



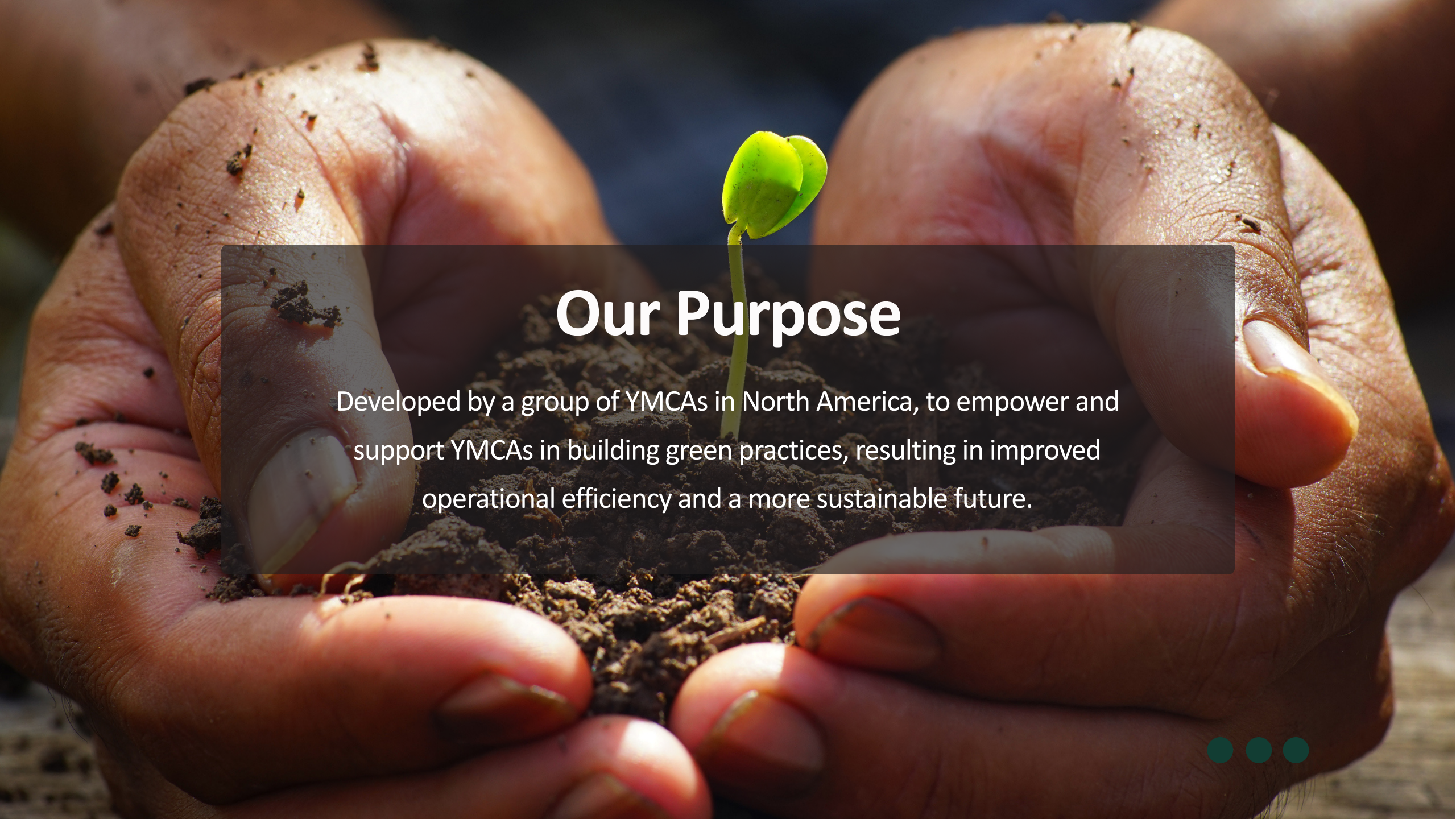
Y M C A G r e e n N e t w o r k

Sustainability Within Reach

WORLD COUNCIL 2026

Wednesday, July 22, 2:45 – 4:15 PM



A close-up photograph of a pair of hands cupped together, holding dark brown soil. A small, vibrant green seedling with two leaves is growing out of the center of the soil. The hands are weathered and have some soil on them. A semi-transparent dark rectangle is overlaid in the center, containing the title and description text.

Our Purpose

Developed by a group of YMCAs in North America, to empower and support YMCAs in building green practices, resulting in improved operational efficiency and a more sustainable future.



YMCA Green Ecosystem

COMMITMENT

Vision, Strategy & Alignment

ENGAGEMENT

Staff, Volunteers & Community Partners

PROGRAMS

YMCA Programs, Community Education & Events

PROPERTY

Buildings, Sites & Transportation

ADVANCEMENT

Financial & Government Supports



THANK YOU TO OUR SPONSOR



OUR SPEAKER



Prof. John Fernández
Massachusetts Institute of
Technology (MIT)

Co-founder MIT Environmental
Research + Action (ERA)

Uniting cities, the biosphere, and artificial intelligence as co-evolving and dominant systems of the 21st century.

Sustainability Within Reach

State of the Planet and the YMCA Leading Communities Worldwide



Massachusetts
Institute of
Technology



MIT
ENVIRONMENTAL
RESEARCH + ACTION

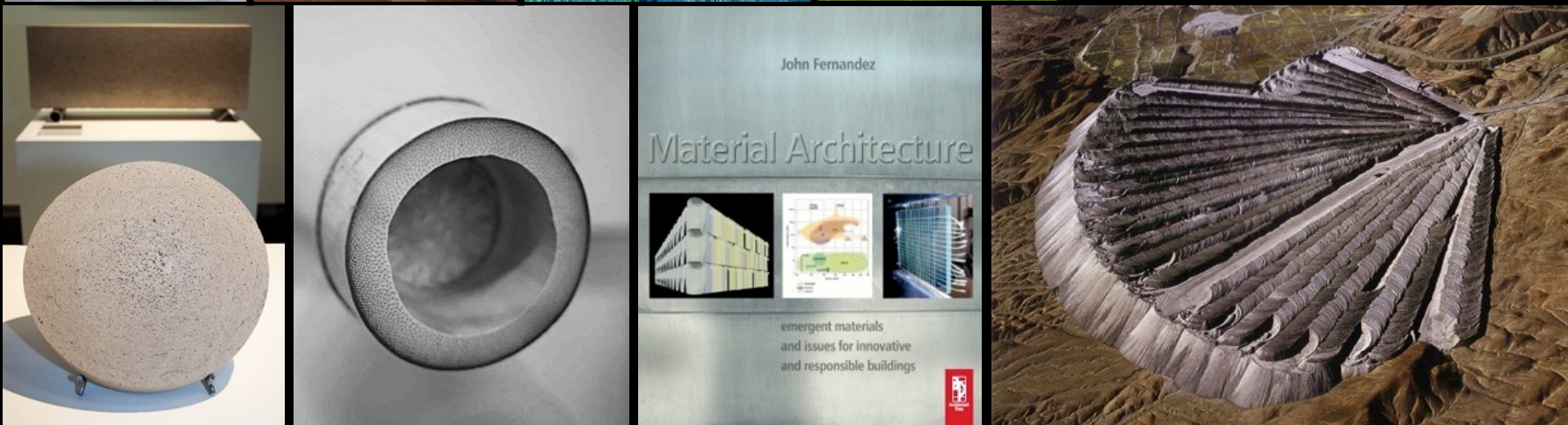
John E. Fernández
Professor + Director MIT ERA

1



DESIGN

2



MATERIALS
&
ENERGY

3



CITIES



New Orleans, USA, 2005

An aerial photograph of a rocky coastline with white-capped waves crashing over a reef. The water is a deep blue-green, and the rocks are dark and jagged. The overall scene is dynamic and powerful.

1
2
3

Our Planetary Reality

Solving Sustainability

Ambition to Action

1

Our Planetary Reality

the world we have made

Our Planetary Reality - the world we have made

Life, death and disease

- Life expectancy: 29 years (1800), now 73 years
- Child mortality: 43% (1800), now below 4%
- Vaccinations prevent 4-5 million deaths/yr

Poverty, hunger, education

- Extreme poverty: 80-90% (1800), now 8-9%
- Substantially higher average calorie availability
- Literacy: 12% (1820), now about 87%

Rights and democracy

- Slavery: 20-30 million (1800), now outlawed everywhere
- Democracy: almost no one (1800), today 50%
- Women's rights: suffrage, education, workforce, legal

Science and the economy

- Since 1800: electricity, airplanes, antibiotics, computers...
- Since 1800: x10-15 income increase (inflation adjusted)
- Humanity permanently escaped the "Malthusian Trap"

Our Planetary Reality - human population success

It took all of human history to reach
1 billion in 1804

1927, **124 years**: 2 billion

1960, **33 years**: 3 billion

1974, **15 years**: 4 billion

1987, 1999, 2012, **12 years**: 5, 6, 7 billion

2022, **11 years**: 8 billion

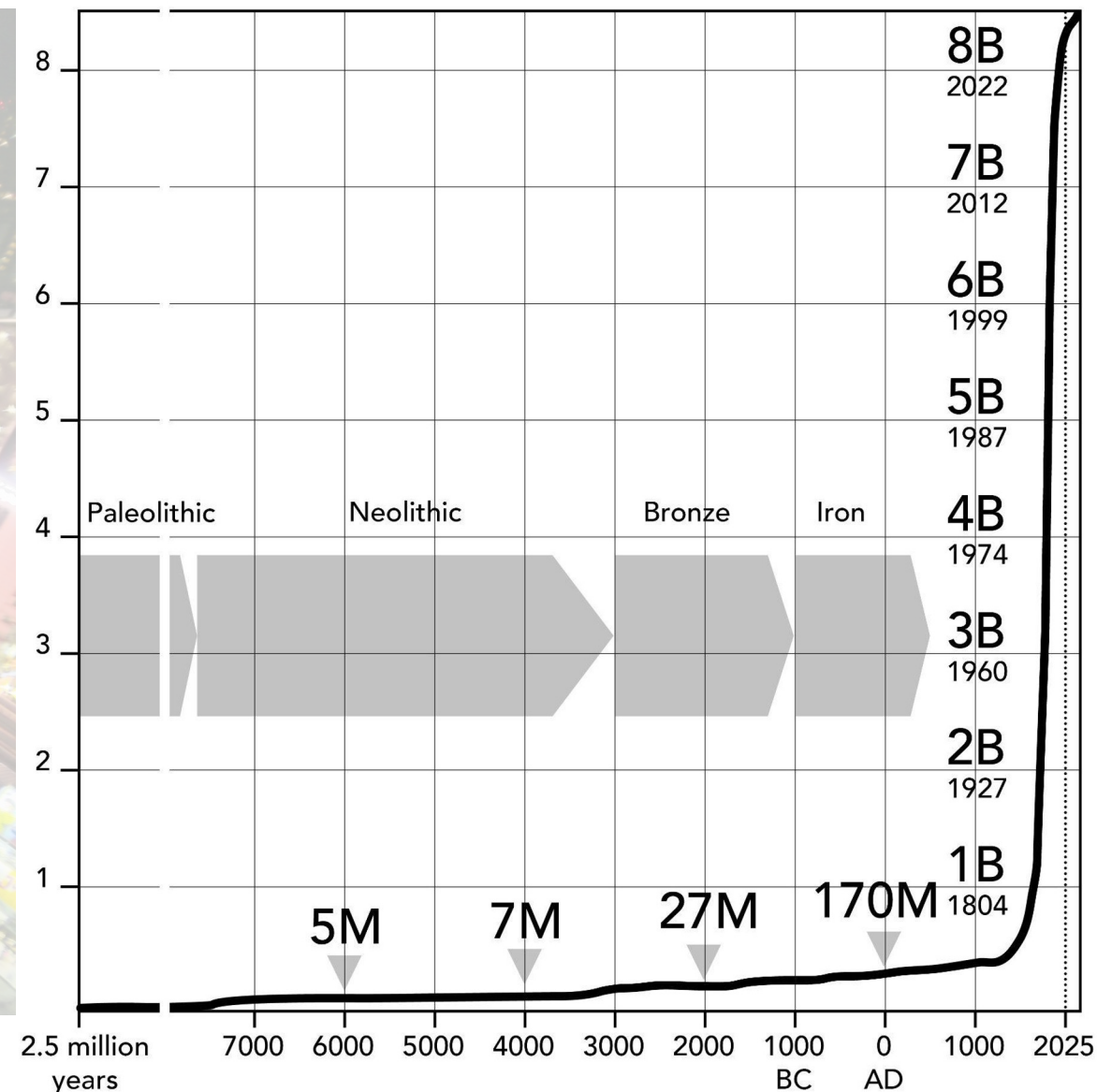
and in the future...

~2036, **14 years**: 9 billion

~2054, **18 years**: 10 billion

~2086, **32 years**: a possible 11 billion.

Shibuya Crossing, Tokyo, Japan.



Our Planetary Reality – urban population growth

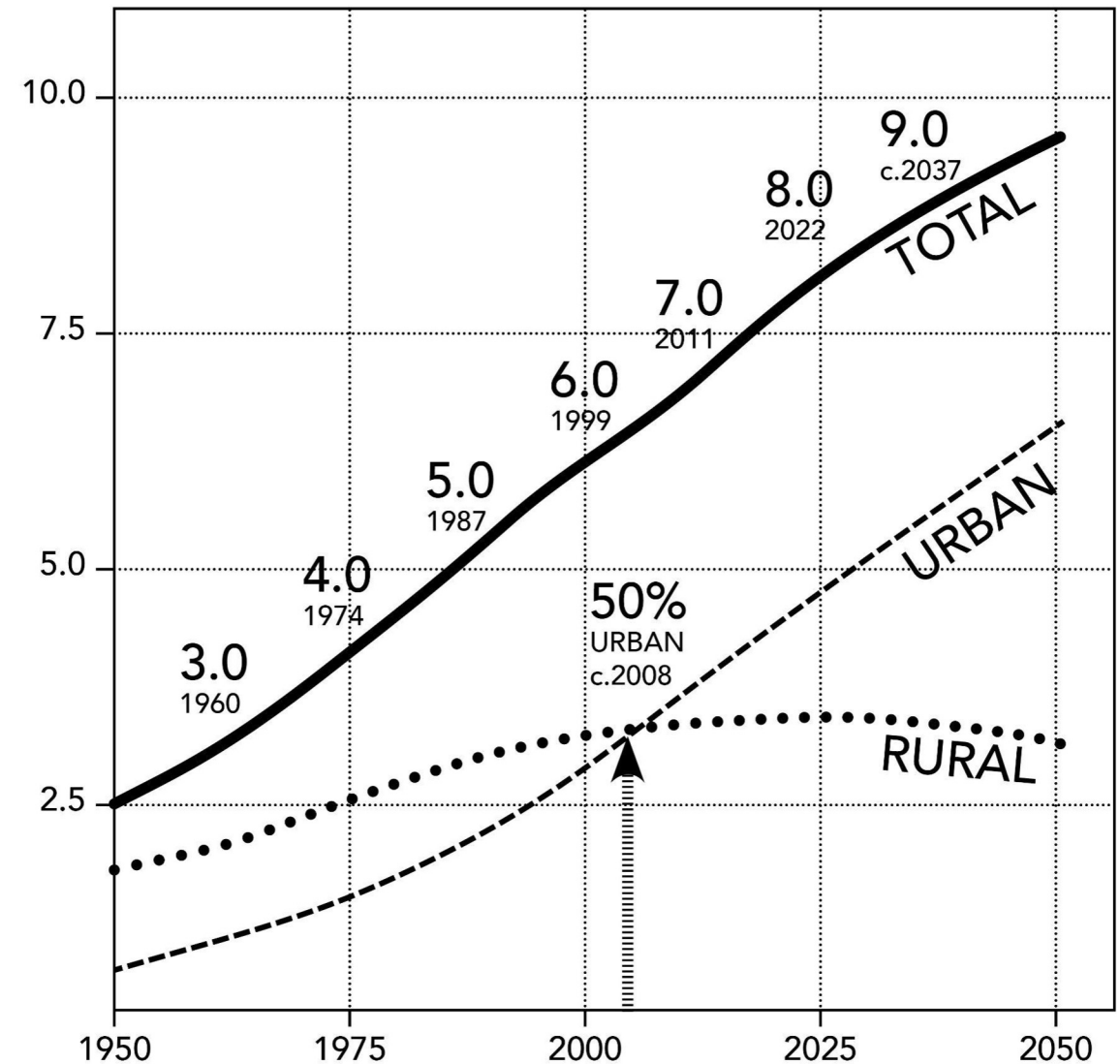
Global urban population growth, also exponential

- 1800 reached 8%
- 1950, 150 years -> 30%
- 2008, 58 years -> 50%

As of 2020, all human-made mass exceeds all living biomass!

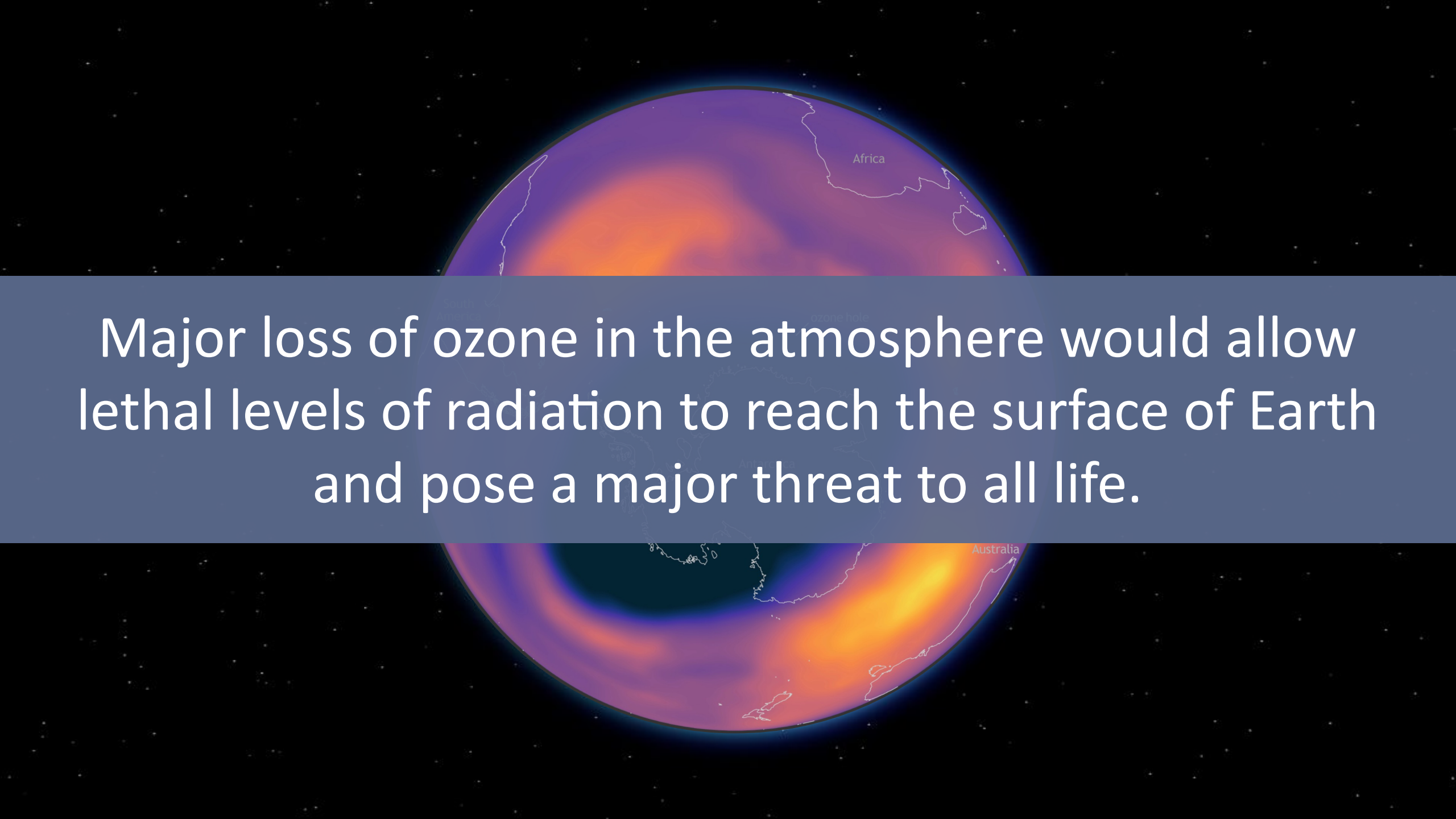
(annual manufactured capital production exceeds annual natural capital production): Source Elhacham et al. Nature, 2020

Chiyoda Ward, Tokyo, Japan.



A high-resolution image of Earth from space, showing the Americas. The top half shows North America with green landmasses and white cloud patterns. The bottom half shows South America, also with green land and white clouds. The blue of the oceans is visible between the continents. The Earth's horizon is a bright blue arc against the black background of space, which is filled with small white stars.

A humane and sustainable society fulfills its needs
while not compromising the ability of future
generations to fulfill their needs.



Major loss of ozone in the atmosphere would allow lethal levels of radiation to reach the surface of Earth and pose a major threat to all life.

Our Planetary Reality — successfully meeting our needs



for MARCH, 1949 171

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GASOLINE • NAPHTHA • BENZENE
ALCOHOL • LACQUER • PAINT
VARNISH • SOLVENTS • ETC.

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MODEL 30

THE MASTER OF FLAME
ANSUL
FIRE EXTINGUISHING EQUIPMENT

DRY CHEMICAL

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ARE YOUR *BEST* PROTECTION**

...and most economical, too! Tests conducted by impartial, nationally recognized approval laboratories have proved the superiority of Ansul Dry Chemical Fire Extinguishers on *Flammable Liquid Fires*. In addition, Ansul Fire Extinguishers provide greater safety for the operator. The stream of Ansul Dry Chemical forms a protective screen safeguarding him against radiant heat.

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- Safe for use on electrical fires too! Even high voltages are not conducted by dry chemical stream.
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Our Planetary Reality – understanding the ozone “hole”



Researcher Susan Solomon, NOAA

Led Antarctic expeditions to understand the atmospheric chemistry leading to the depletion of the ozone hole.

Chemical Process Seen in Ozone Hole

Scientists in Antarctica say evidence points to relationship of gases

By PHILIP SHABECOFF

Special to The New York Times

WASHINGTON, Oct. 20 — A team of American scientists said today that they had found “strong evidence” that a chemical process is causing a mysterious hole in the ozone layer over Antarctica.

In remarks transmitted by satellite from McMurdo Station in Antarctica, the scientists said that data from recent atmospheric measurements weakens other theories about the cause of the periodic thinning of the ozone layer over the southernmost part of the globe. The phenomenon peaks each October.

Other theories have attributed the thinning of the ozone to thermally caused upward wind pressures or to bursts of solar activity.

‘We Suspect a Chemical Process’

In a statement read from McMurdo to reporters at a news conference here, the scientists said: “At present we have not conclusively established the cause of the ozone hole. However, we have strong evidence against theories that upward winds or high solar activities caused the depletion. We suspect a chemical process is fundamentally responsible for the formation of the hole.”

If the initial findings of the American team are confirmed, they will dramatically narrow the search for the cause of the Antarctic ozone depletion and for the cause of what is believed to be a worldwide thinning of

the ozone layer. The search for the cause of the Antarctic ozone hole will be guided by measurements not only of ozone, but of ozone and a number of other closely related molecules.”

She said the complexity of the ozone problem and the large number of questions that remain unanswered were a cause for concern.

Warning From Nature

Dr. Crofton B. Farmer of Pasadena’s Jet Propulsion Laboratory, also at McMurdo, said that while there was not sufficient evidence to conclude yet that the ozone hole was produced by man-made chemicals, what was now being observed in the Antarctic might be “nature giving us a gentle warning.”

The measurements by the United States scientists on the ground confirmed satellite measurements of rapid depletion of ozone over the Antarctic. They found that the amount of ozone in the “hole” decreased by about 40 percent within a 20 to 30 day period, mostly at altitudes between 7.2 to 12 miles.

Some scientists and environmental groups are concerned that the rapid ozone depletion over Antarctica may be a precursor of a similar phenomenon in other areas of the globe. But other scientists, including participants in today’s news conference, note that the climate and other conditions in Antarctica are not duplicated elsewhere.

Recently, Dr. Donald Heath of NASA reported on findings of a Nimbus-7 satellite indicating findings of an ozone loss in the Arctic centered over Spitzbergen, Norway. NASA has not yet analyzed Dr. Heath’s findings, which show a smaller ozone “hole” than that found over the Antarctic.

Dr. Sherwood Rowland, one of first to report on the depletion of the ozone layer, recently presented data taken from readings of ozone levels made at Arosa, Switzerland since the 1920’s that showed an average annual ozone loss there of 3 percent starting

New York Times, October 21, 1986

Our Planetary Reality – repairing planetary systems



Prof. Susan Solomon MIT

Shared the 2007 Nobel Peace Prize,
with the Intergovernmental Panel
on Climate Change and Al Gore.



The ozone hole is “healing” as a result of
science + policy formulation +
international cooperation.

Regenerating the atmosphere

Correct science plus effective
policy through the United
Nations led to successful
phasing out of anthropogenic
ozone depleting substances.

**We can fix
REALLY BIG
THINGS!**

Our Planetary Reality — a world of biodiversity



Our Planetary Reality – a world of biodiversity

Pre colonial bison population estimated at 25-30 million

By the late 1880s, population numbered no more than a few hundred and *possibly less than 100 in the wild.*

Today, ~500,000 exist, but only 30,000 roam wild.



Our Planetary Reality – regenerating biodiversity

Regenerating the natural world

Hunted to almost extinction, the North Atlantic Humpback Whale is one of the most successful recoveries of a species due to human actions.

Pre-whaling: 20,000-30,000

Mid 20th century: 700-1000 individuals

Today: ~35,000

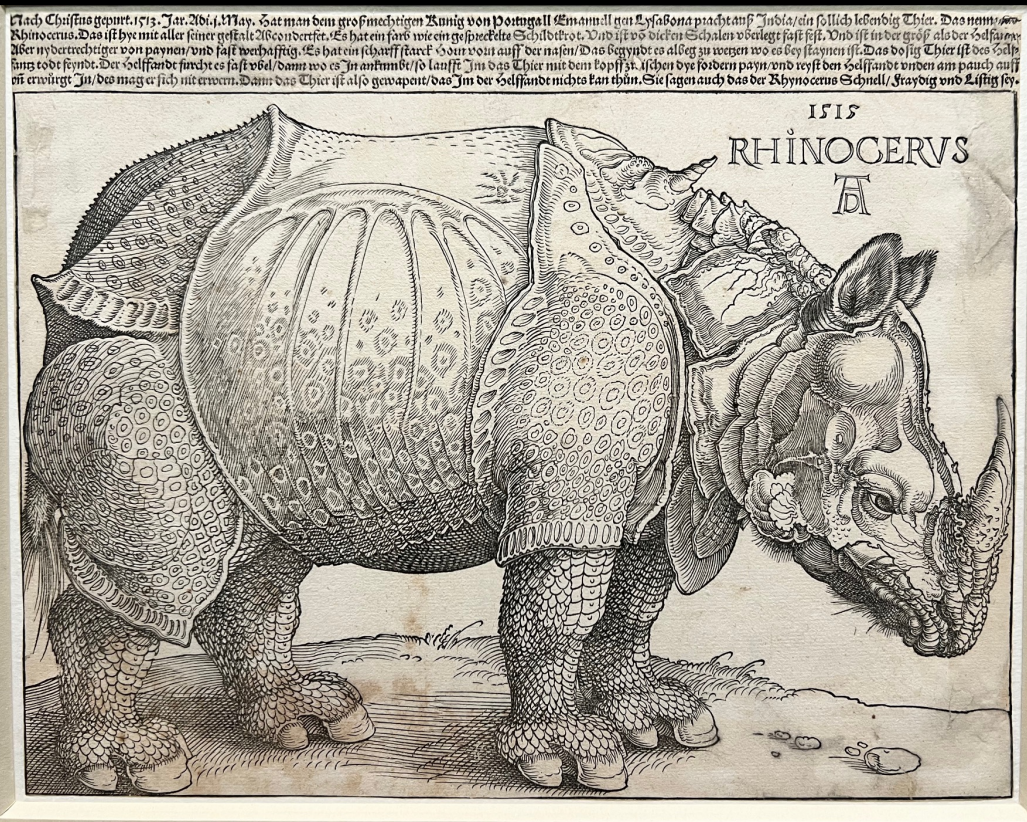
+100%

population recovery

Our Planetary Reality – regenerating biodiversity



Our Planetary Reality – a world of extinction



Rhinoceros, Albrecht Durer 1515



The last male northern white rhino, Sudan, died on March 19, 2018.
Two females survive, rendering the subspecies *functionally extinct*.

Our Planetary Reality – climate change, the science

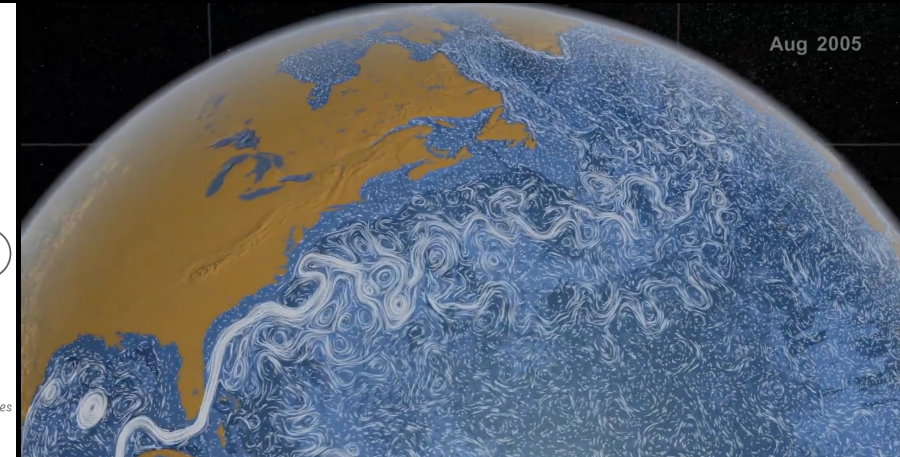
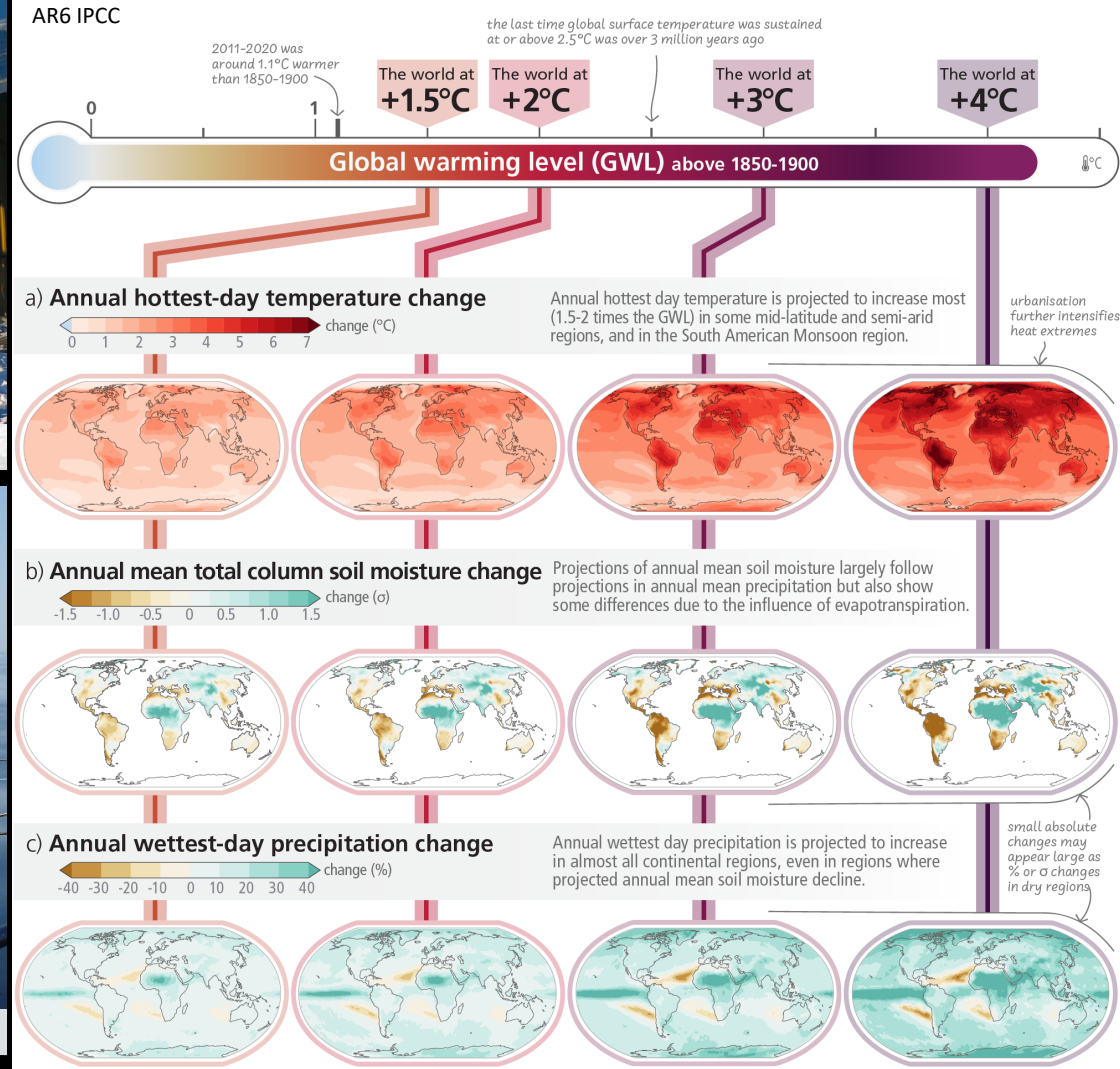


World Meteorological Organization

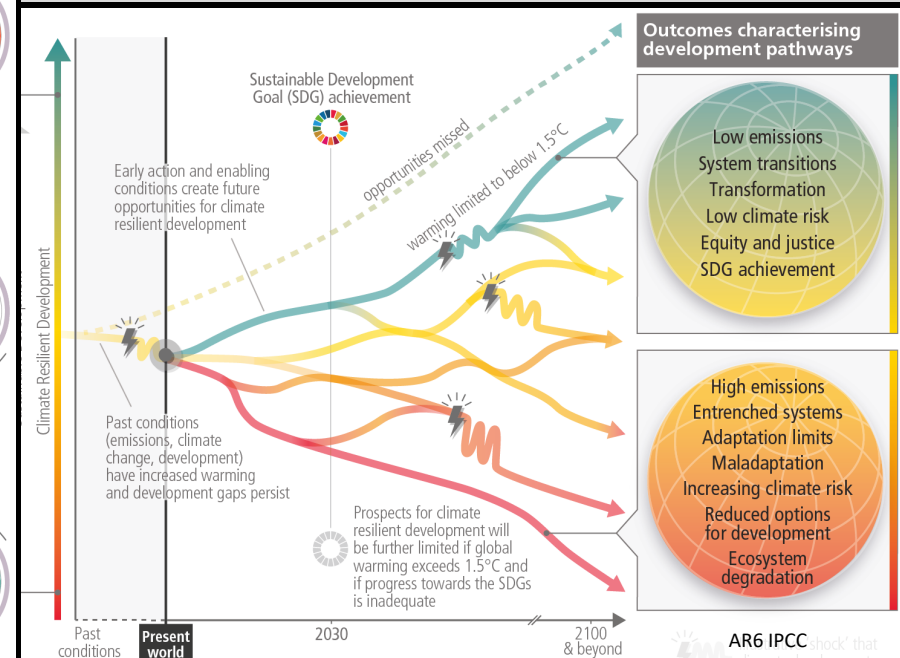


Woods Hole Oceanographic Institute/MIT

With every increment of global warming, regional changes in mean climate and extremes become more widespread and pronounced



NASA Goddard



AR6 IPCC

Our Planetary Reality – a world of fossil fuels



80% of total global energy consumed is from fossil fuels

Oil and gas field - somewhere in the west United States

Oil and gas field methane flaring – in the Colombian Amazon

Our Planetary Reality – a world of fossil fuels

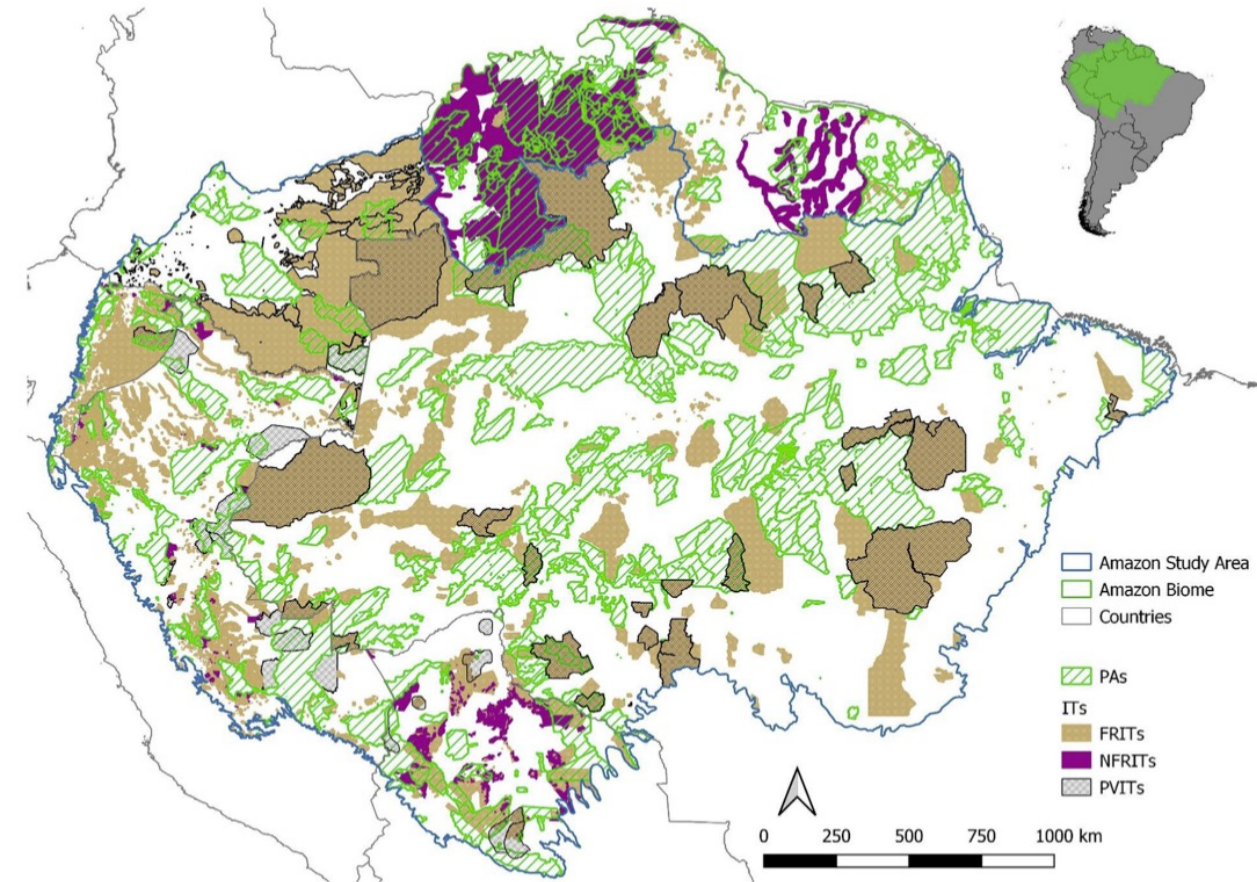


Fig. 1. Map of Protected Areas (PAs) and Indigenous Territories (ITs) in all the Amazon Biome showing different categories: FRITs (Formally Recognized Indigenous Territories), NFRITs (No Formally Recognized Indigenous Territories), PVITs (People in Voluntary Isolation Territories).

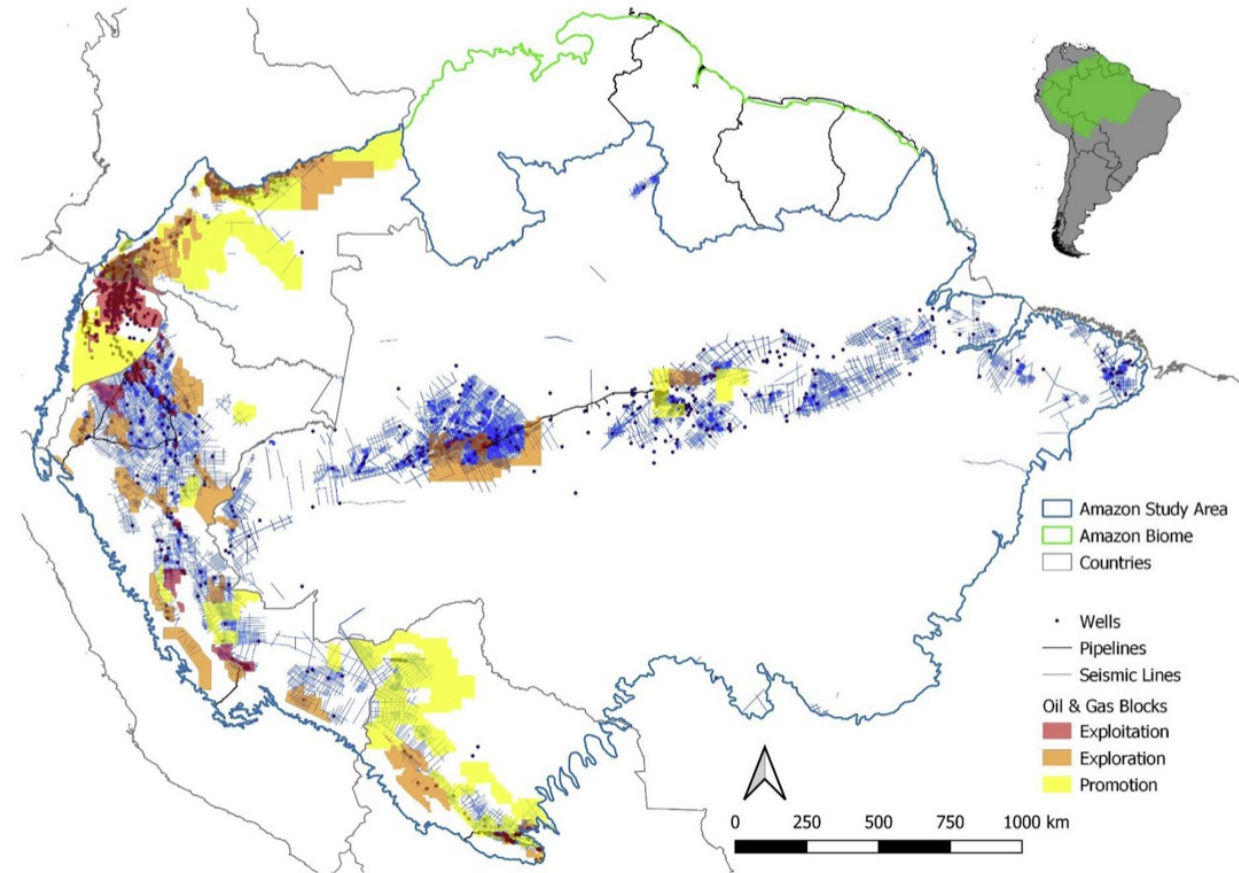
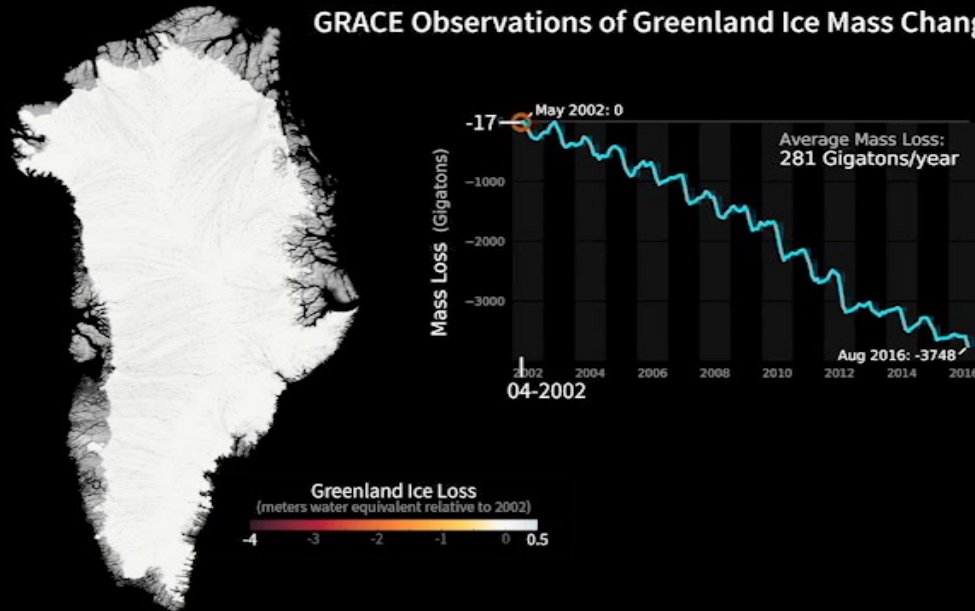


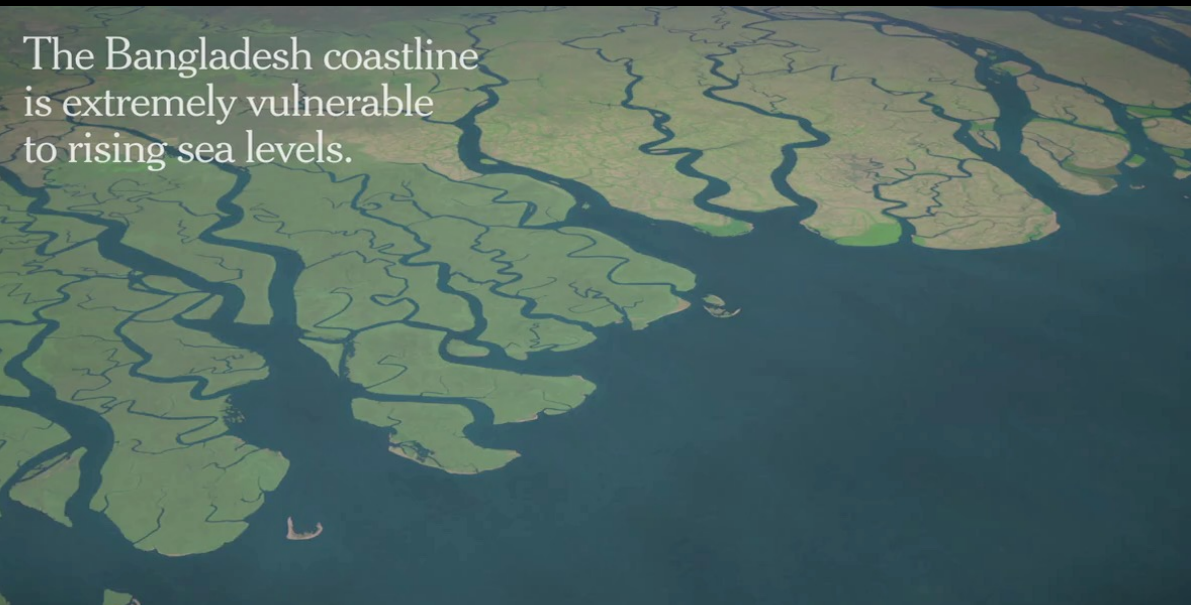
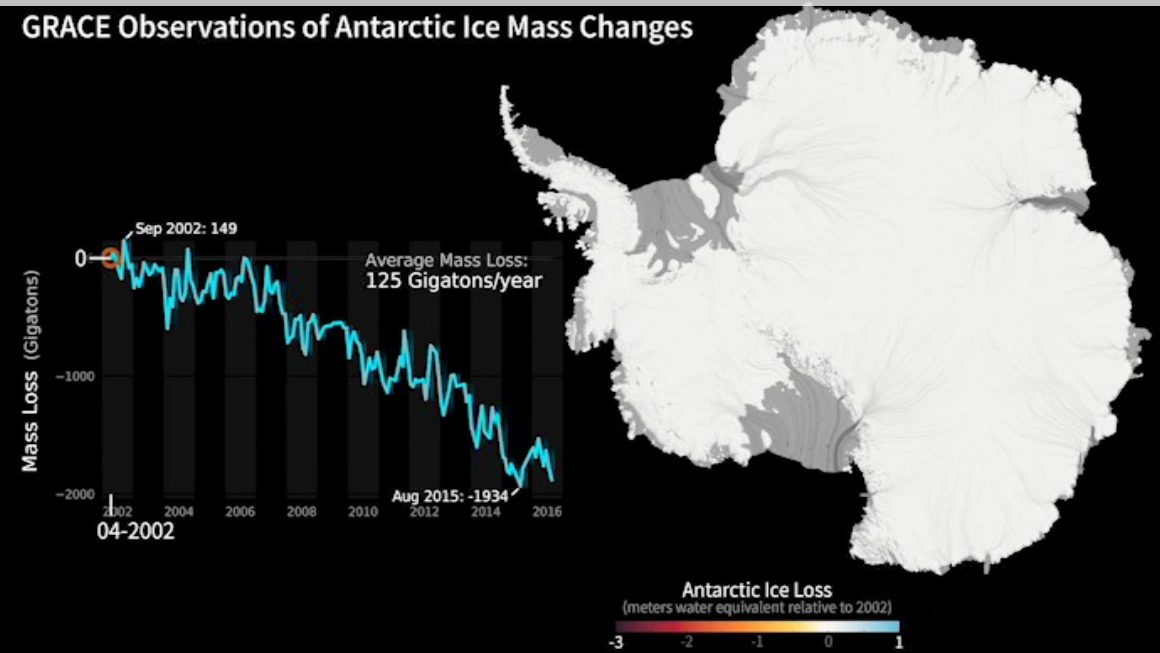
Fig. 2. Map of oil and gas elements in the Amazon Biome: wells, pipelines, seismic lines and blocks by category (exploitation, exploration, promotion). Amazon regions of Venezuela, Guyana, French Guyana and Suriname have not oil and gas operations.

Our Planetary Reality - Climate Change

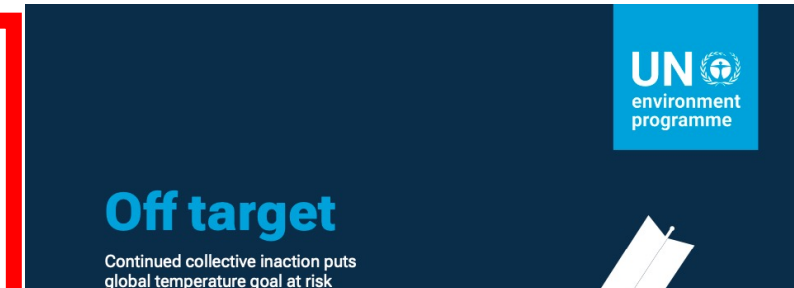
GRACE Observations of Greenland Ice Mass Changes



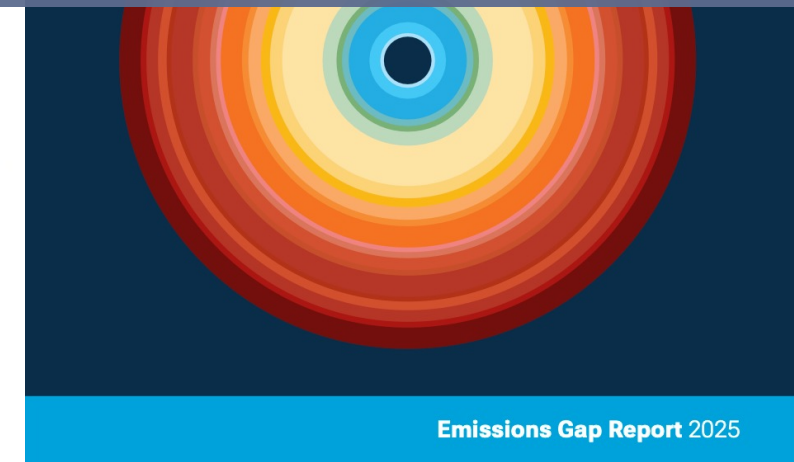
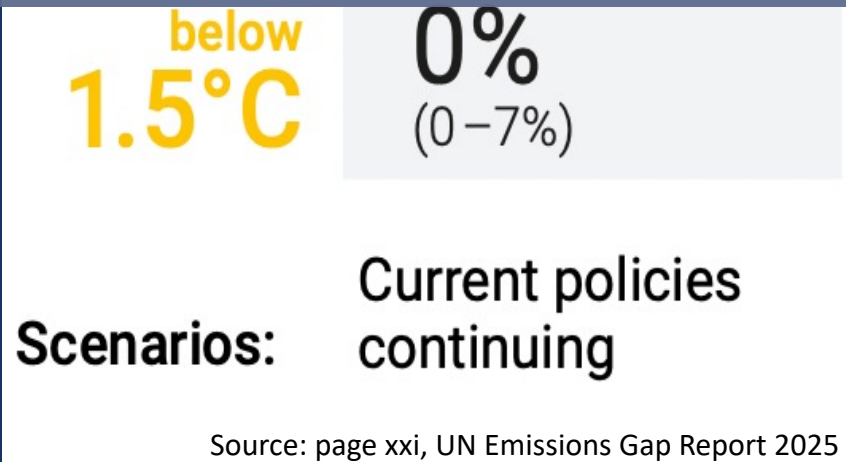
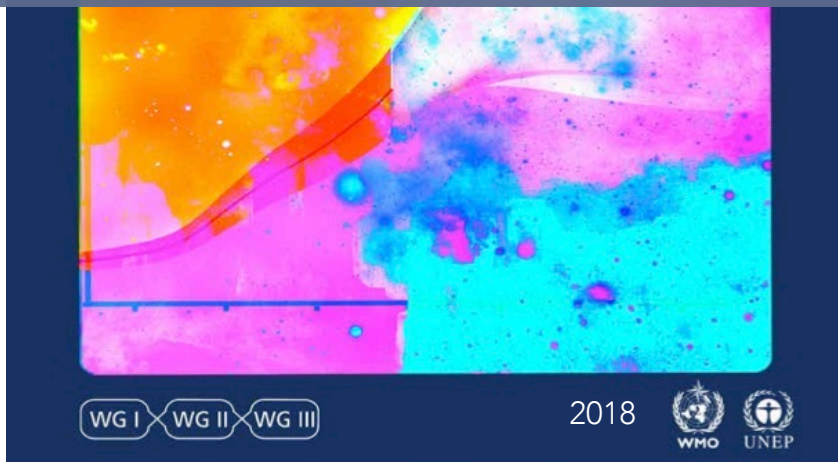
GRACE Observations of Antarctic Ice Mass Changes



Climate Change – how much warming is likely?



Global greenhouse gas emissions continue to increase,
but likely to plateau around 2030-2035



Source: page xxi, UN Emissions Gap Report 2025

Our Planetary Reality

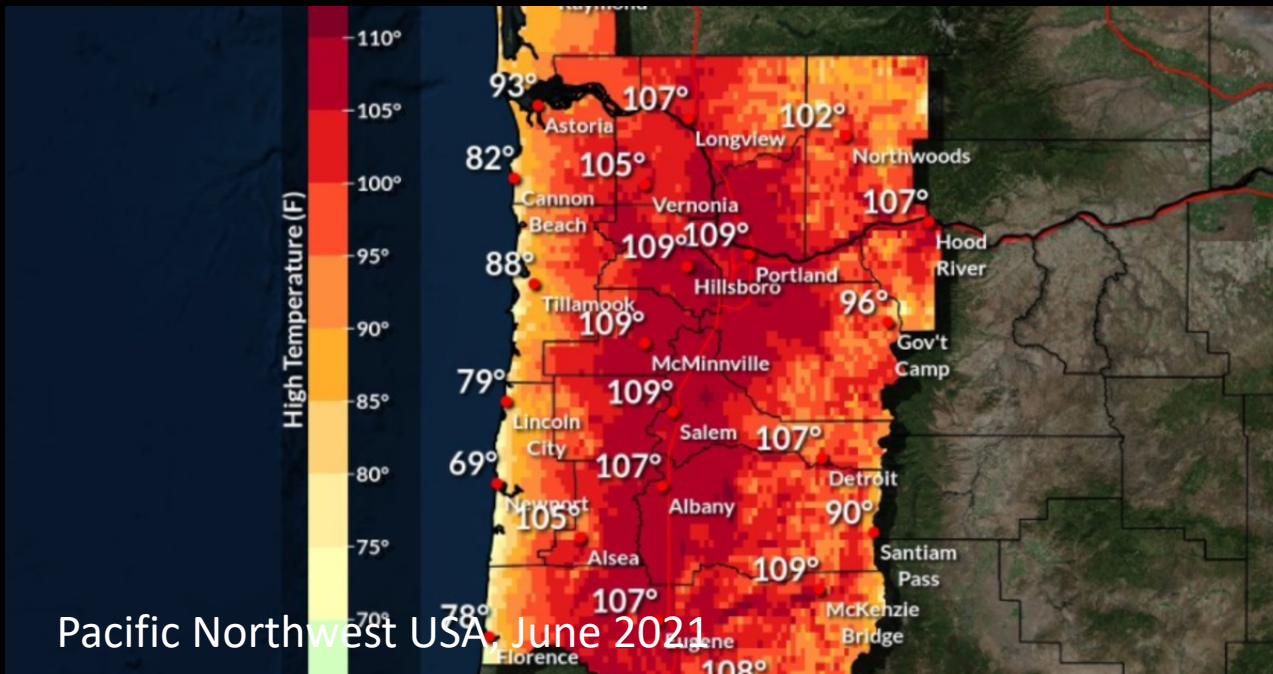


Outer Banks of North Carolina, 2022

Climate Change



Kolkata, India, 2022



Pacific Northwest USA, June 2021



Central Europe, July 2021

Climate Change – extreme weather + tipping points

Extreme Heat Over Land

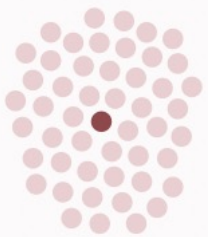
50-year event

Frequency and increase in intensity of extreme temperature event that occurred **once in 50 years** on average in a climate without human influence

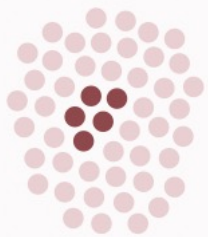
Future global warming levels

1850–1900

Present 1°C

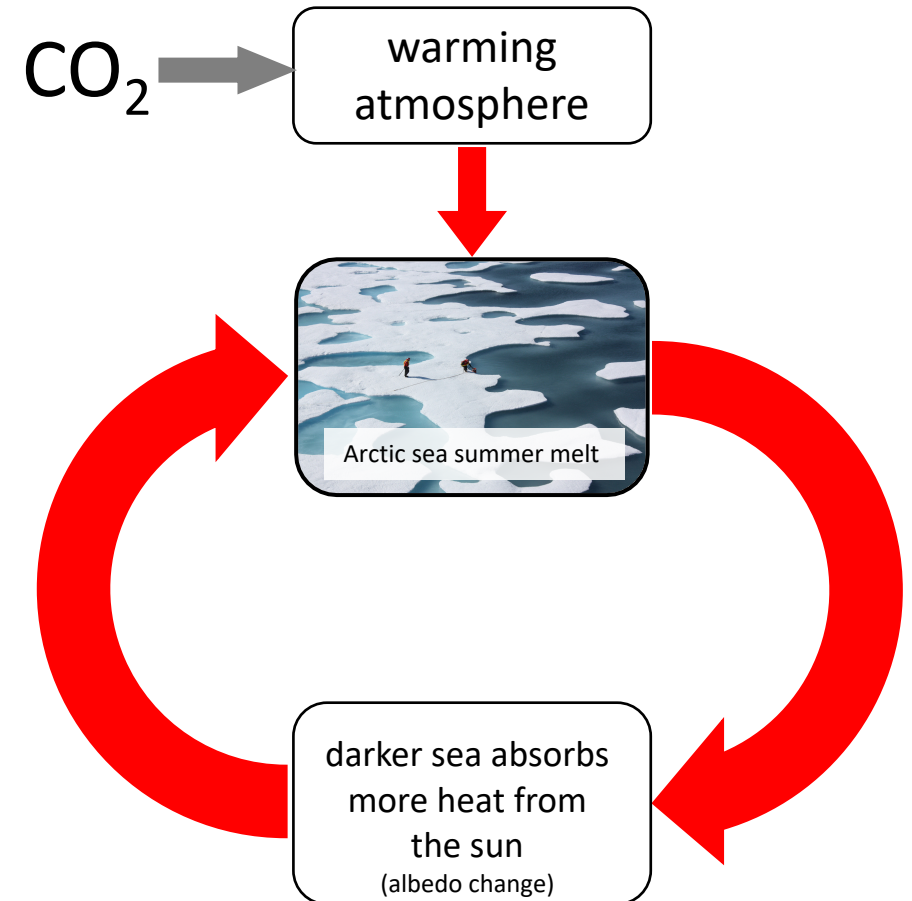


Once



now likely occurs
4.8 times
(2.3–6.4)

tipping point: in climate science, a physical change that is triggered and then leads to more of the same change.

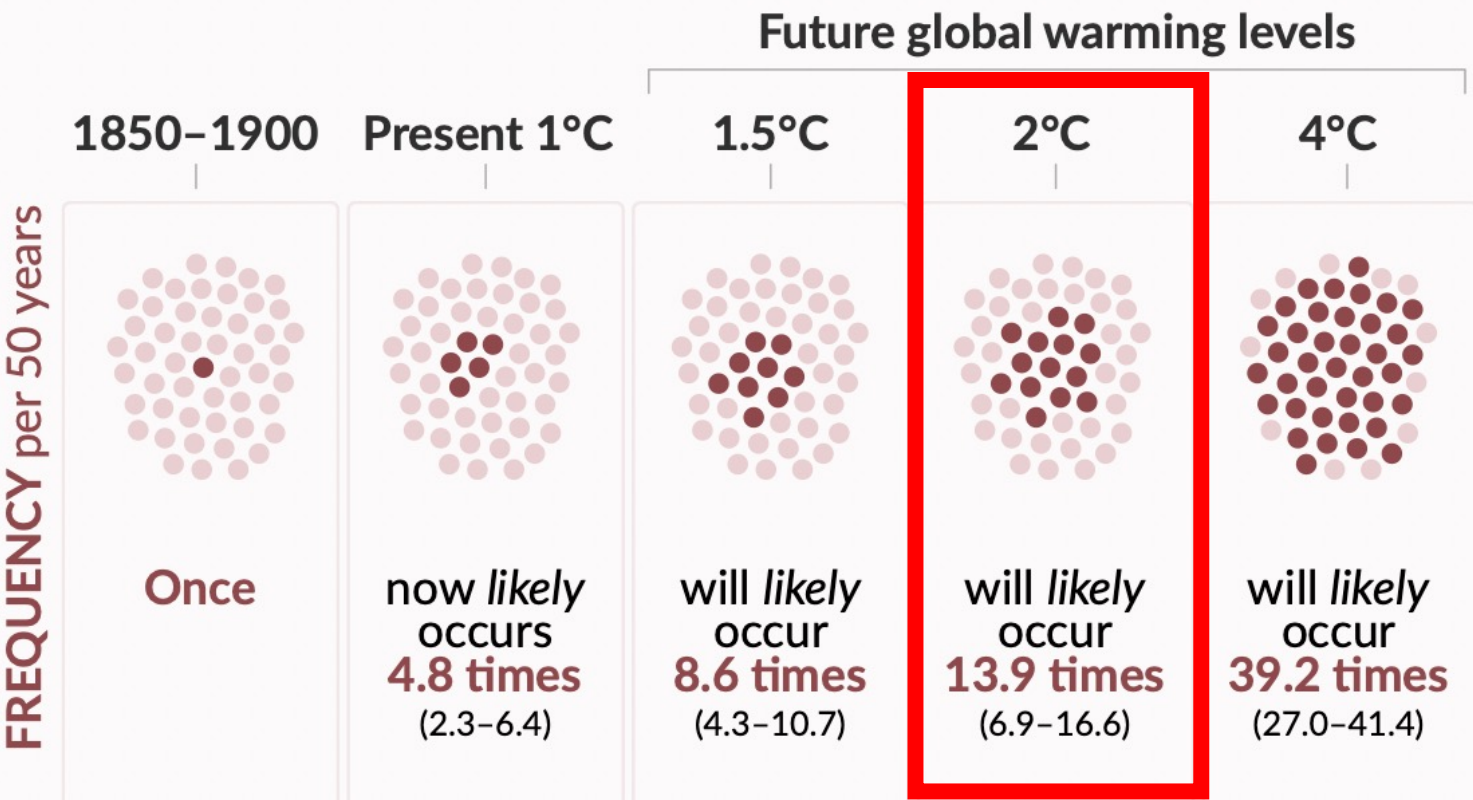


Climate Change – extreme weather + tipping points

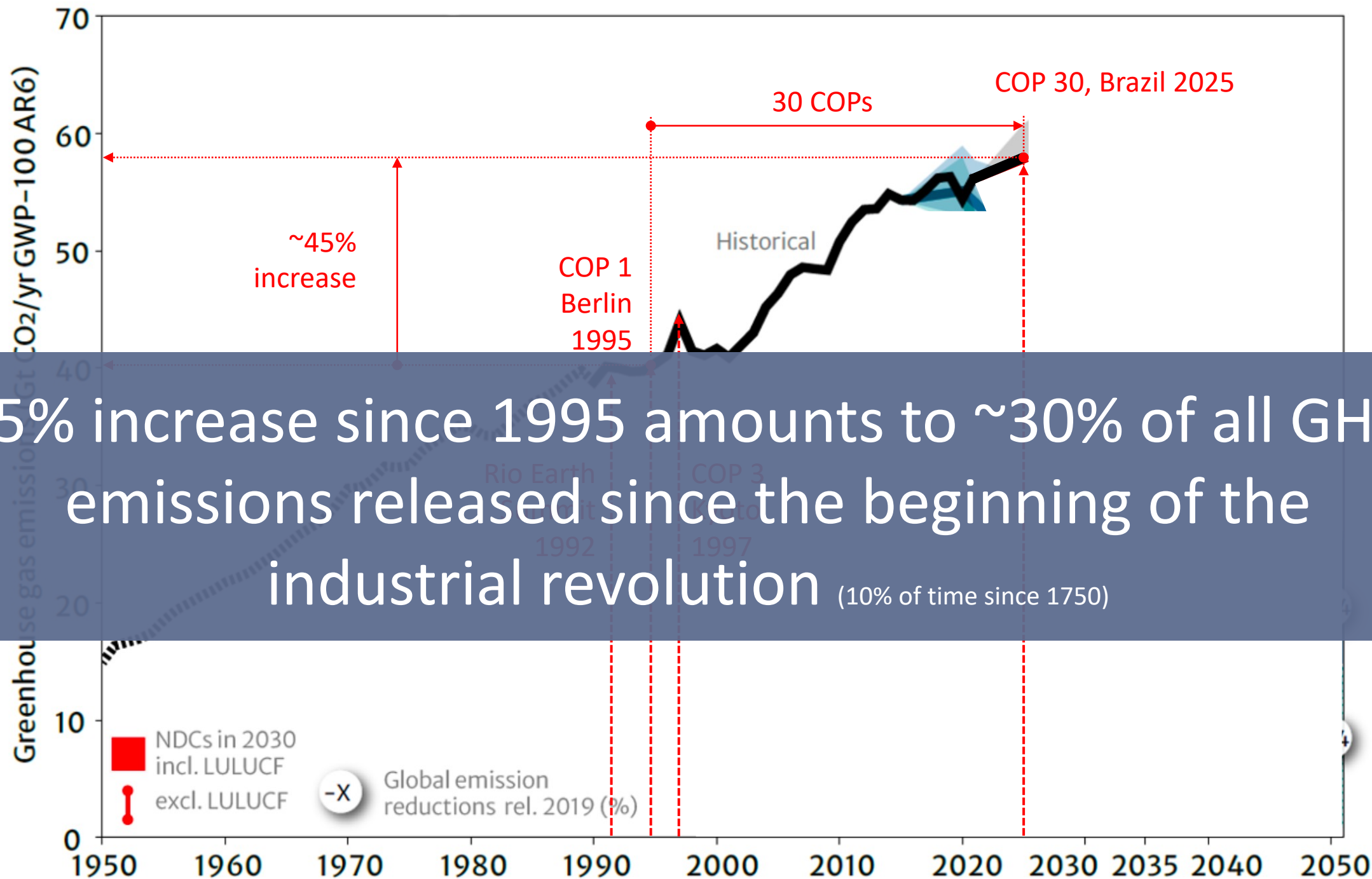
Extreme Heat Over Land

50-year event

Frequency and increase in intensity of extreme temperature event that occurred **once in 50 years** on average in a climate without human influence



Members of Namaygoosisagagun First Nation (Collins First Nation), in northwestern Ontario evacuate by boat, July 15, 16, 2026.



45% increase since 1995 amounts to ~30% of all GHG emissions released since the beginning of the industrial revolution (10% of time since 1750)

Our Planetary Reality – “subnational actors”



Cities and regions



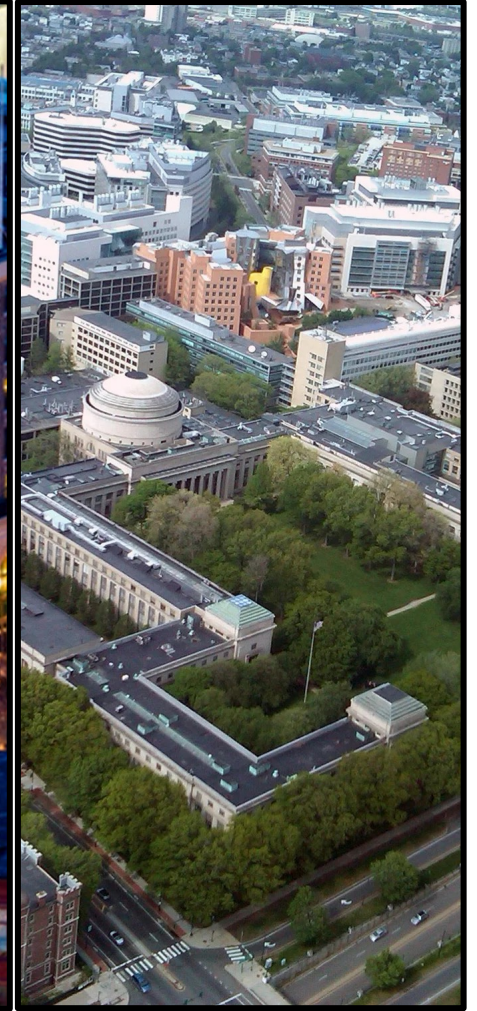
Local government,
collectives, councils, and
cooperatives



Business, industry, finance



Civil society – NGOs,
community groups, faith-
based orgs, advocacy groups
and more



Universities and research
institutes

2

Solving Sustainability

the decarbonized world we are making



SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY 	2 ZERO HUNGER 	3 GOOD HEALTH AND WELL-BEING 	4 QUALITY EDUCATION 	5 GENDER EQUALITY 	6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY 	8 DECENT WORK AND ECONOMIC GROWTH 	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	10 REDUCED INEQUALITIES 	11 SUSTAINABLE CITIES AND COMMUNITIES 	12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION 	14 LIFE BELOW WATER 	15 LIFE ON LAND 	16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	17 PARTNERSHIPS FOR THE GOALS 	 SUSTAINABLE DEVELOPMENT GOALS

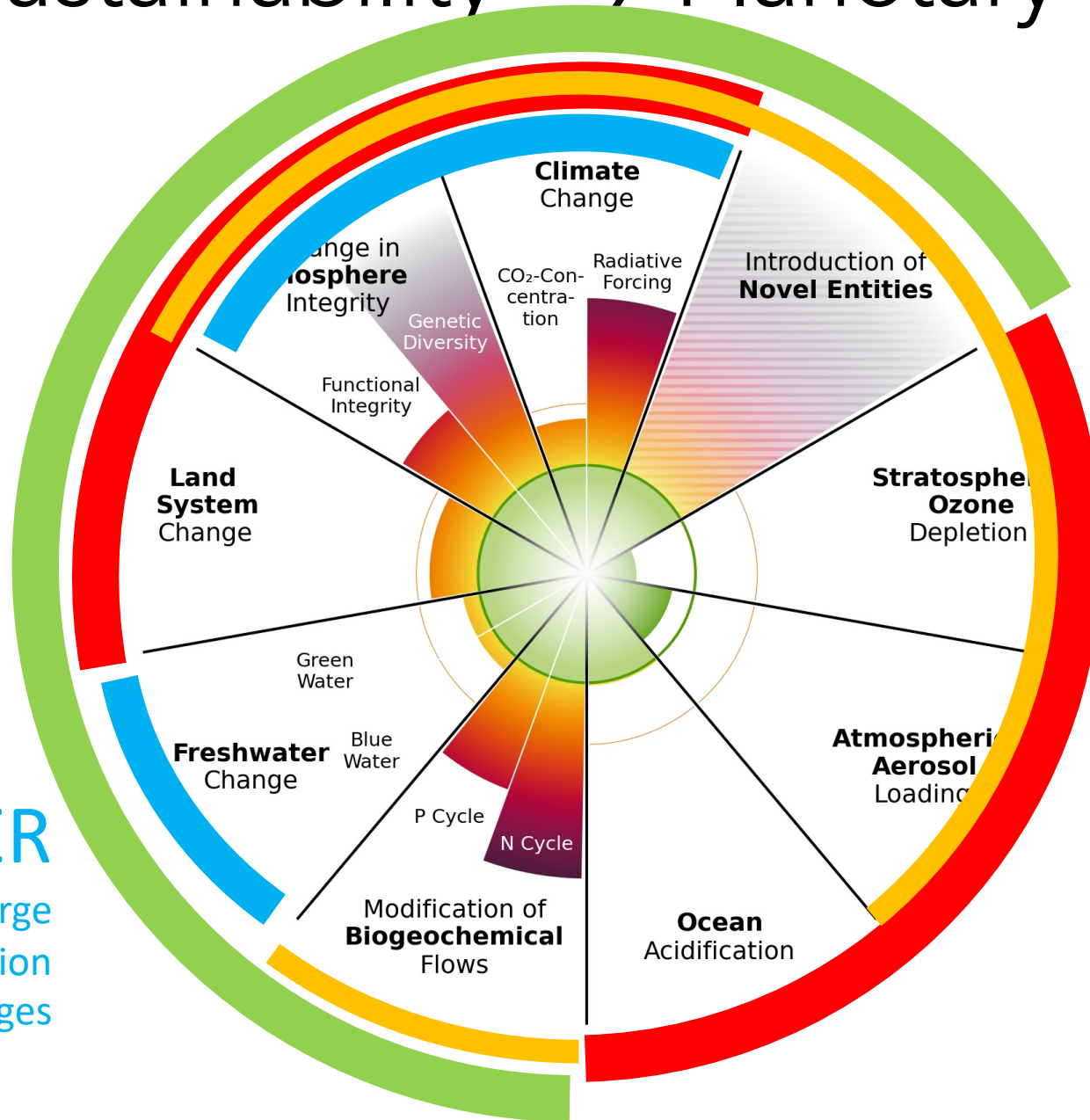
Solving Sustainability – 9 Planetary Boundaries

FOOD

deforestation
GHG emissions
ecological damage
freshwater use
fertilizer overuse
pesticide use

WATER

withdrawals beyond recharge
salt and seawater intrusion
hydrological cycle changes



MATERIALS

mining and tailing wastes
GHG emissions
high energy consumption
chemical pollution
air pollution (particulates)

ENERGY

air pollution
GHG emissions
ecological damage
chemical spills,
refining disasters and
environmental justice



Solving Sustainability – toward decarbonization



“a fuel intensive to a mineral-intensive energy system”

IEA

Solving Sustainability - the world we are decarbonizing

The global economy is electrifying

Electricity is decarbonizing

Clean energy employment is growing

Investment in clean energy is strong

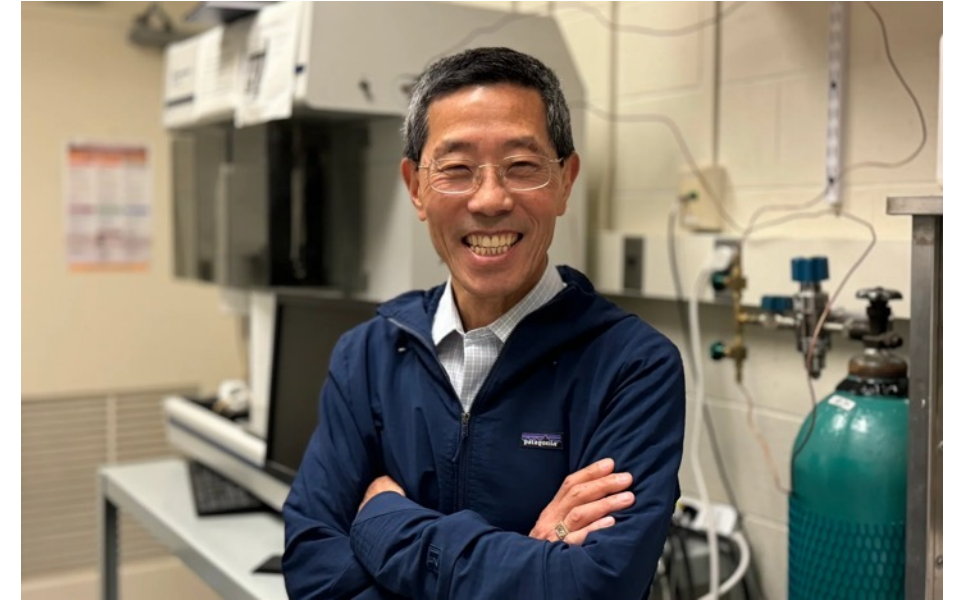
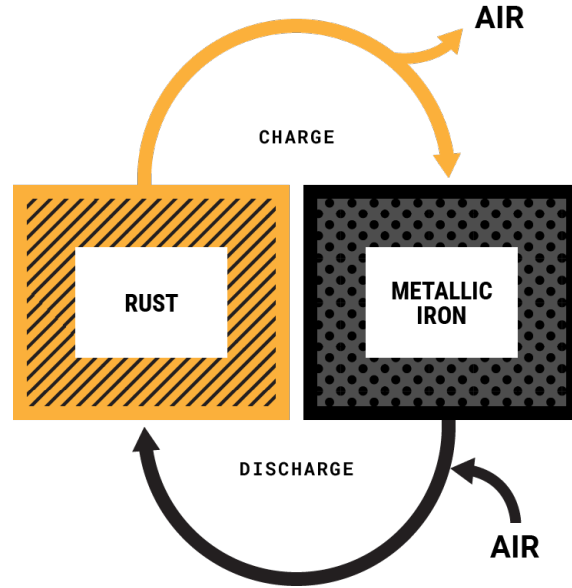
- Power demand increased 4.5% in 2025, driven by heat pumps, EVs, greater AC use and now data centers
- 90% of new renewable energy is cheaper than fossil alt.s

- 90% of all NEW electricity capacity is renewable
- Solar accounts for 78% of all NEW electricity capacity
- Clean electricity is growing faster than electricity demand
- Battery capacity has increased dramatically (ongoing)

- Clean energy employment: 30M in 2019, 35 M in 2023
- Clean energy employment is now greater than fossil fuel
- Solar energy is now the world's largest renewable energy employer – employment has spread globally

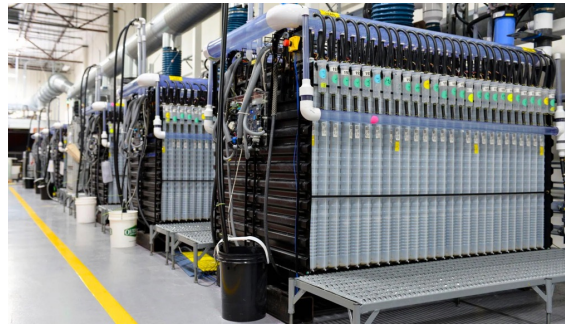
- For past 10 years, global spending on clean energy has been greater than investments in fossil fuels
- Today, for every \$1 invested in fossil fuels supply, \$2 is invested in clean energy technologies

Solving Sustainability – grid scale power storage



Battery Storage Technology

Our first commercial product is an iron-air battery capable of storing electricity for 100 hours at system costs competitive with legacy power plants. Made from iron, one of the most abundant minerals on Earth, this front-of-the-meter battery will enable a cost-effective, renewable energy grid year-round.



Form Energy An iron-air battery uses a reversible rusting process to store energy. The battery uses iron as an anode and oxygen from the air as a cathode.

MIT Prof. Yet-Ming Chiang

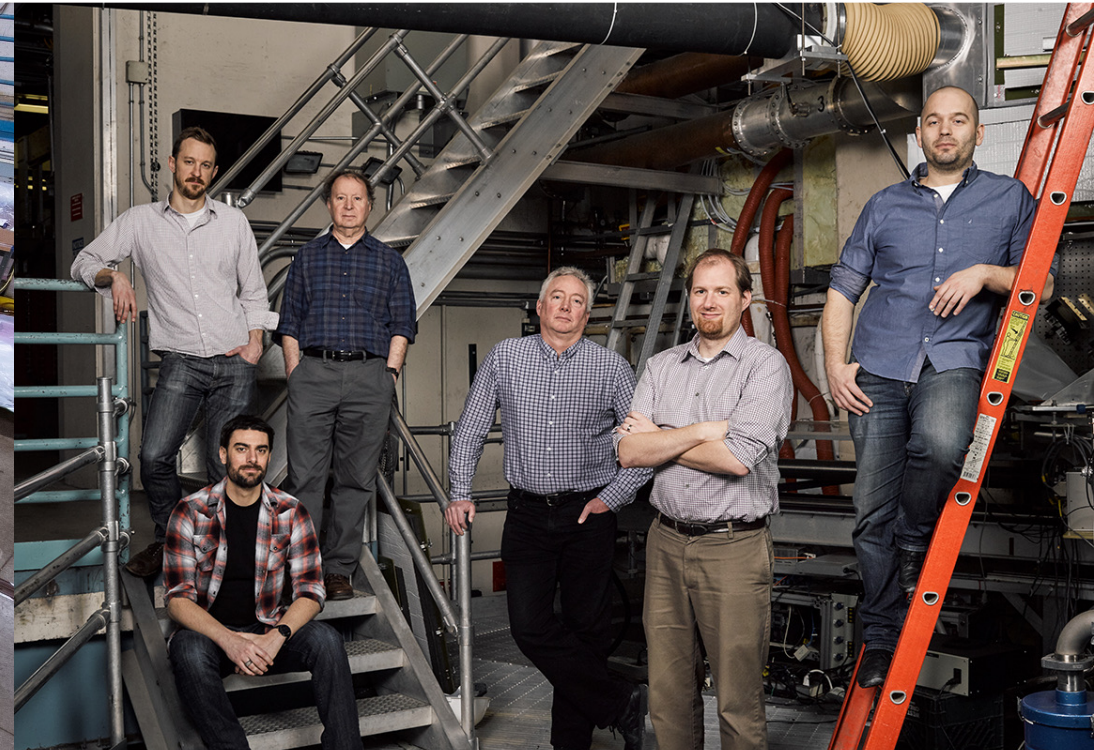
The Yet-Ming Chiang Lab tackles a broad range of technical challenges from grid scale power storage, low carbon concrete, high-power lithium iron phosphate battery manufacturing processes.

The work has been cited as crucial to an acceleration of decarbonization across industry.

Solving Sustainability – Fusion, free energy forever



Fusion prototype reactor, MIT 2020



Cambridge energy startup smashes Massachusetts record for venture capital

Commonwealth Fusion Systems raises \$1.8 billion to advance fusion reactor

By Aaron Pressman Globe Staff, Updated December 1, 2021, 11:54 a.m.



Solving Sustainability – local, small and effective

Local solar power - community owned and operated



Community solar power facility

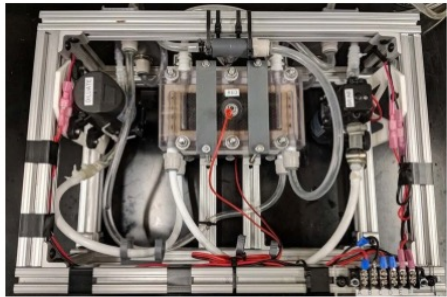


Solar powered water purification

Solving Sustainability – global engineering

MIT Global Engineering and Research Center (GEAR)

Water-Energy Food Nexus



Home-use
desalination



Drip irrigation



Village-scale
desalination



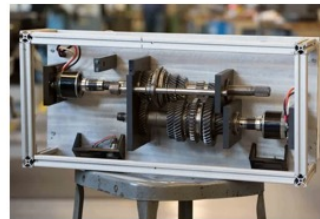
Small farm
mechanization



Sanitation
systems



Single Cylinder
Turbo



Hybrid
Transmission



MIT Prof. Amos Winter

Director of the Global Engineering and Research Center (GEAR). GEAR Center characterizes the unique technical and socioeconomic constraints of emerging markets, then combines these insights with engineering science to create high-performance, low-cost, globally-relevant technologies.

Solving Sustainability – urban and community resilience

MIT FARM LAUNCHES TO CONNECT CAMPUS AND LOCAL AGRICULTURE

October 16, 2025



MIT URBAN RISK LAB'S "POROSITY HUNT" PROJECT WINS INTERNATIONAL SUSTAINABLE CAMPUS NETWORK AWARD

January 22, 2025



MIT URBAN RISK LAB AND TECO MÉXICO LAUNCH RESILIENT HOUSING PROJECT

February 27th, 2026



MIHO MAZEREEUW DISCUSSES COMMUNITY-DRIVEN RESILIENCE STRATEGIES FOR AGING SOCIETIES AT BANGKOK URBAN LONGEVITY CONFERENCE

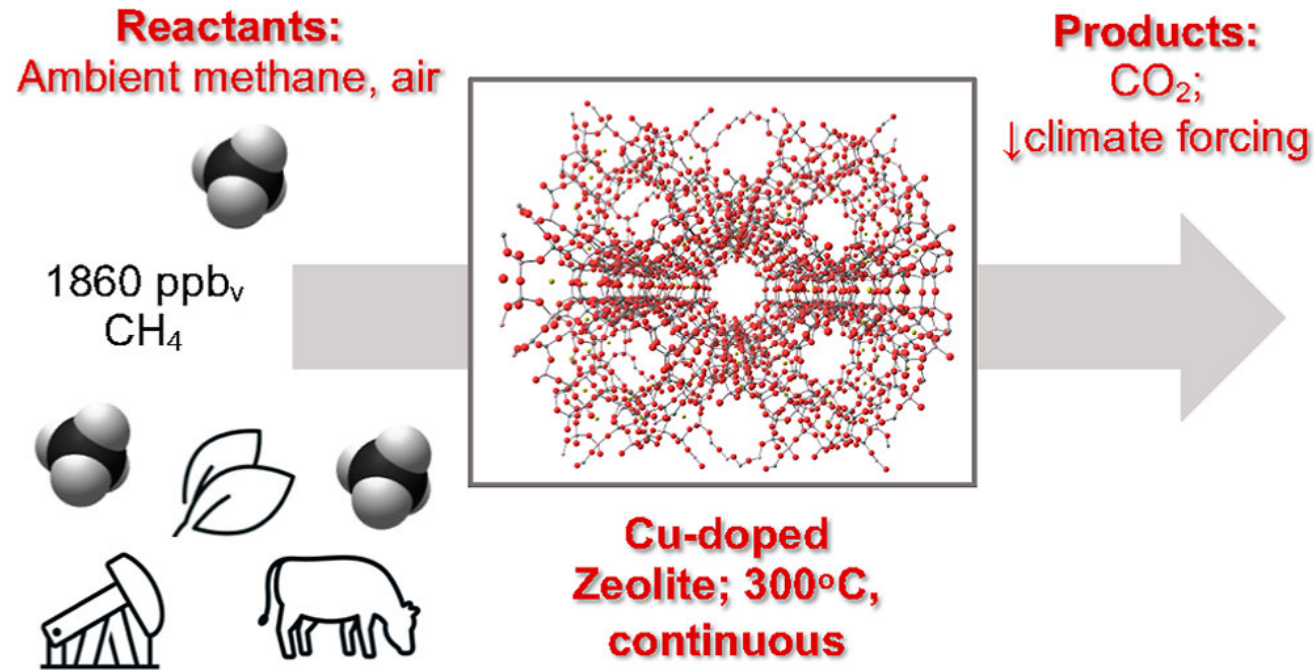
October 31, 2024



MIT Prof. Miho Mazereeuw

The Urban Risk Lab at MIT develops methods, prototypes, and technologies to embed risk reduction and preparedness into the design of cities and regions to increase the resilience of local communities.

Solving Sustainability – agricultural methane capture



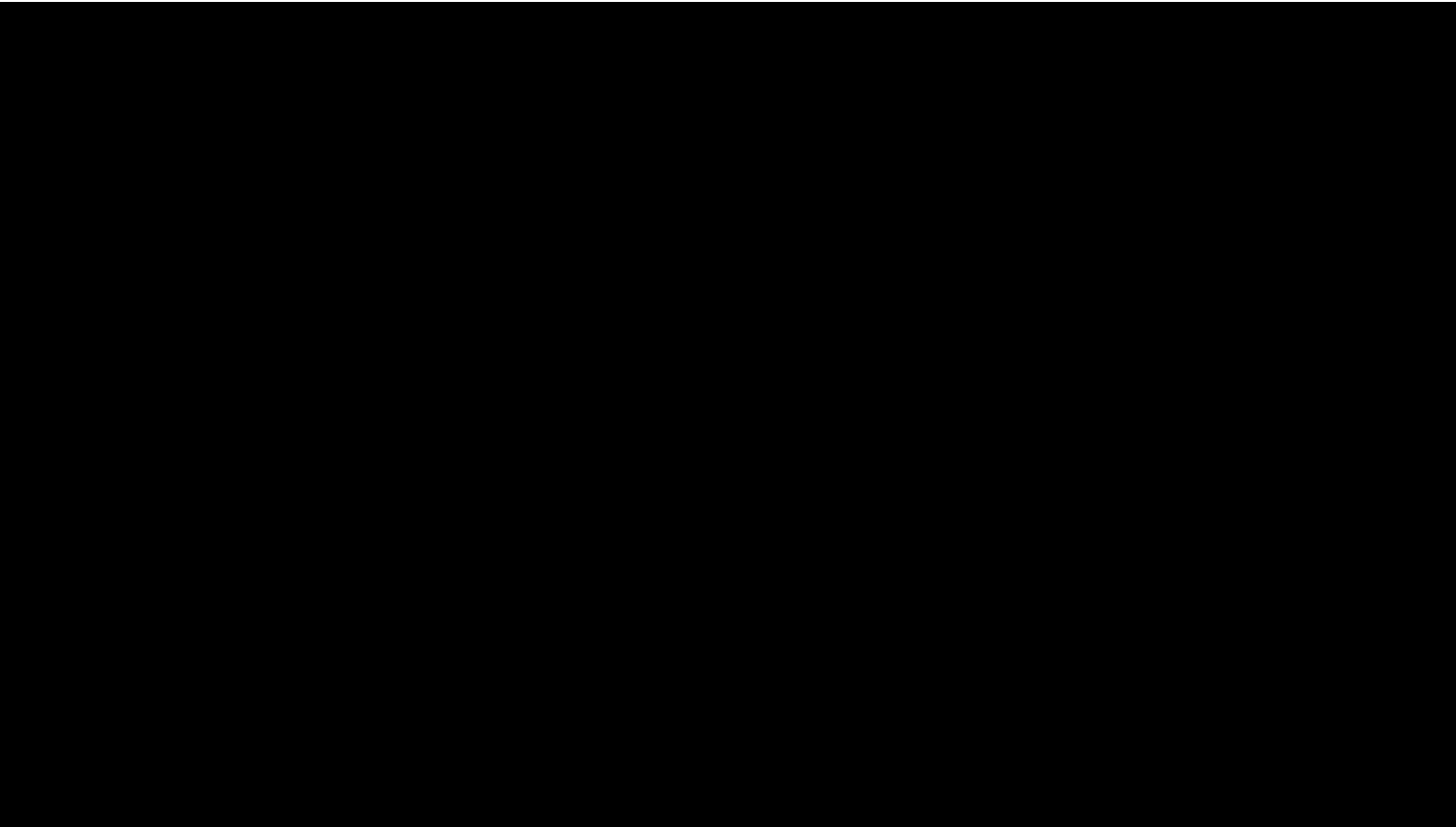
Giannetto et al. 2023; Brenneis et al. 2022



MIT Prof. Desiree Plata

The use of a biomimetic copper zeolite capable of converting atmospheric- and low-level methane at relatively low temperatures (e.g., 200–300 °C) in simulated air.

Solving Sustainability – informal transport networks



Digital Matatus. This project captured transit data for informal transport in Nairobi, developed mobile routing applications and designed a new transit map for the city. The data, maps and apps are free and available to the public, transforming the way people navigate and think about their transportation system.



MIT Prof. Sara Williams

Prof. Williams is the director of the Civic Data Design Lab and the Leventhal Center for Advanced Urbanism. She combines her training in computation and design to create communication strategies that expose urban policy issues to broad audiences and create civic change.

Solving Sustainability – co-design with communities

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Working with people
around the world
to develop and advance
collaborative approaches
and practical solutions to
global poverty challenges.

News & Blog



Blog | Mar 30, 2022 | Miru Kumakura

MIT D-Lab

**Building a Business in Refugee Settlements: Speaking to
Entrepreneurs from Rhino Refugee Camp**

MIT Global
Experiences

Solving Sustainability – co-design with communities

MITD-Lab designing for a more equitable world

Healthcare access Ghana

Delayed ambulance service leads to maternal fatalities. Roads are difficult.

3 wheeled vehicles provide quick response and much-needed health resources, especially in rural areas. Result: 64% decrease in time, hospital to rural comm.

Tricycle ambulances are saving lives in Ghana



Low-cost tricycle ambulances are being used in northern Ghana to tackle maternal mortality, providing access to lifesaving care in rural communities. Photo: Moving Health

News | Jul 08, 2026 | Maya Baylis

CNN

Solving Sustainability – co-design with communities

MITD-Lab designing for a more equitable world

Informal settlements Argentina

Poor building performance leads to health issues and other social ills.

Building science to establish a baseline-measuring variables related to health, energy performance, safety, and indoor comfort, housing improvements become evidence-based rather than anecdotal.

Building science, weatherization and community-based learning in Argentina



Photo: Courtesy MIT D-Lab

Blog | Mar 09, 2026 | D-Lab IAP 2026 Argentina Team

MIT D-Lab

MIT Environmental Research + Act

Nature

Protecting natural carbon sinks and biodiversity through action-driven research

Cities

Advancing Sustainable Urbanization in an increasingly urban world

AI & Robotics

Deploying responsible technologies for a humane, prosperous, and biodiverse future

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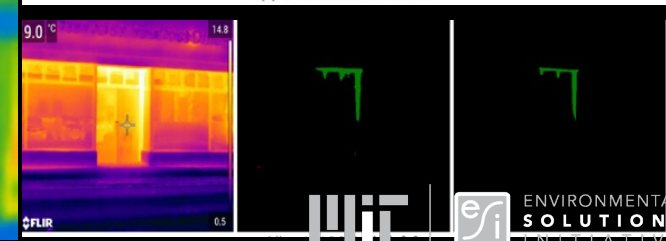
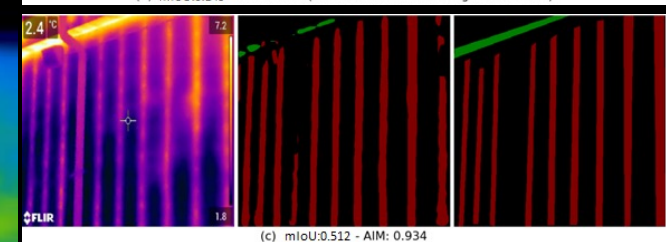
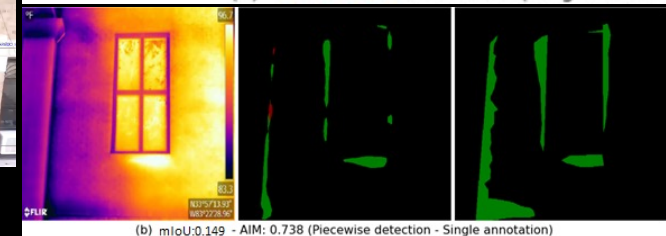
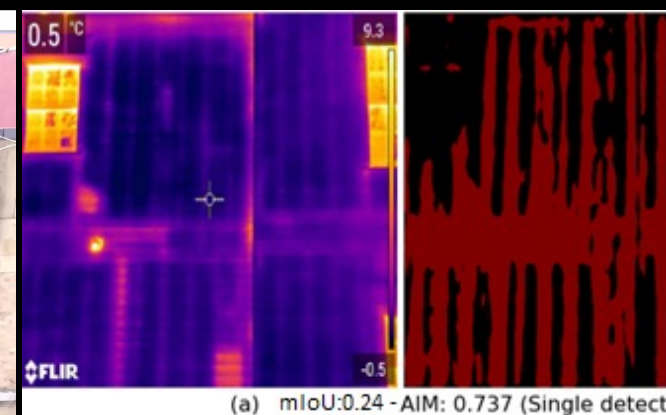
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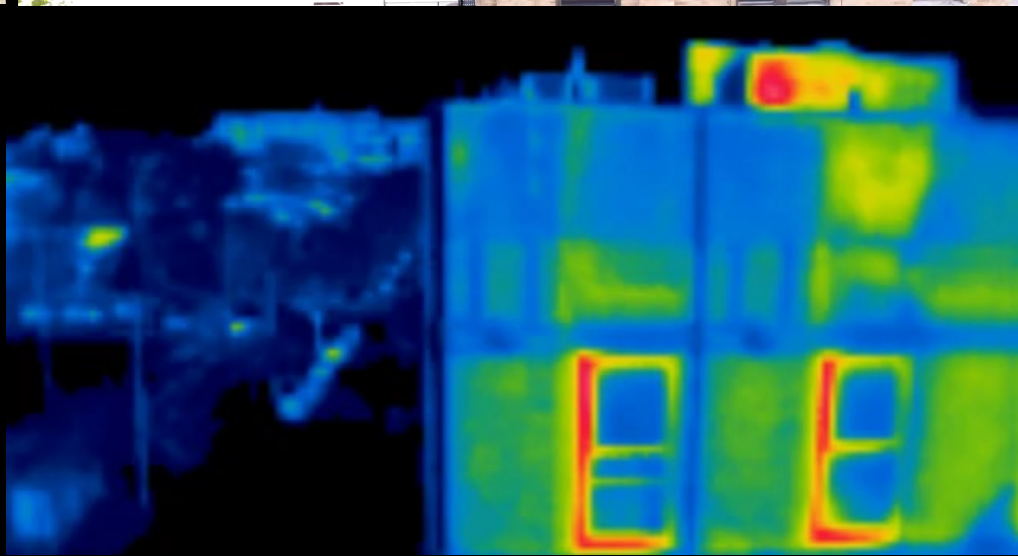
Community citizen science and action - NYC



Outdoor Aerial Thermography Inspection



Indoor Thermal Inspection & Personal Interviews



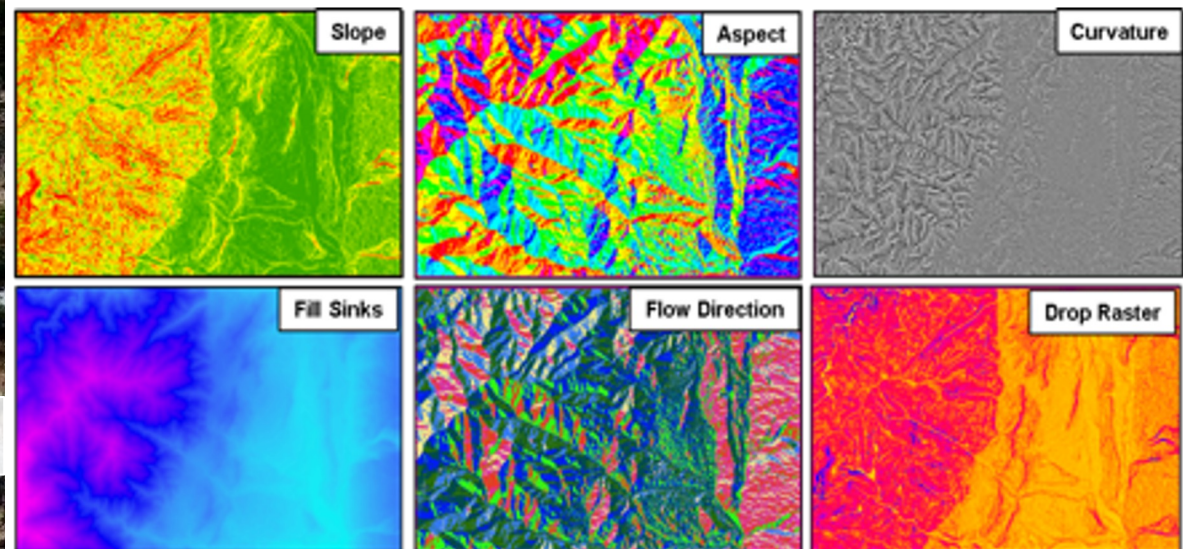
Solving Sustainability – AI and climate threats



Mocoa, Colombia 2017 – 336 dead, 200 missing, 400 injured



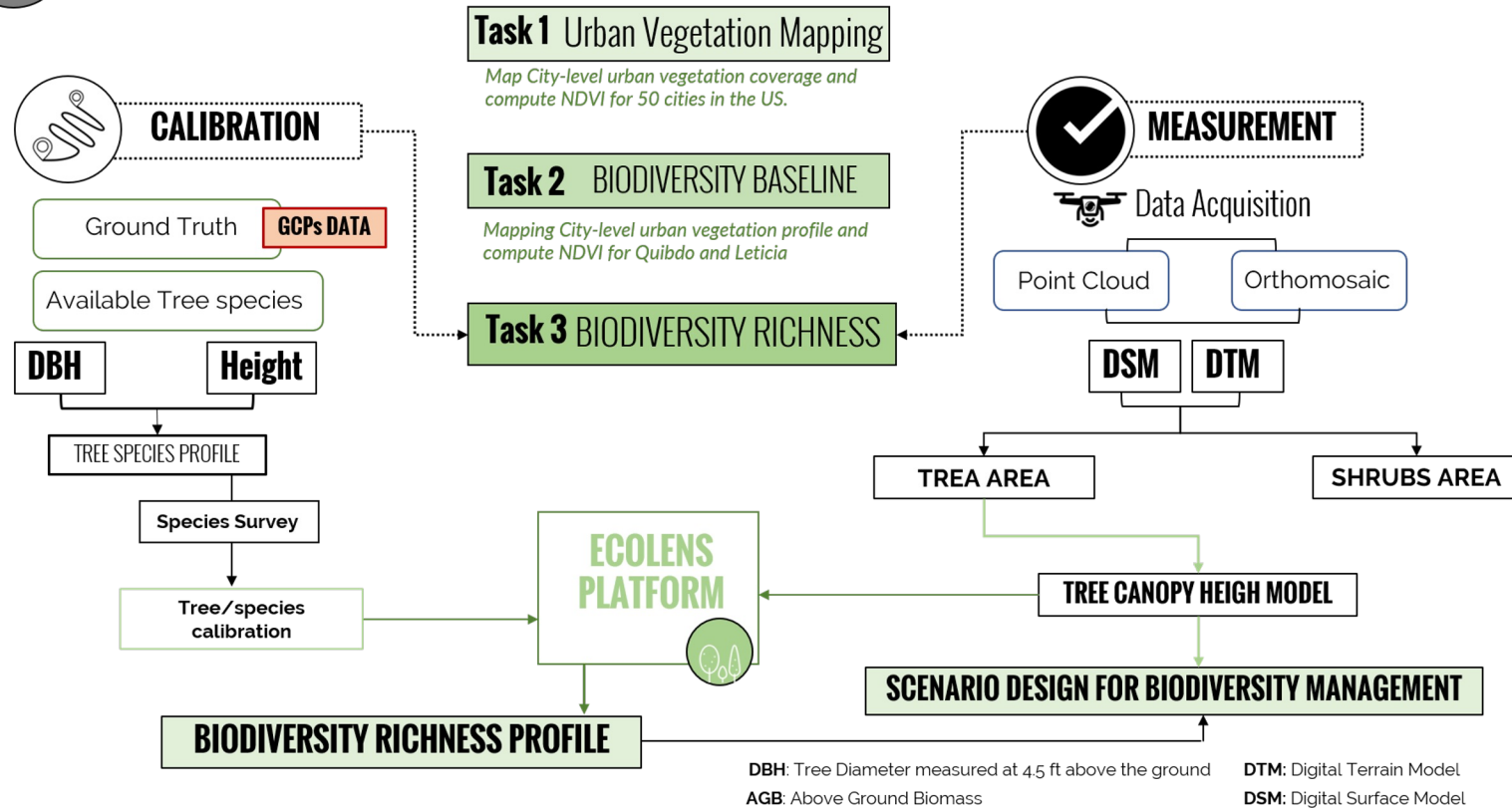
MIT Urban Metabolism Group, Lincoln Labs,
CorpoAmazonia



Biodiversity assessment, monitoring and enrichment



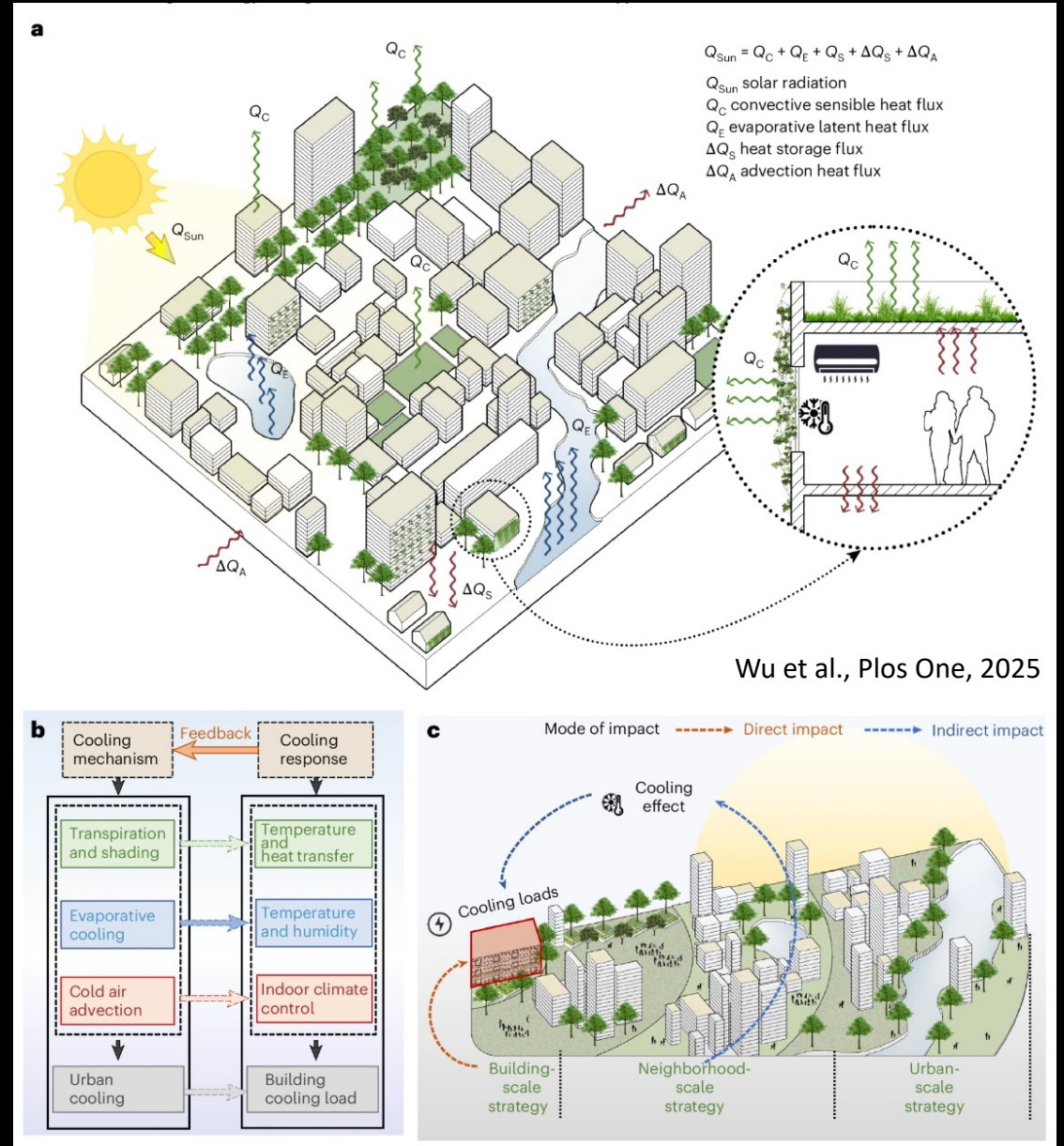
ECO-LENS: Data Platform For Biodiversity Management



Community co-creation – Biodiverse cities



MIT BiodiverCities Research Initiative - Quibdó, Colombia.
March 2022



3

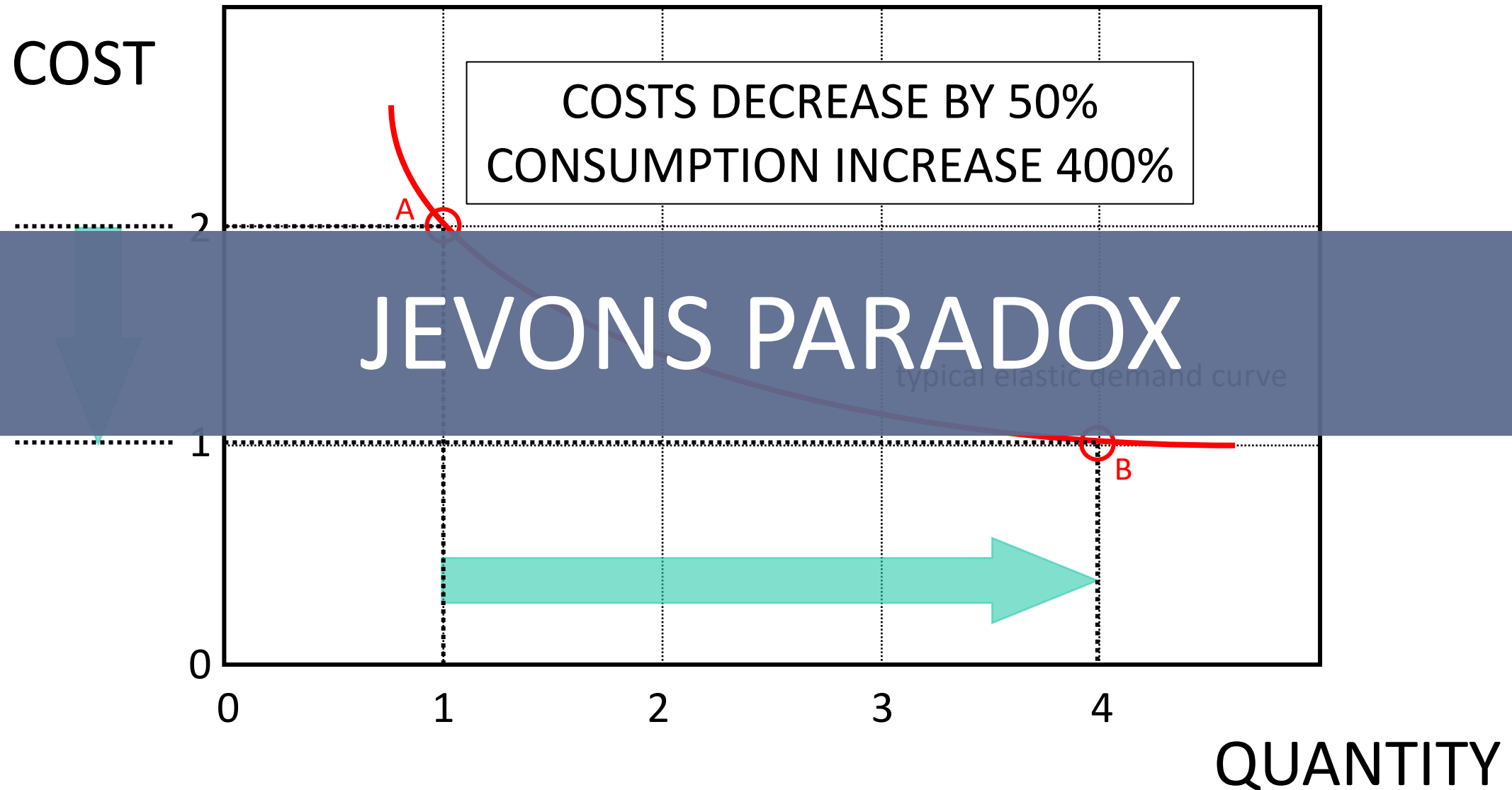
Ambition to Action

human behavior and culture change – YMCA + MIT

Climate Change

the hardest thing to change, the most consequential results

Ambition to Action– human behavior



Ambition to Action– Jevons paradox

Efficiency gains overwhelmed by increased consumption



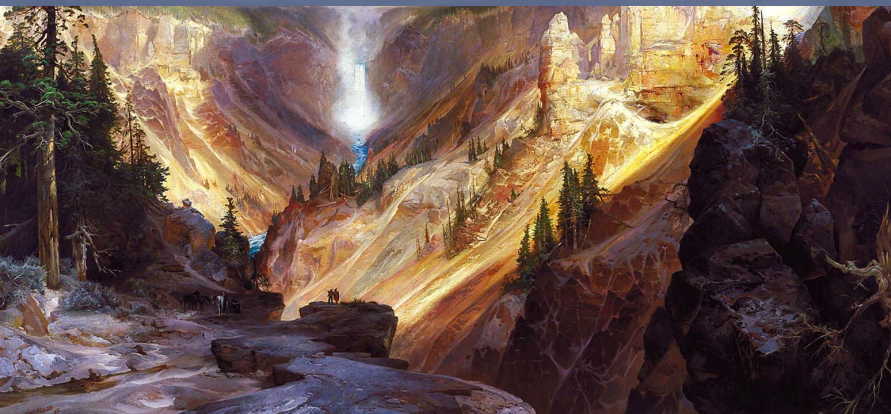
Technological progress cannot be relied on to reduce consumption and, by extension, environmental impact

1,200 lbs	weight	4,000-6,000 lbs
200-250 miles	range	400-500 miles
40-45 mph	max speed	115-130 mph
20-30 mpg	miles per gallon	20-30 mpg

Shifted Baseline Syndrome – the “wild” west



Our extraordinary ability to adapt to a new normal partially (and sometimes wholly) blinds us to the impacts of our actions.



The Grand Canyon of Yellowstone, Thomas Moran 1872



Yellowstone National Park
Est. 1872 as world's first national park

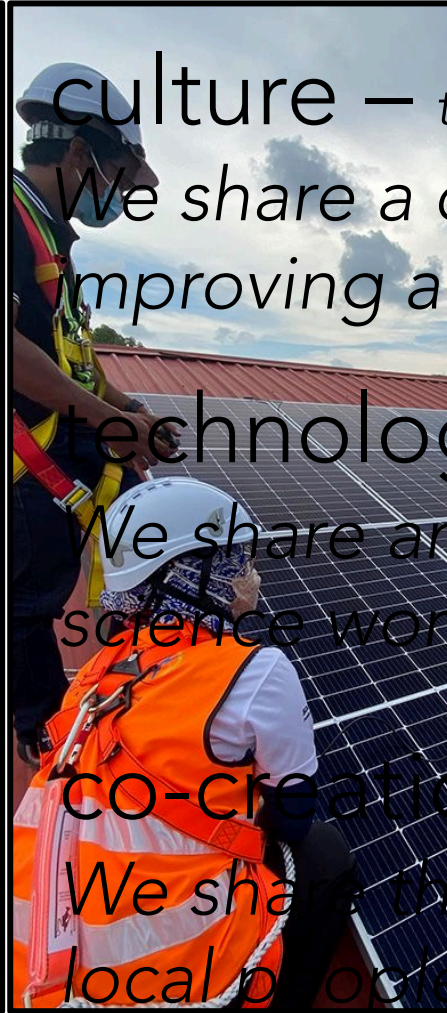
Ambition to Action – YMCA + MIT



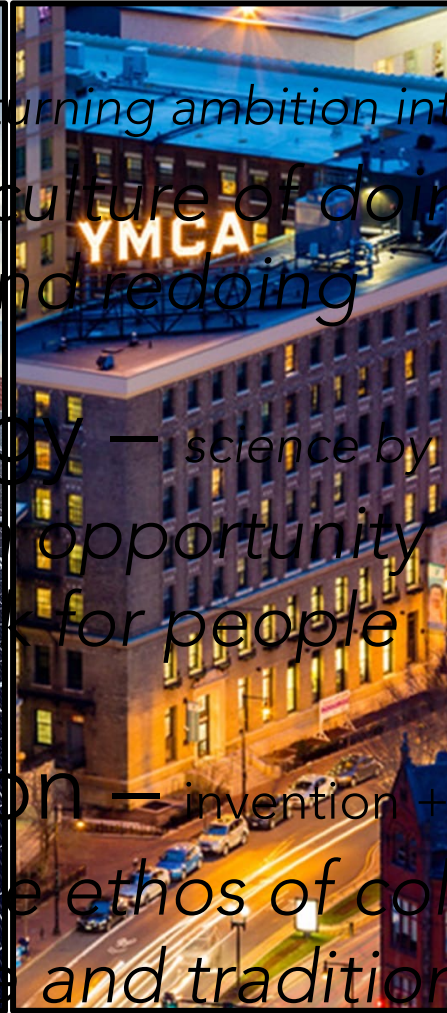
Cities and regions



Local government,
collectives, councils, and
cooperatives



Business, industry, finance



Civil society – NGOs,
community groups, faith-
based orgs, advocacy groups
and more



Universities and research
institutes

culture – turning ambition into action with urgency
We share a culture of doing, learning,
improving and redoing

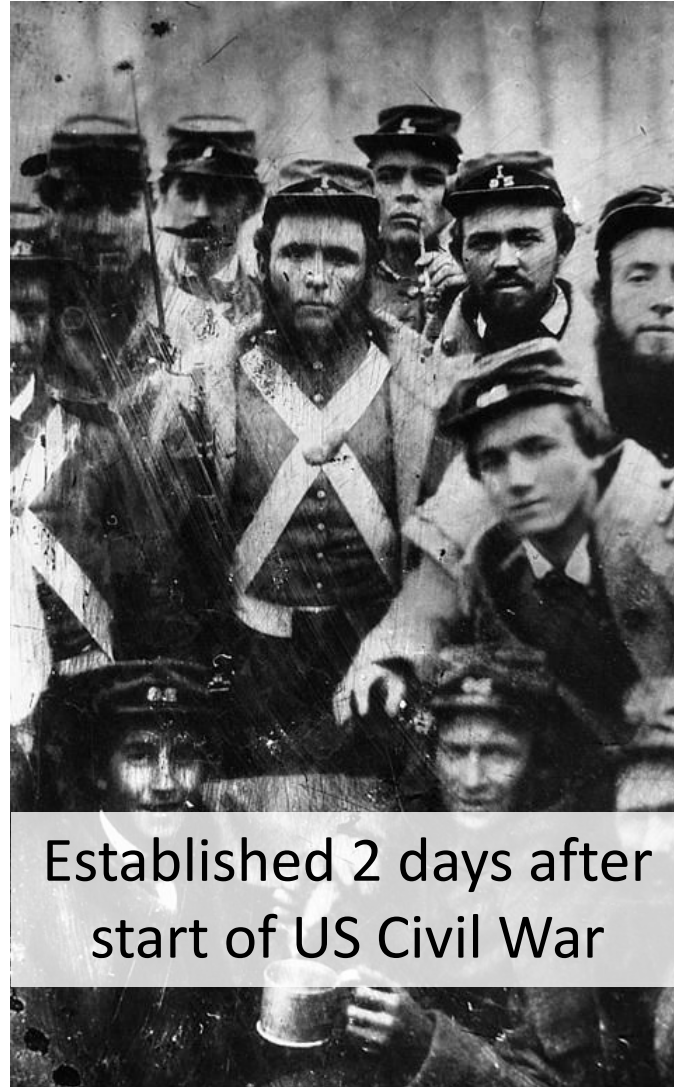
technology – science by and for people
We share an opportunity for making
science work for people

co-creation – invention + ingenuity in community
We share the ethos of collaboration with
local people and traditions

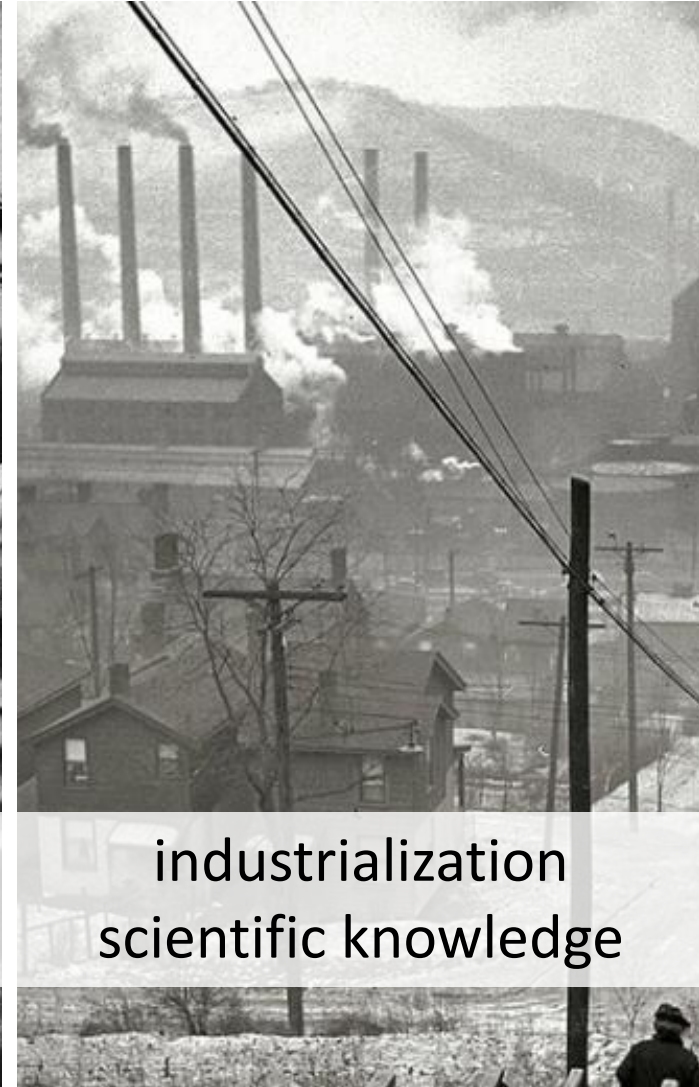
Ambition to Action – Service to country and the world



MIT on the Charles River, Cambridge MA



Established 2 days after
start of US Civil War

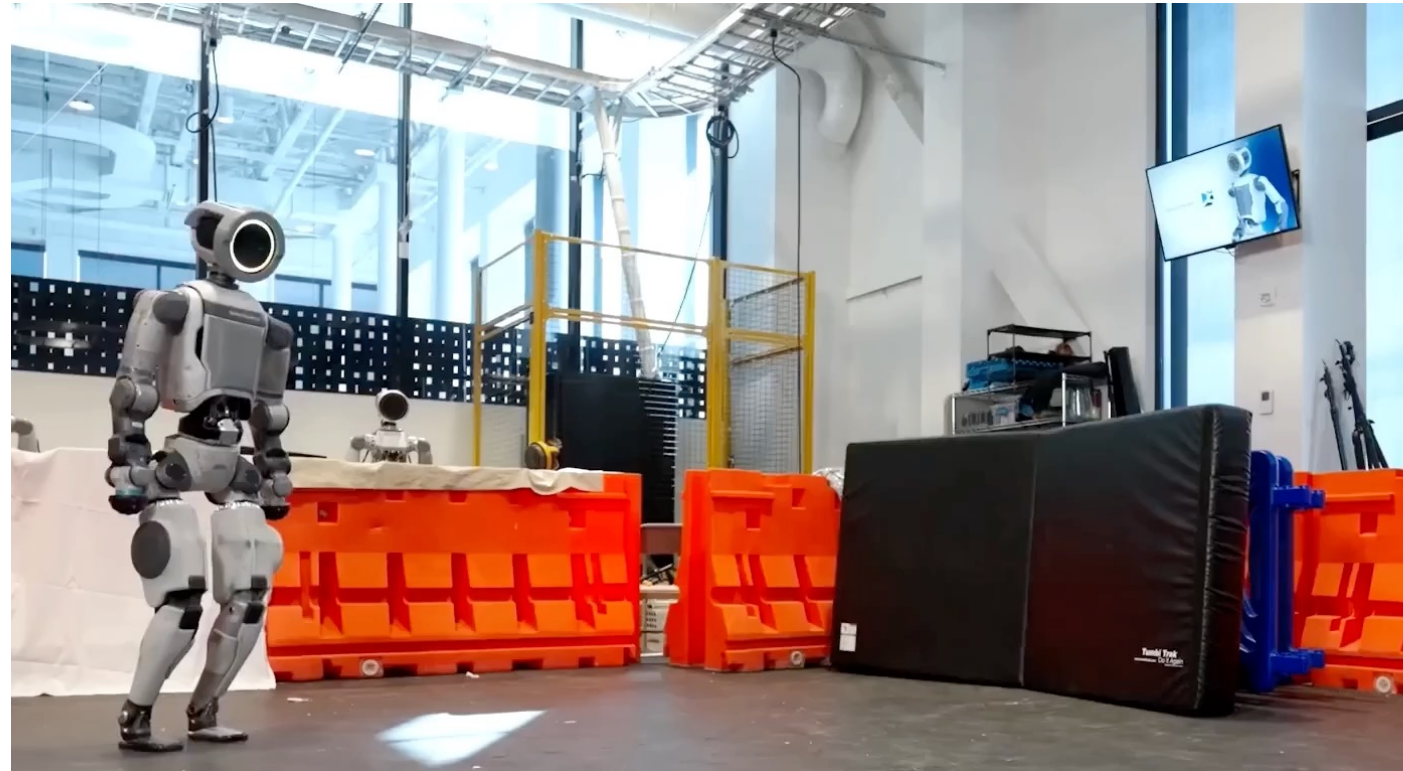


industrialization
scientific knowledge

Ambition to Action – Service to country and the world

MIT

- 1,000 professors
- 12,000 students
- 1 campus
- 26,000 active companies, 3.3 million people employed, \$12 trillion worldwide annual sales



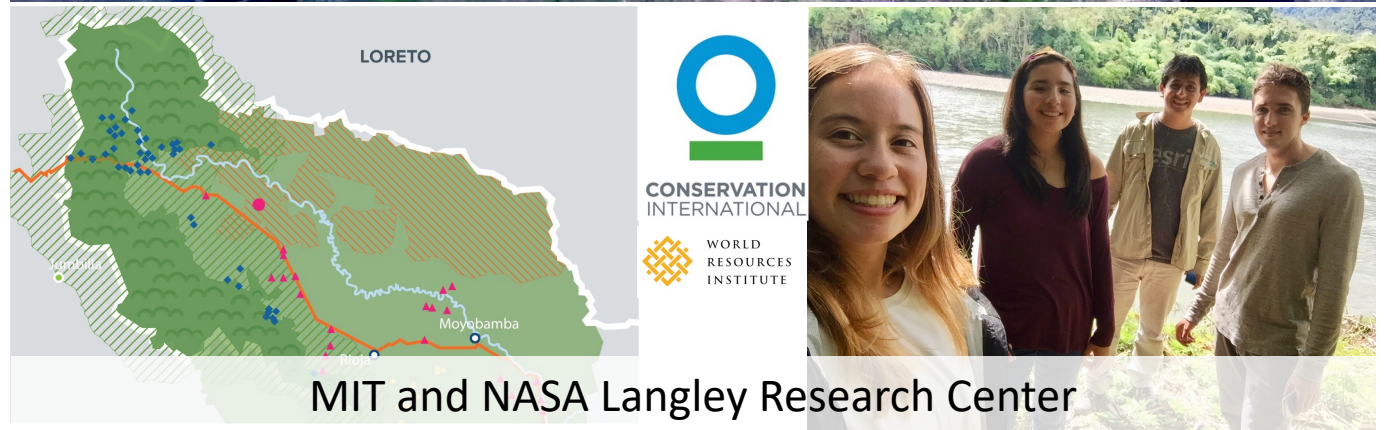
Boston Dynamics – MIT spinoff company
Acquired by Hyundai Motor Group in 2020
Founded by Marc Raibert, former professor EECS

RAI Institute & Boston

Ambition to Action – Service to country and the world

MIT

- Climate Project
- Climate Policy Center
- Center for Sustainability Science and Strategy
- Sloan Sustainability Initiative
- And much more...



ENVIRONMENTAL
SOLUTIONS
INITIATIVE

MIT on the Charles River, Cambridge MA



MIT and NASA Langley Research Center

Ambition to Action – YMCA Vision 2030, Pillar 3

YMCA

- 65 million people across 12 countries
- 90,000 staff
- ~920,000 volunteers
- 12,000 branches

Sustainable Planet Pillar



Ambition to Action – YMCA + MIT

How might we
work together?



Earth Day Hack, MIT 2017

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Earth Day Hack, MIT 2017

Thank you.

