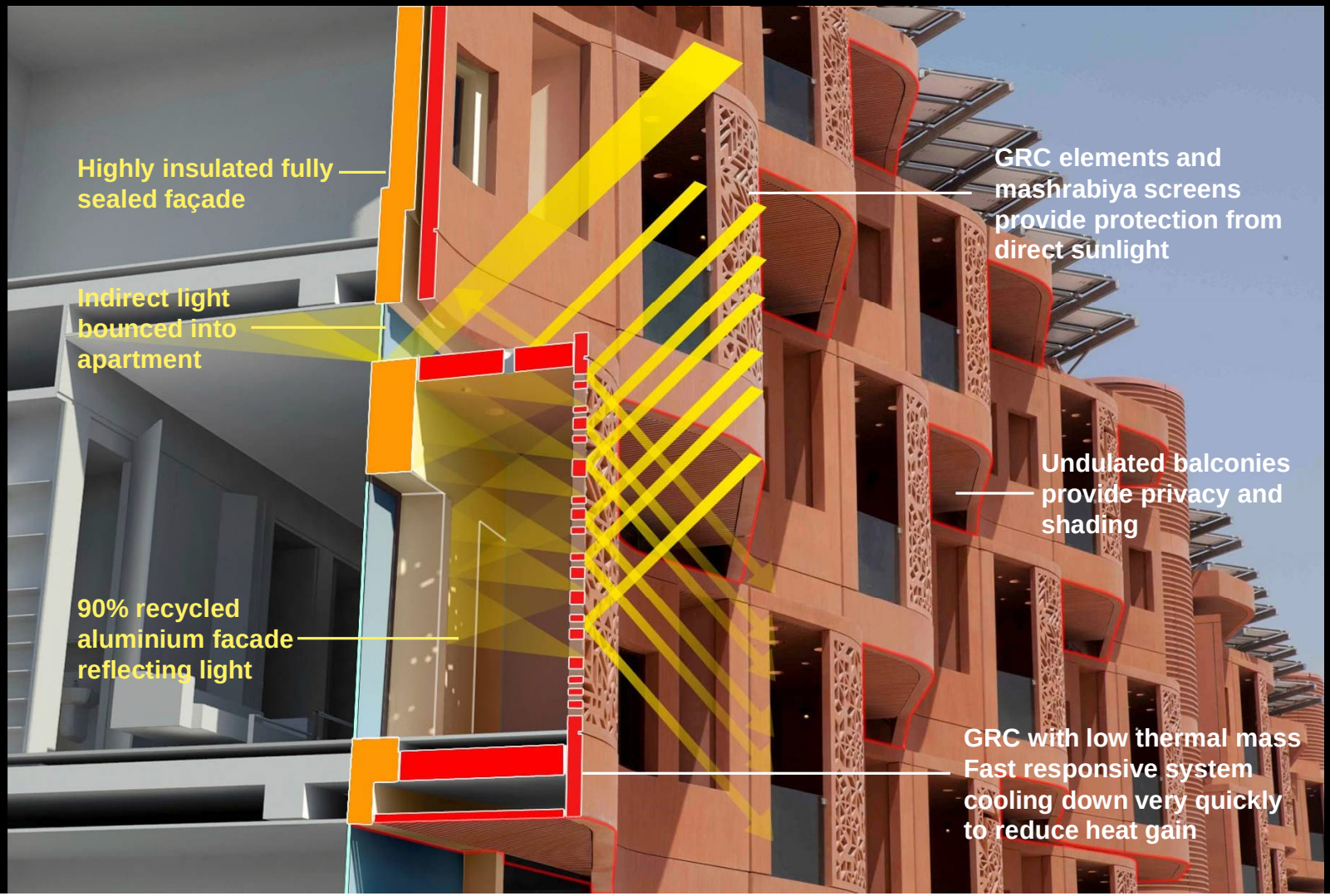
Radiant temperature = Temperature as felt



Giovanni Betti and Harsh Thapar Environmental Design Analysts, Foster + Partners

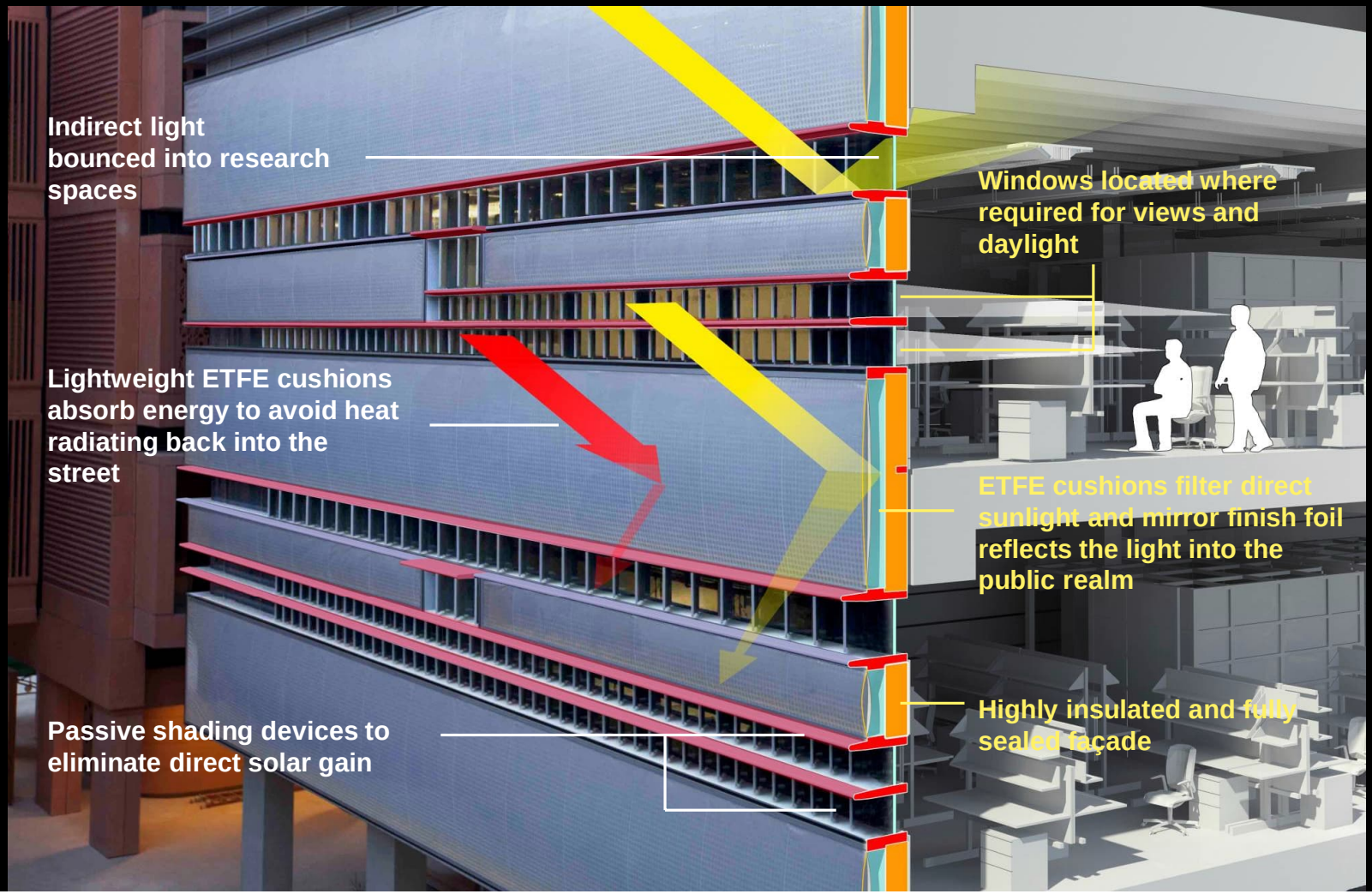

Residential Facade

Residential Façade
Concept and Performance




Laboratory Facade

Laboratory Façade
Concept and Performance

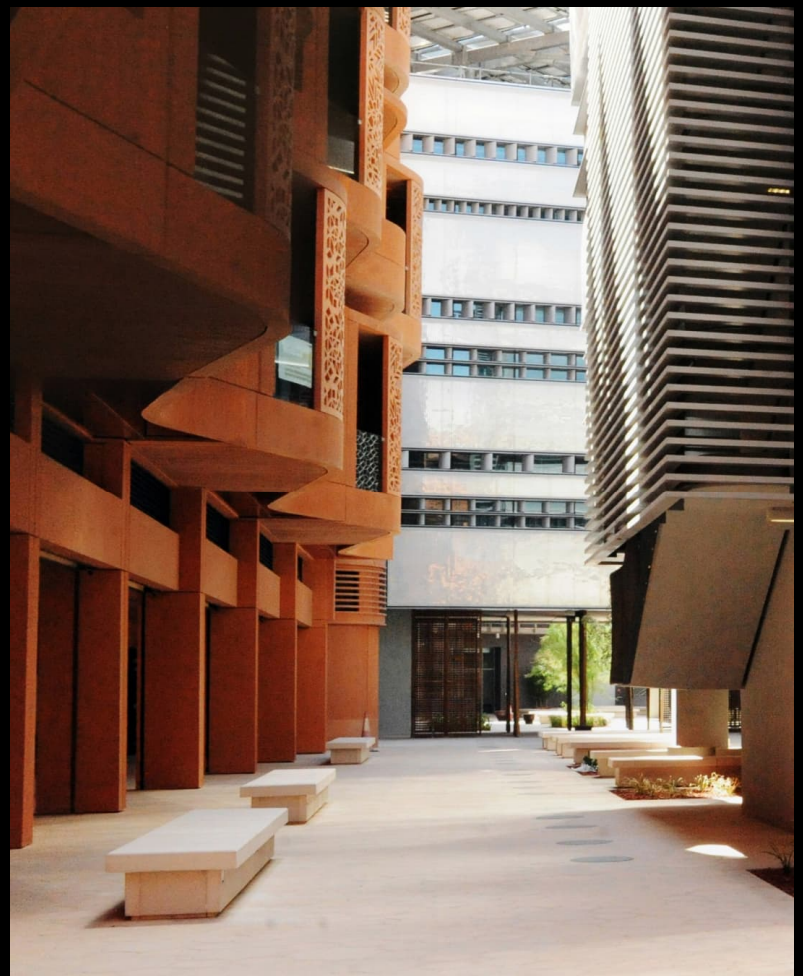


Street Comparison

Hamdan Street, Central Abu Dhabi

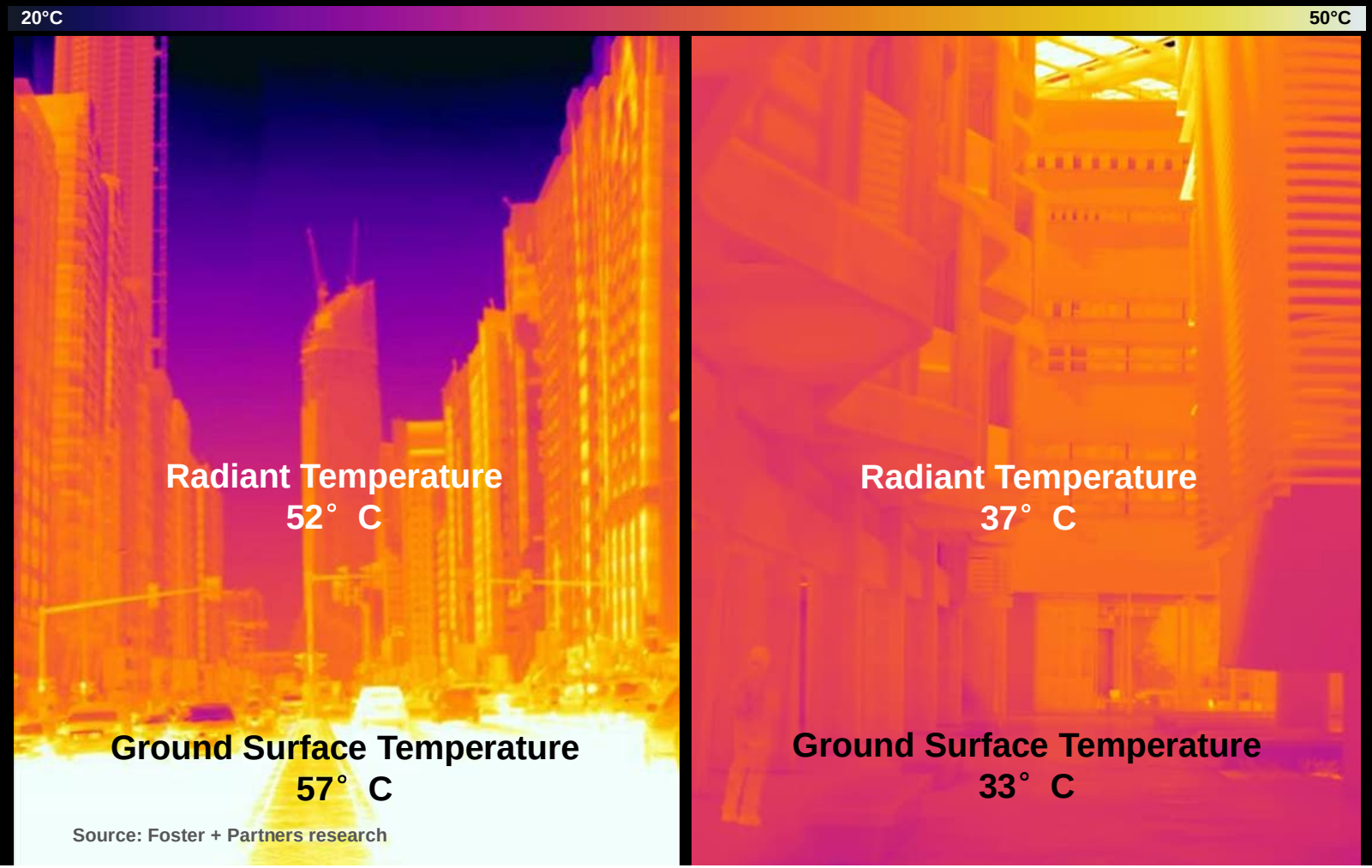
Source: Foster + Partners research

Masdar City, Abu Dhabi

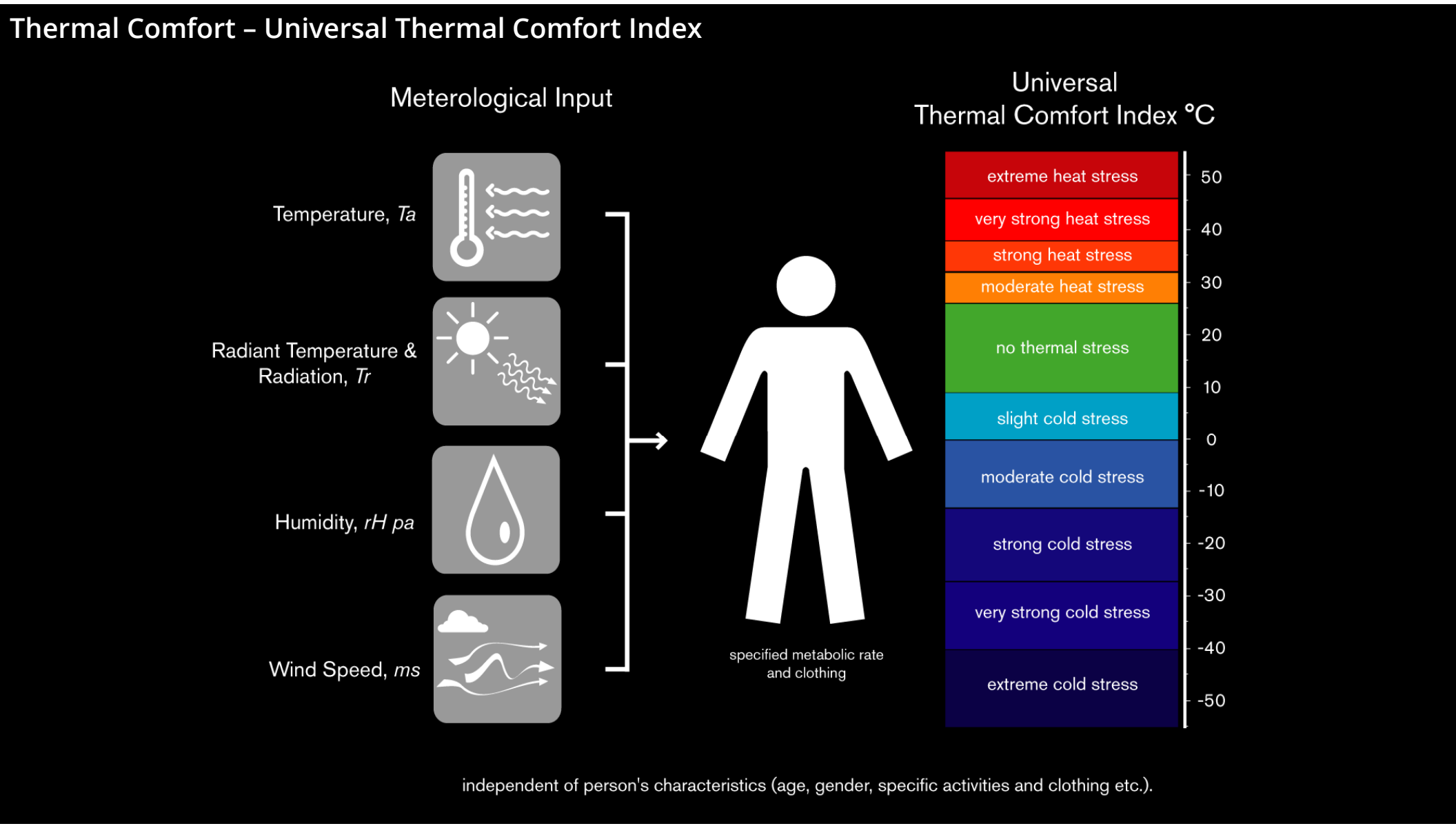


Street Comparison

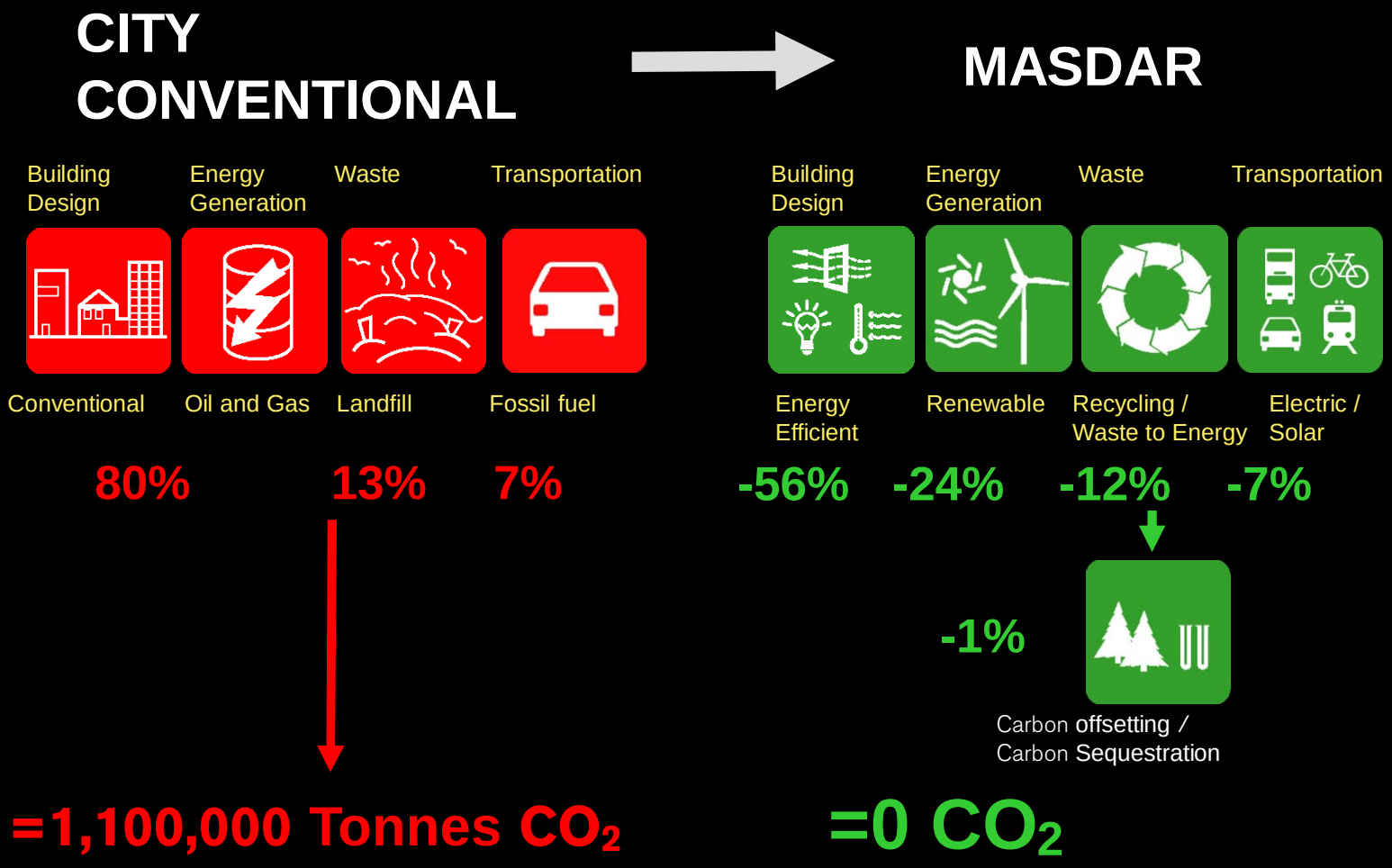
39°C Air temperature



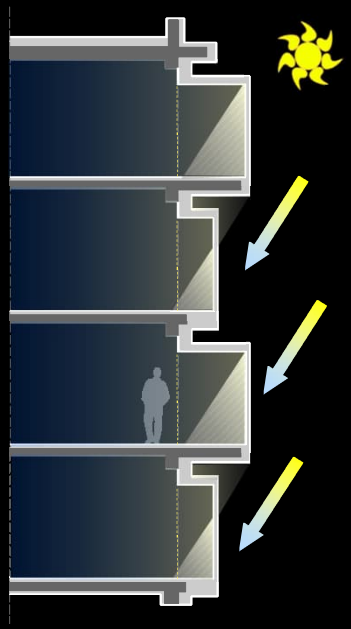
Thermal Comfort – Universal Thermal Comfort Index



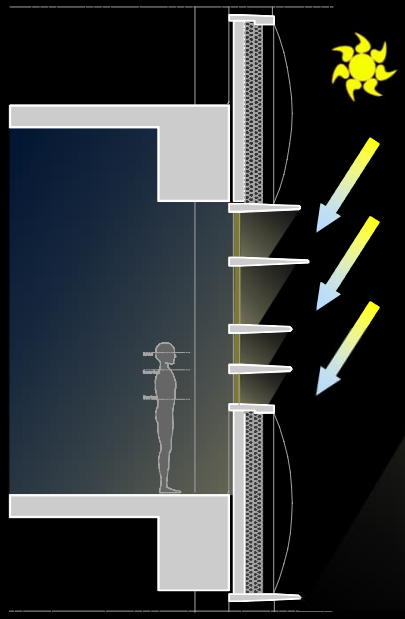
independent of person's characteristics (age, gender, specific activities and clothing etc.).


CITY
CONVENTIONAL
MASDAR
Building Design
Energy Generation
Waste
Transportation
Conventional
Oil and Gas
Landfill
Fossil fuel
80%
13%
7%
=1,100,000 Tonnes CO_2
Building Design
Energy Generation
Waste
Transportation
Energy Efficient
Renewable
Recycling / Waste to Energy
Electric / Solar
-56%
-24%
-12%
-7%
-1%
Carbon offsetting /
Carbon Sequestration
=0 CO_2

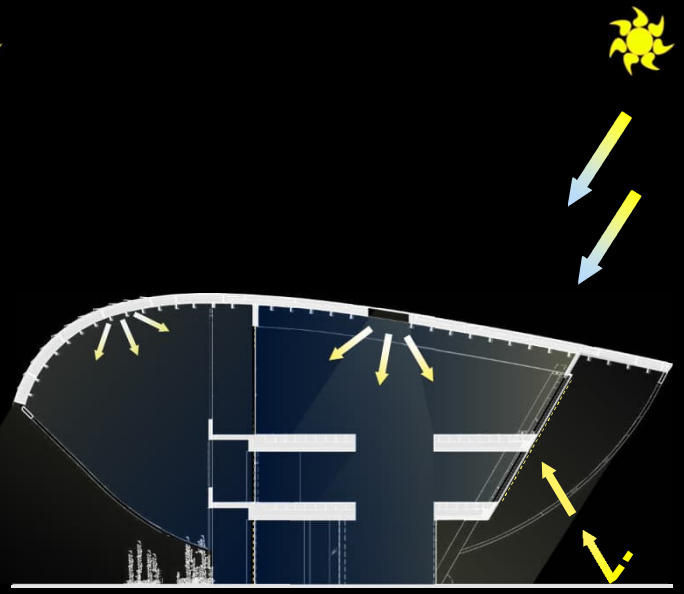
3 Types of shading



Self shading through balconies



Louvers



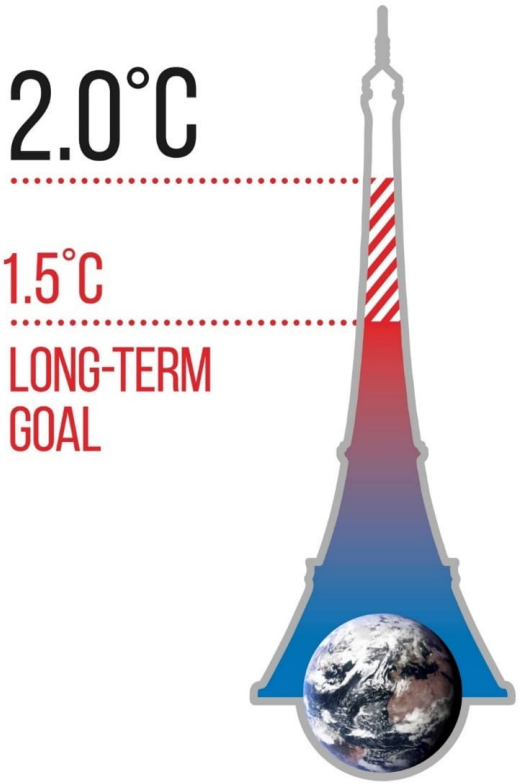
Roof Structures

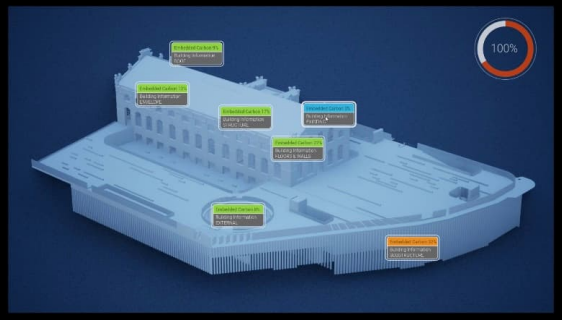
Masdar

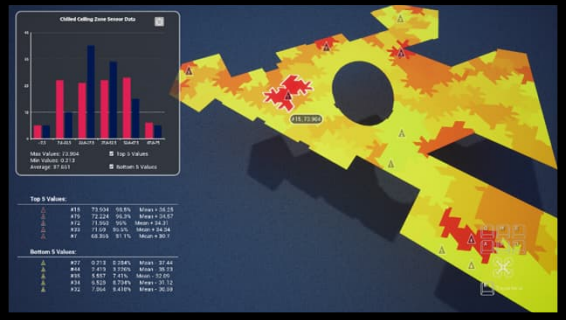
Measuring Our projects

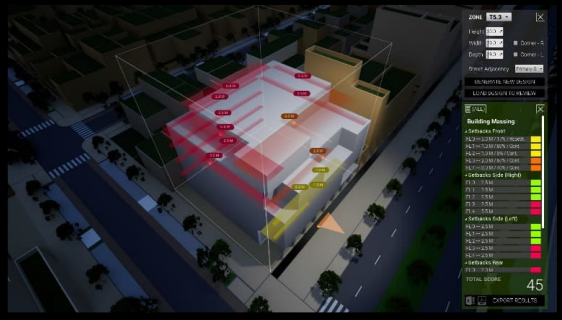
Metrics and data

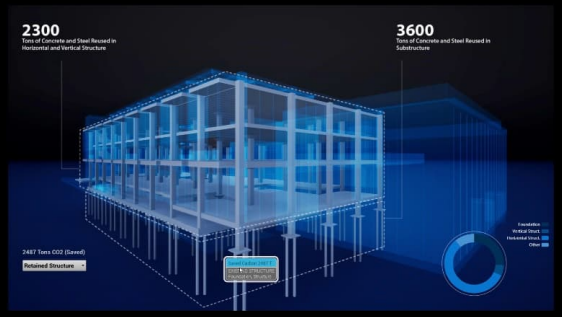
Foster + Partners

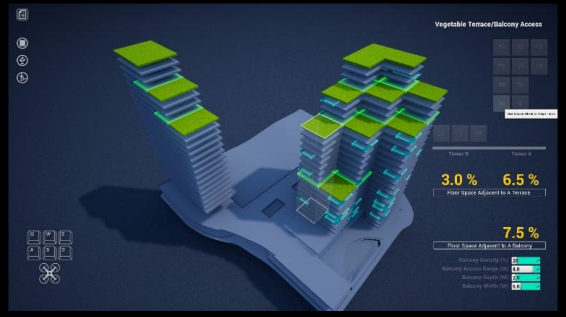










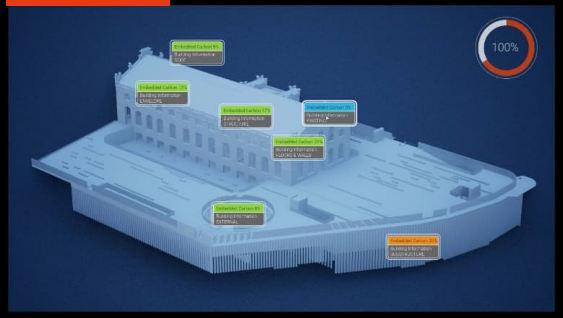


- Visualize Design Schemes
- Graph & Map Numeric Data

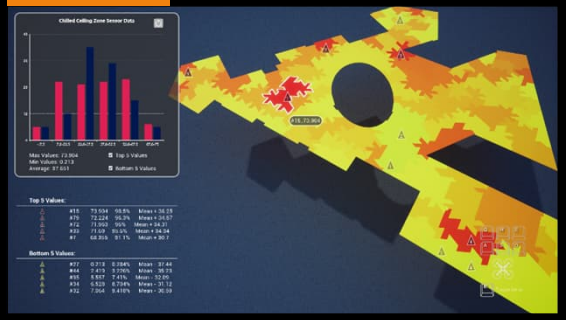
- Visualize Design Schemes
- Assess Design Schemes
- Graph & Map Numeric Data
- Simulate Design Options & Display Sustainability Implications

- Visualize Design Schemes
- Assess Design Schemes
- Graph & Map Numeric Data
- Manage BIM Assets
- Generate Reports
- Simulate Design Options & Display Sustainability Implications

Energy & Carbon



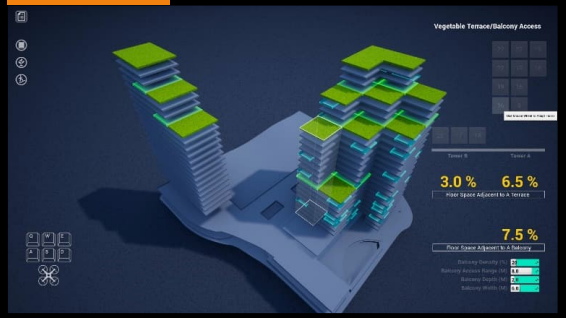
Wellbeing



Community Impact | Planning for Change | Feedback

Energy & Carbon

Wellbeing



Energy & Carbon | Mobility & Connectivity | Resources


DataPrep Preview [NetMode: Standalone] (64-bit/Windows)
Energy & Carbon
Resources
Bench Headquarters - Manila, Philippines
Embodied
Total Carbon (kgCO2e)
32,239,634
Target: 501 kgCO2/m2
Analyse
Structure
7212434
Facade
Services
Fitout
Refurbishment
Energy
Transport
Volume (m3)
Columns
Walls
Beams
Slabs
Building Elements (kgCO2e)
Material (kgCO2e)
Concrete
Steel
A1-A3


Energy &
Carbon
Resources
Save/Load
Restart
Quit
Import A File
Bldg Max Height
50.0
Planar Snap Grid
2 Meters
Floor Height
4 Meters
Space Category
Generic
Sketch A New Massing Unit

A Balance of Sources and Sinks
= Net Zero = 2^{O}C

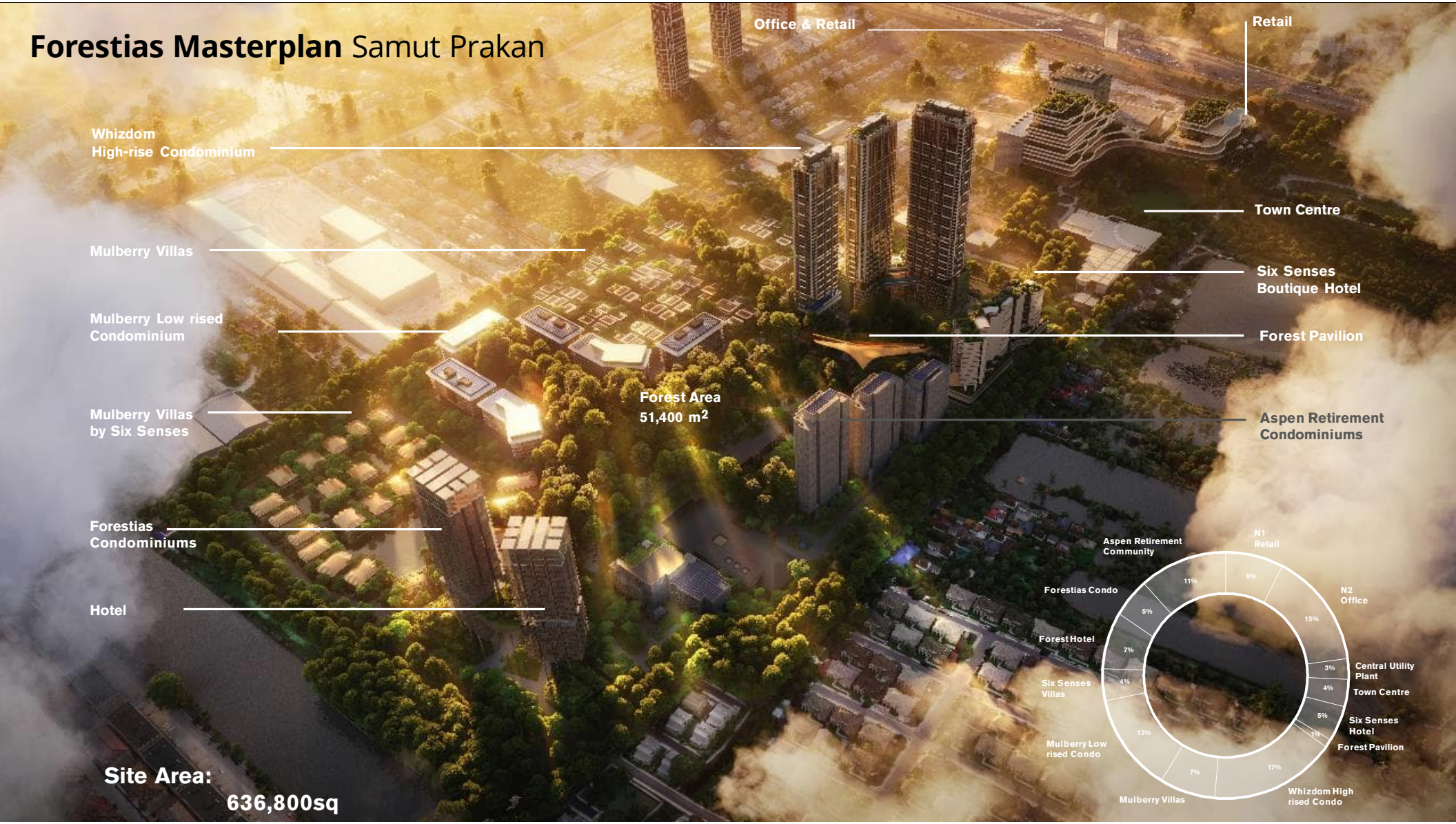
If Lost and/or Drum
Please Return
ขอขอบ
ในคลองไม่สะดวก
ขอแสดงความ
กำลังซ่อมแซม
และปรับปรุงทาง
ตลาดสี่มุมเมือง


SUPER PLAY
52GB


Untitled Map
รังสิต
Bang Kaeo
IKEA

Forest Gateway

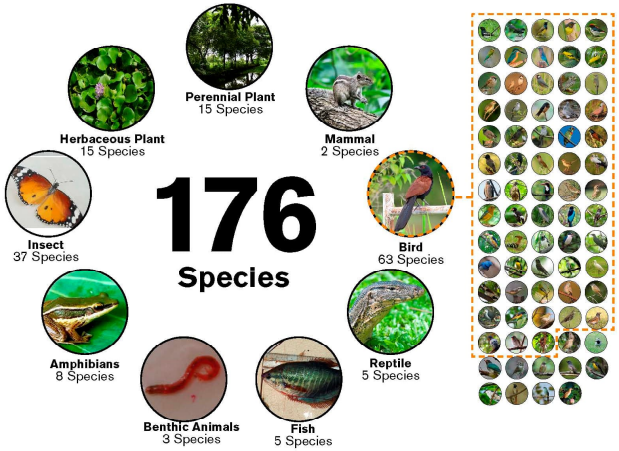
Forestias Masterplan Samut Prakan



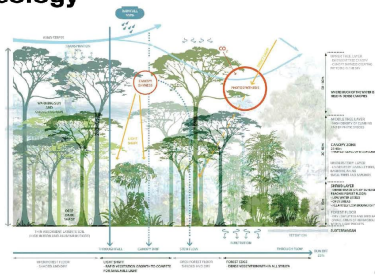
Site Area:
636,800sq

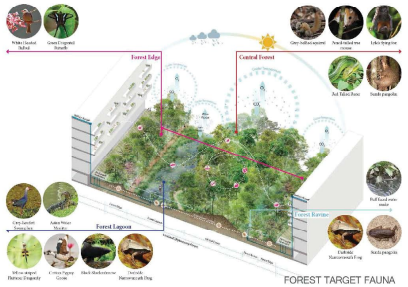
Forest Ecology

Diversity Survey

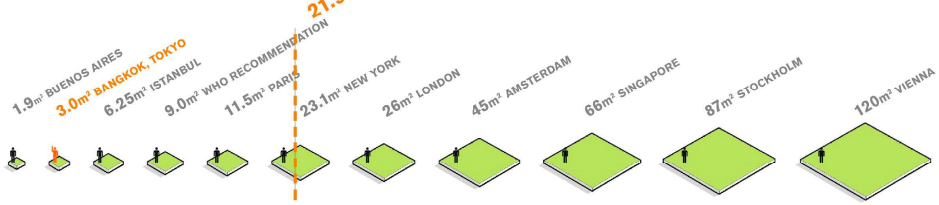


Forest Ecology





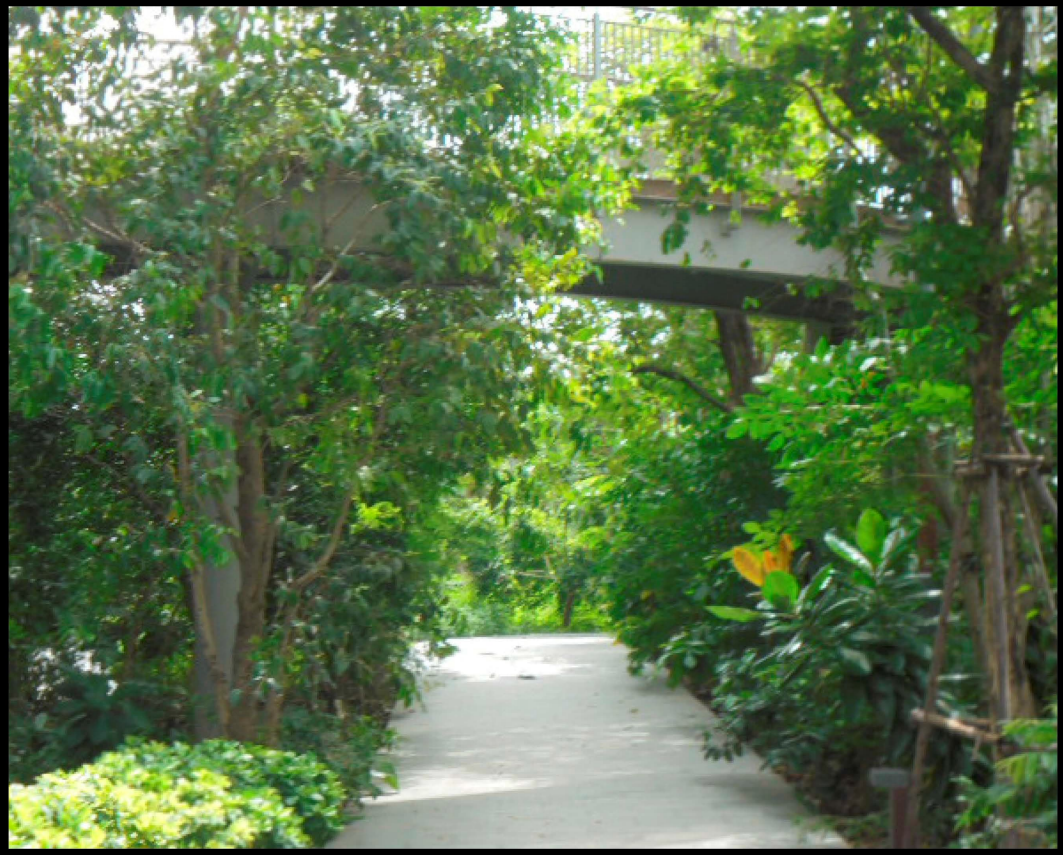
Storm Water Retention




40 seconds
Brief view if nature has a positive impact

Typical Bangkok Street

Forestias Forest



January 2022

26°C

Air Temperature

Weather	UV Index	Humidity	Wind Speed
Partly Cloudy	10	68%	5km/h

The Forestias Project is on Debaratana Road (Bangna Trad Road), Bangkaew Sub-District, Bangplee District, Samut Prakan Province with an approximate area of 242 rai, 39.1 square wah. There are several projects to develop a total of 13 projects as follows: Office Building, Retail complex, Central Facility Center, Town Center, Forest Pavilion, Whizdom Condominiums, Mulberry Grove Villas, Mulberry Grove Condominiums, The Aspen Tree Residences, Six Senses Residences, Forest at The Forestias, Serviced Apartments, Six Senses The Forestias. Within the project, there is a service road that is provided for use by all projects. The project is owned by 4 companies as follows: MQDC Town Royal Residence Limited, with registered capital of 50,000,000 baht (fully paid), MQDC Royal Place Limited, with registered capital of 50,000,000 baht (fully paid), Royal Aspen MQDC Town Limited, with registered capital of 10,000,000 baht (fully paid), MQDC Town Corporation Limited, with registered capital of 100,000,000 baht (fully paid). Mortgage registration is with Kasikorn Bank Public Company Limited.** All the pictures are simulated atmosphere for advertising purposes only. Details of the project when the construction is completed may differ from the displayed images. The project has its registered office at 699 Soi Sukhumvit 50, Sukhumvit Road, Prakhanong, Klongtoey, Bangkok. Chief Executive Officer is Mr. Visit Malaisirirat. For more information please contact The Forestias Project, tel. 1265. The project started construction in October 2017 and is expected to be completed in December 2023. *Future project look is subject to change. **The companies' financial institution may change.

Biodiversity Survey

90% of existing trees kept

Forest Planting

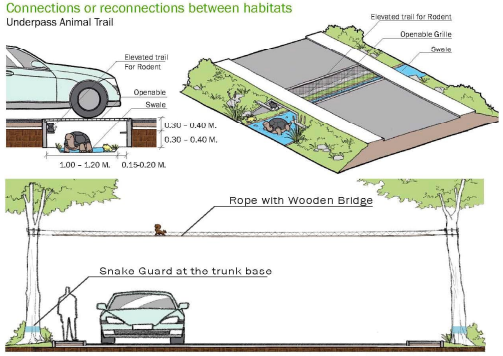
Community Involvement

Nursery Guardient Scheme

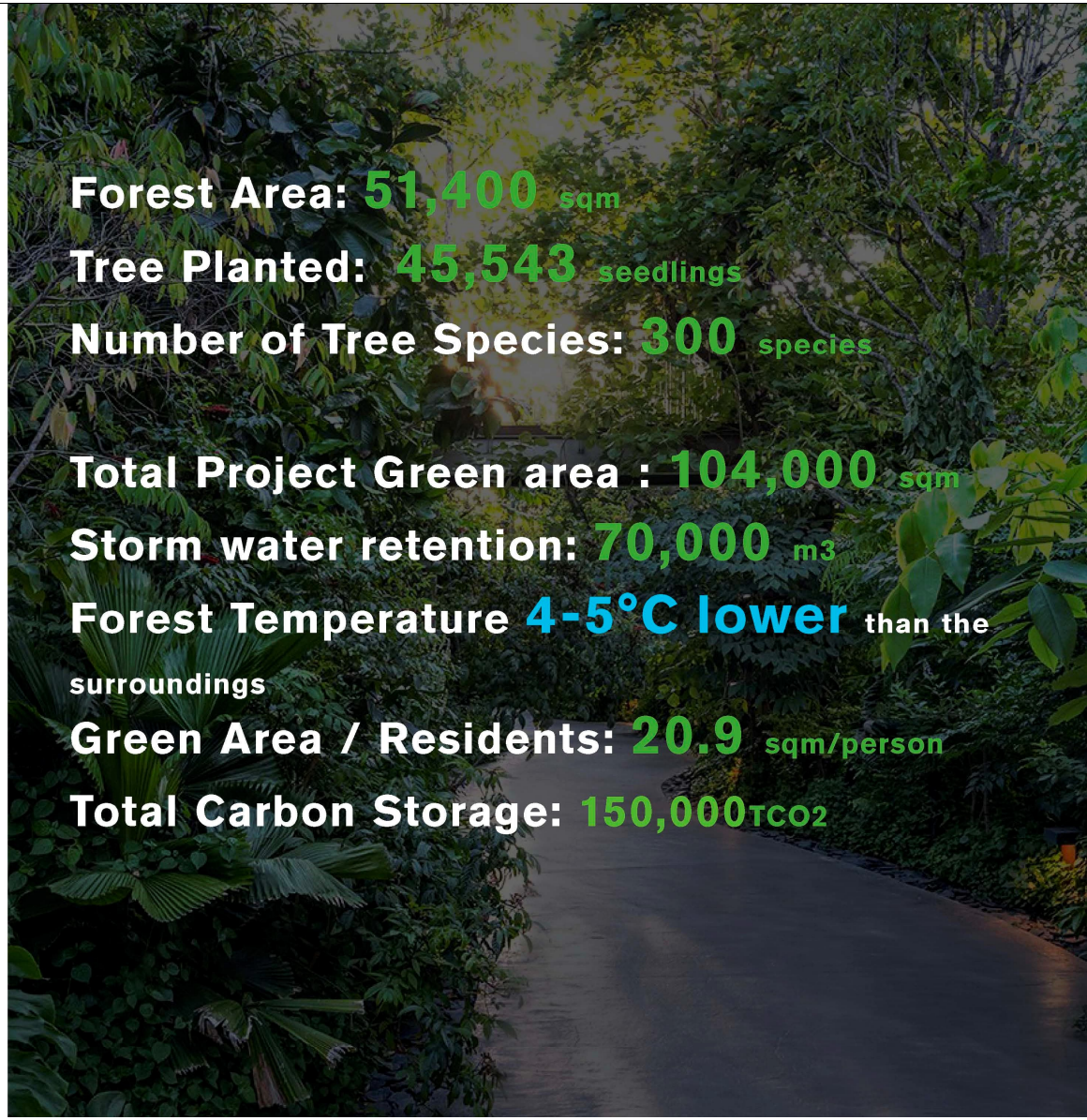
Wildlife crossing

Connections or reconnections between habitats

Underpass Animal Trail



Widelife Crossing



Forest Area: **51,400** sqm

Tree Planted: **45,543** seedlings

Number of Tree Species: **300** species

Total Project Green area : **104,000** sqm

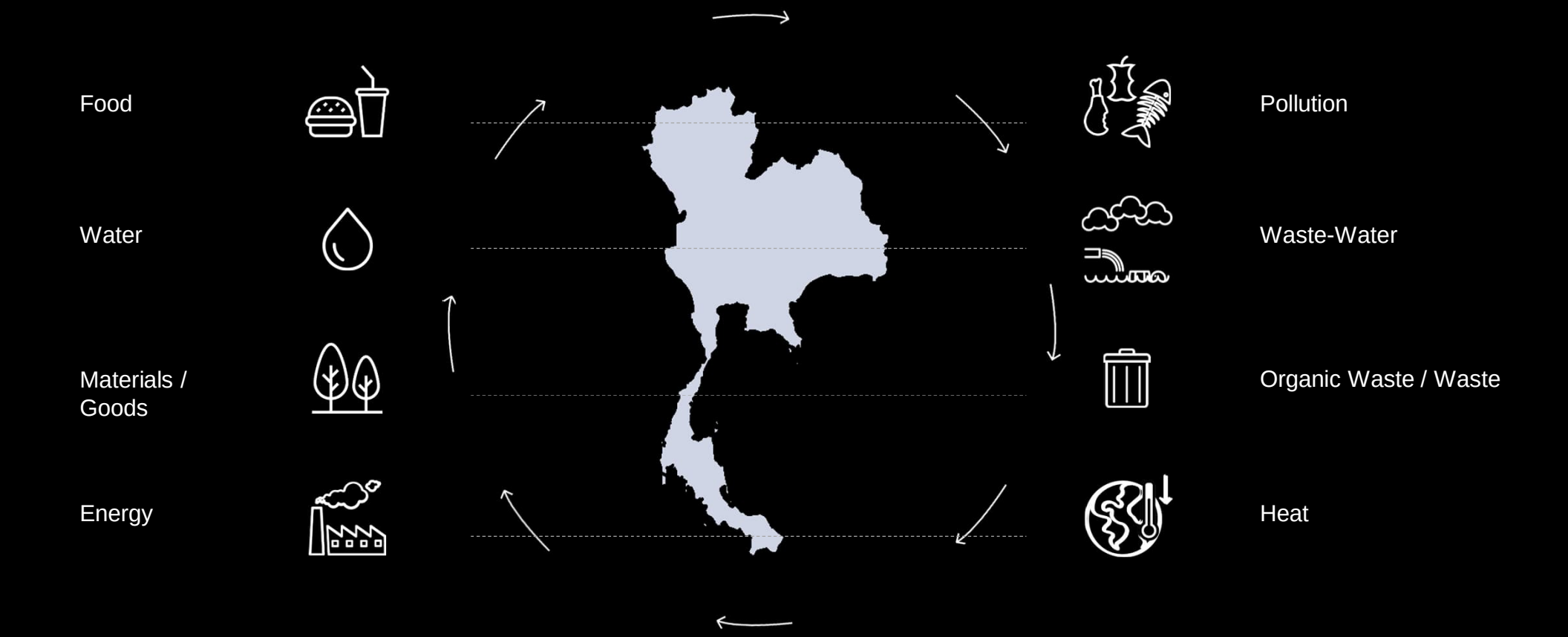
Storm water retention: **70,000** m3

Forest Temperature **4-5°C lower** than the surroundings

Green Area / Residents: **20.9** sqm/person

Total Carbon Storage: **150,000**TCO_2

Circular Economy - No waste and pollution – recycling of material and energy flows



净零碳计划将消除建筑物成为搁浅资产的风险

A Net Zero Carbon Scheme will Eliminate the Risk of the Building becoming a Stranded Asset

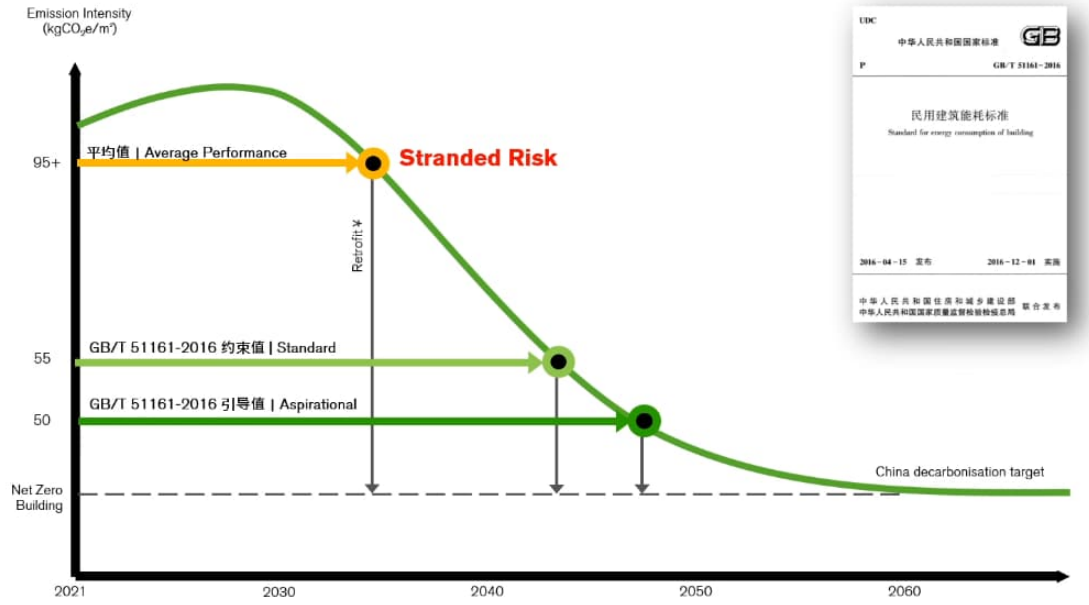
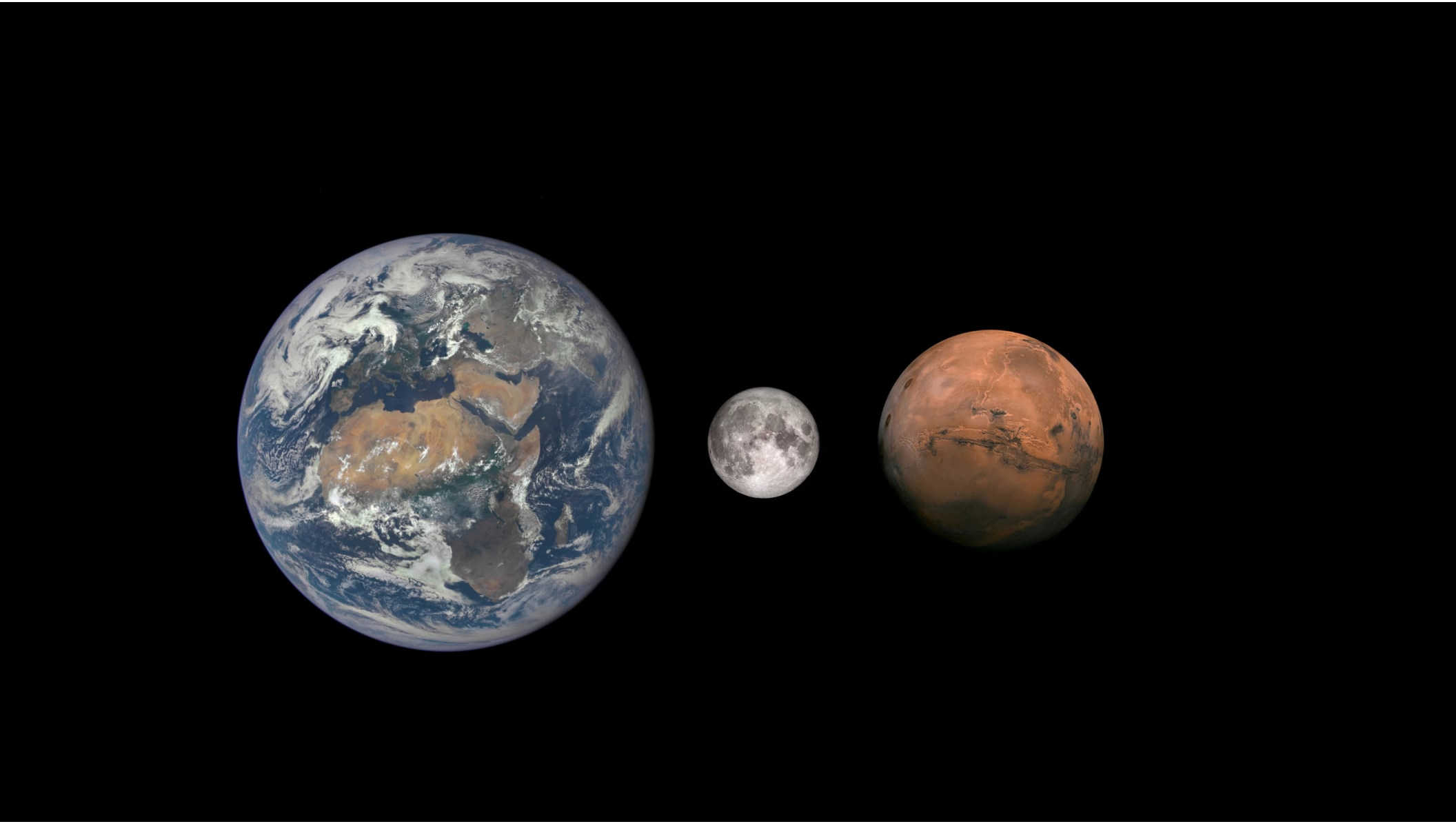


Figure adapted from Carbon Risk Real Estate Monitor (CRREM)

Design for a Circular Economy



Lunar Habitation for Nasa

NASA Plant Researchers Explore Question of Deep-Space Food Crops

3D-printed Mars habitat built by Robots


BostonDynamics
B67


BLACK MIRROR
Boston Dynamics

Foster + Partners

Sustainability Manifesto 2019

UN Paris Agreement Targets

Going beyond best practice

Understanding carbon emissions

Measuring carbon emissions

Balancing the planet

Offsetting carbon emissions

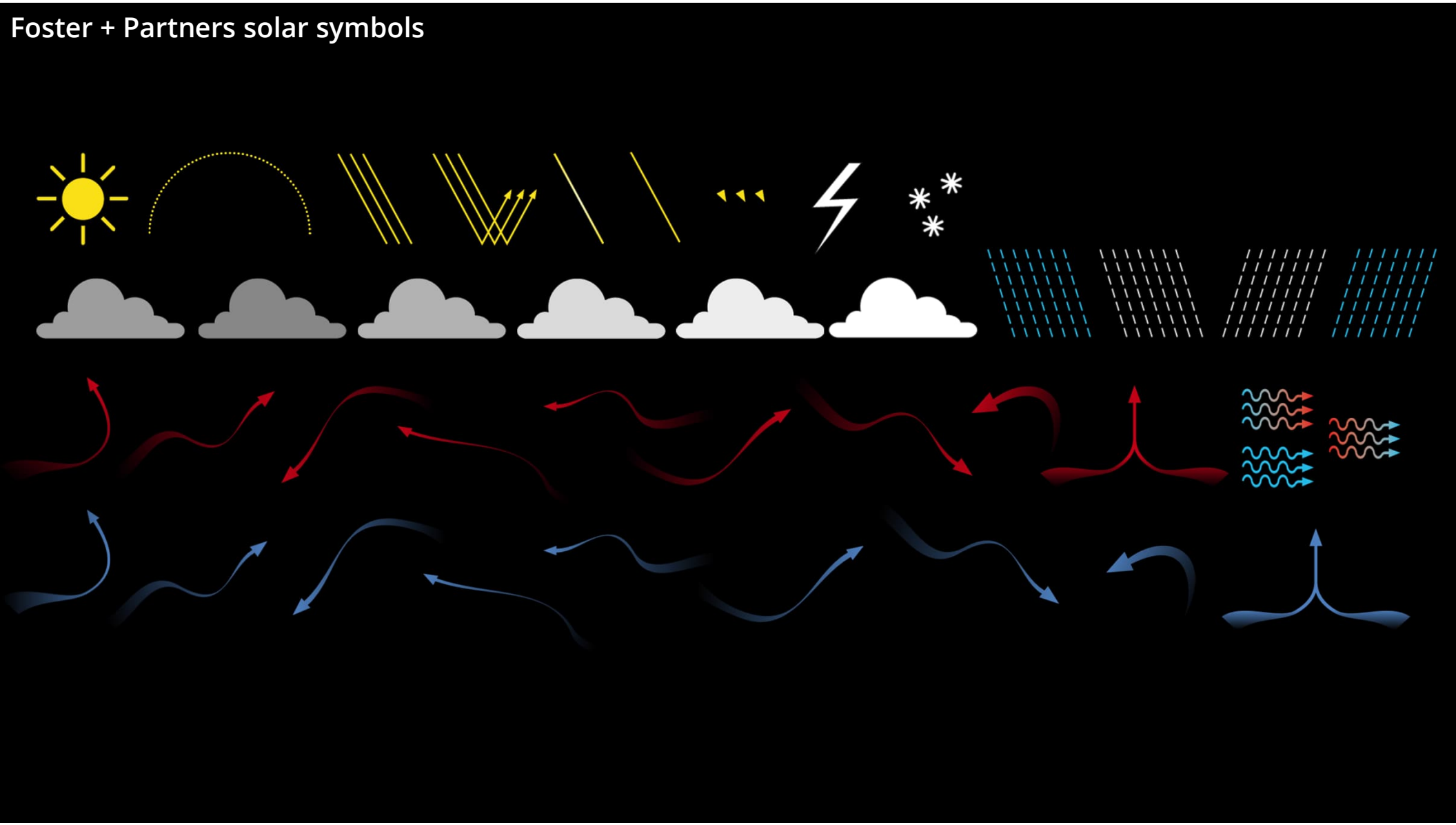
Foster + Partners

any questions?

Near-Zero emission and resilient building

Title | Subtitle

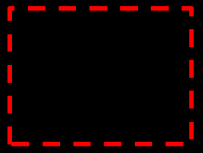
Foster + Partners solar symbols



Foster + Partners colours and annotations

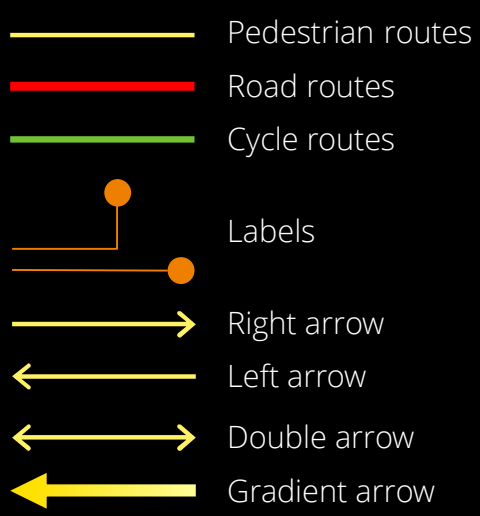
Gardens/
Green areas

Water



Site

Dashed lines



✓

X

Copyright symbol ©

Registered Trademark symbol ®

Trademark symbol ™

People icons

4 years ago

3 years ago

2 years ago

1 year ago