AstraZeneca

The Carbon Environment

A Strategy to Achieve Zero Emissions

September 20, 2023

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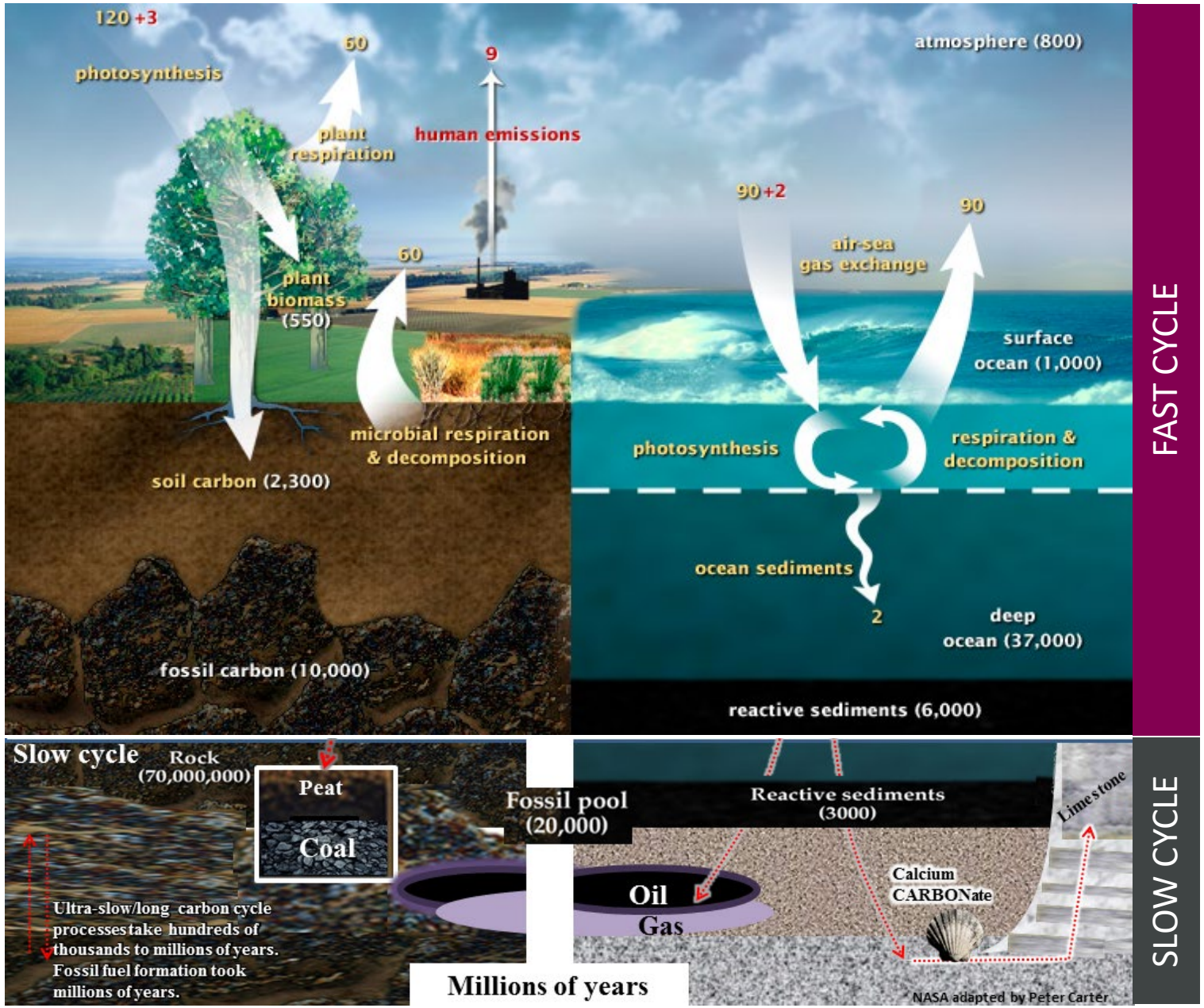
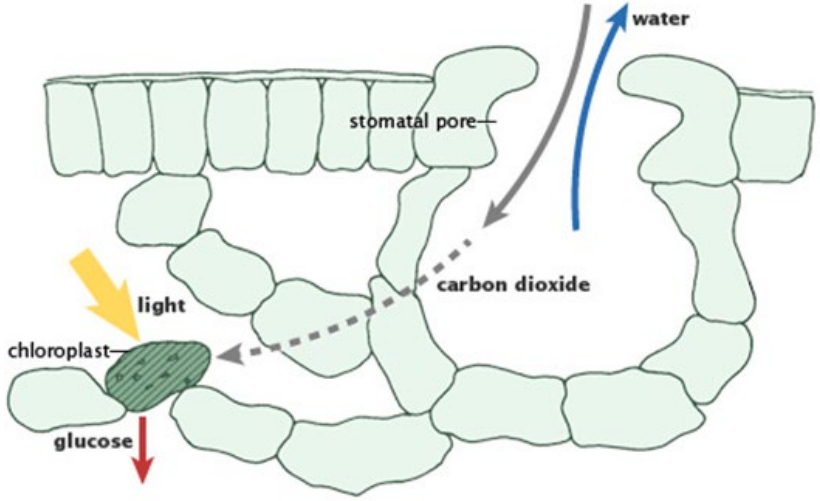
The Carbon Environment

A Brief Look at the Science of Carbon

A Brief Scientific Look at the Carbon Cycle





The photosynthesis cycle, where plants absorb carbon dioxide and sunlight to create sugars. This process forms the foundation of the fast (biological) carbon cycle

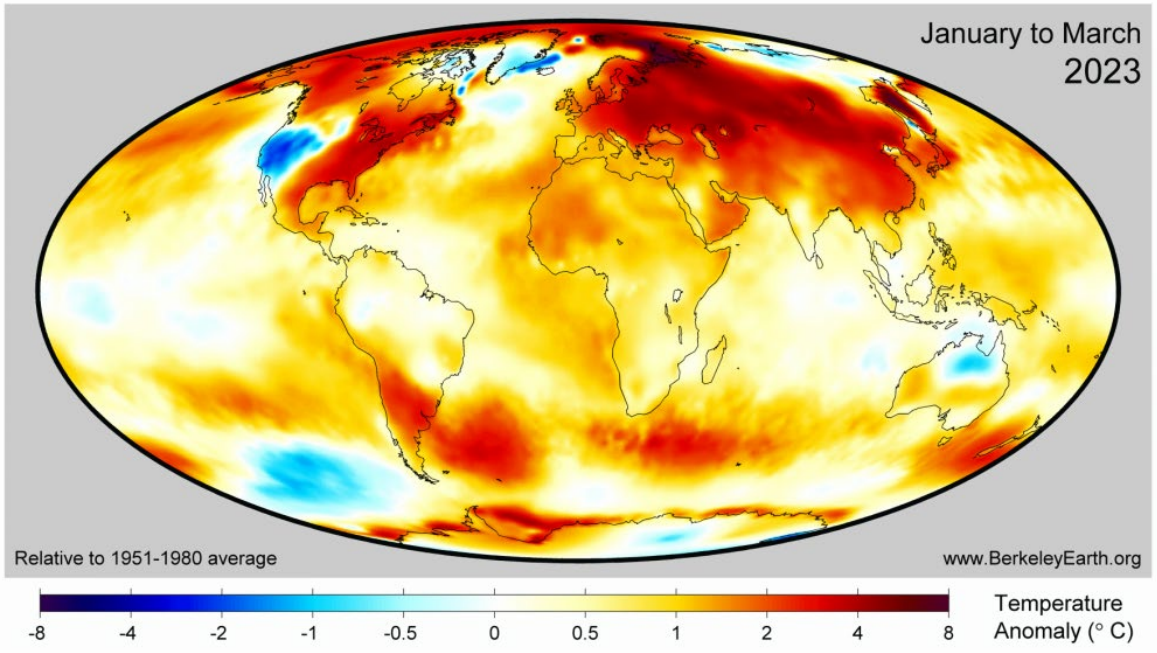
(illustration adapted from PJ Sellers et al., 1992)

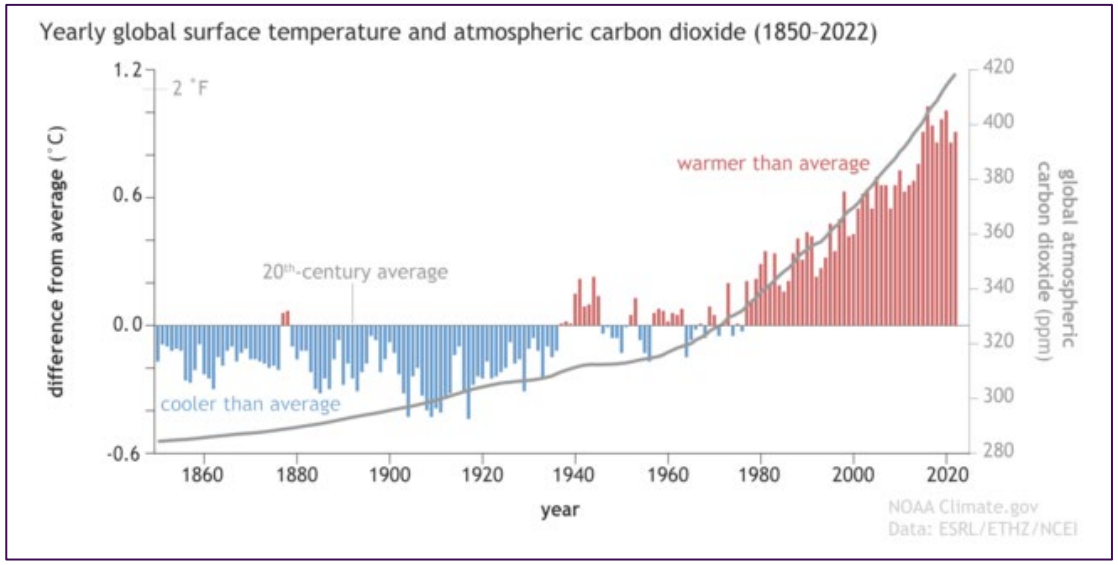
This diagram of the fast carbon cycle shows the movement of carbon between land, atmosphere, and oceans. Yellow numbers are natural fluxes, and red are human contributions in gigatons of carbon per year. White numbers indicate stored carbon.

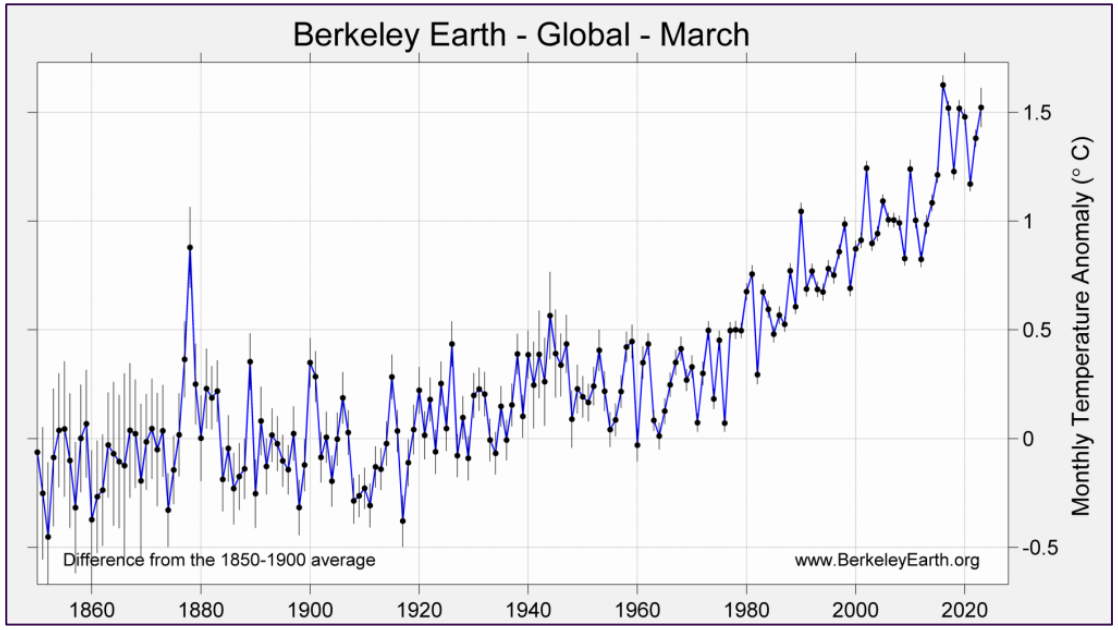
Through a series of chemical reactions and tectonic activity, carbon takes between 100-200 million years to move between rocks, soil, ocean, and atmosphere in the slow carbon cycle.

Picture Source: NASA Earth Observatory, 2011

Correlation of Carbon Emissions and Global Temperature





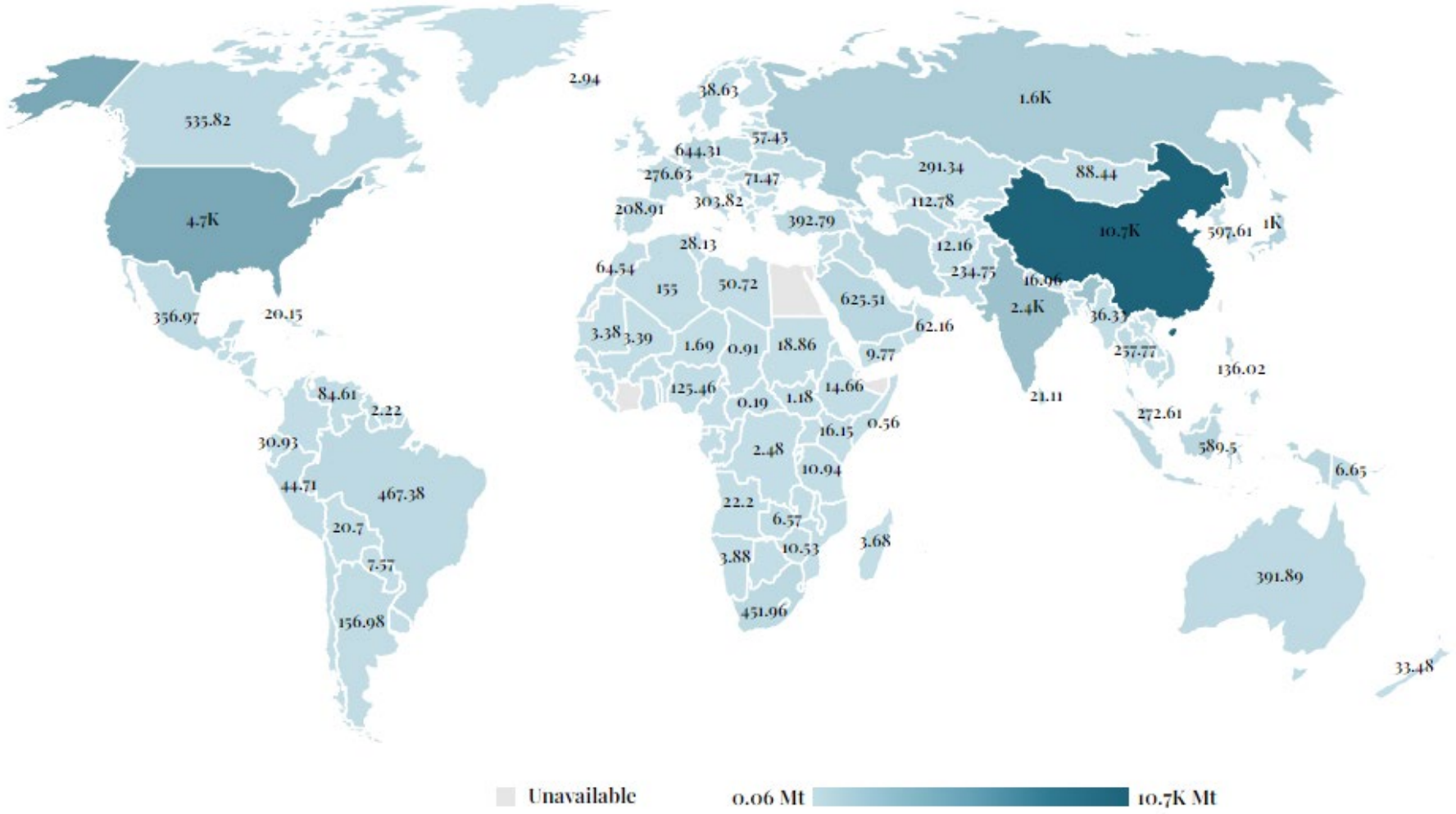


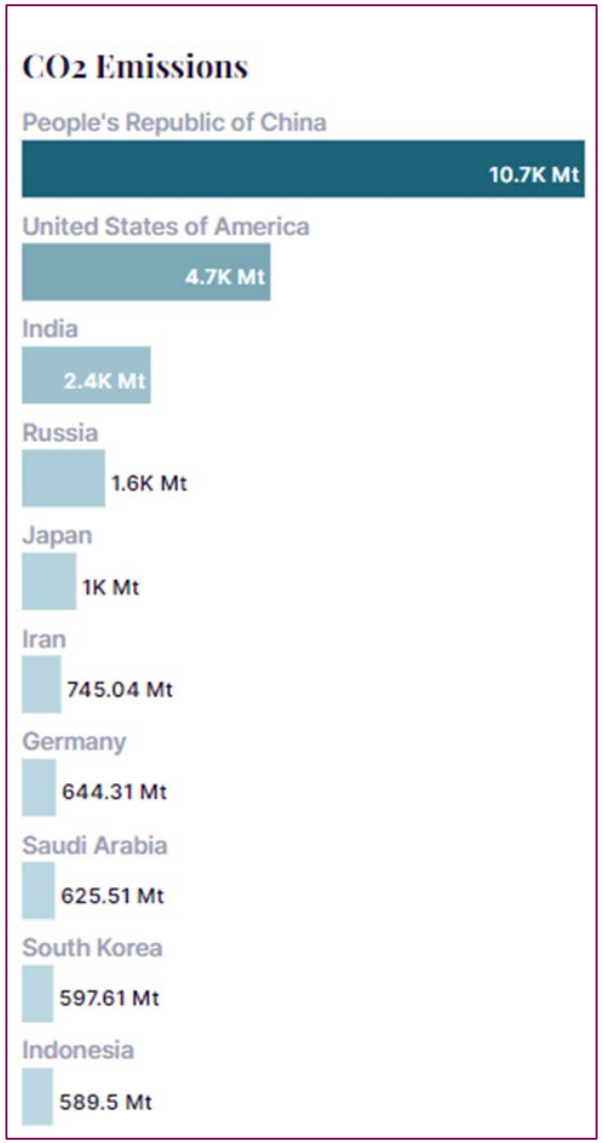
The Paris Agreement:

The treaty recommendation was to set **1.5 degrees Celsius limit as a "defense line"** — if the world can keep below this line, it potentially could avoid the more extreme and irreversible climate effects that would occur with a 2 degrees Celsius increase, and for some places, an even smaller increase than that.

Picture Source: Berkeley Earth Website

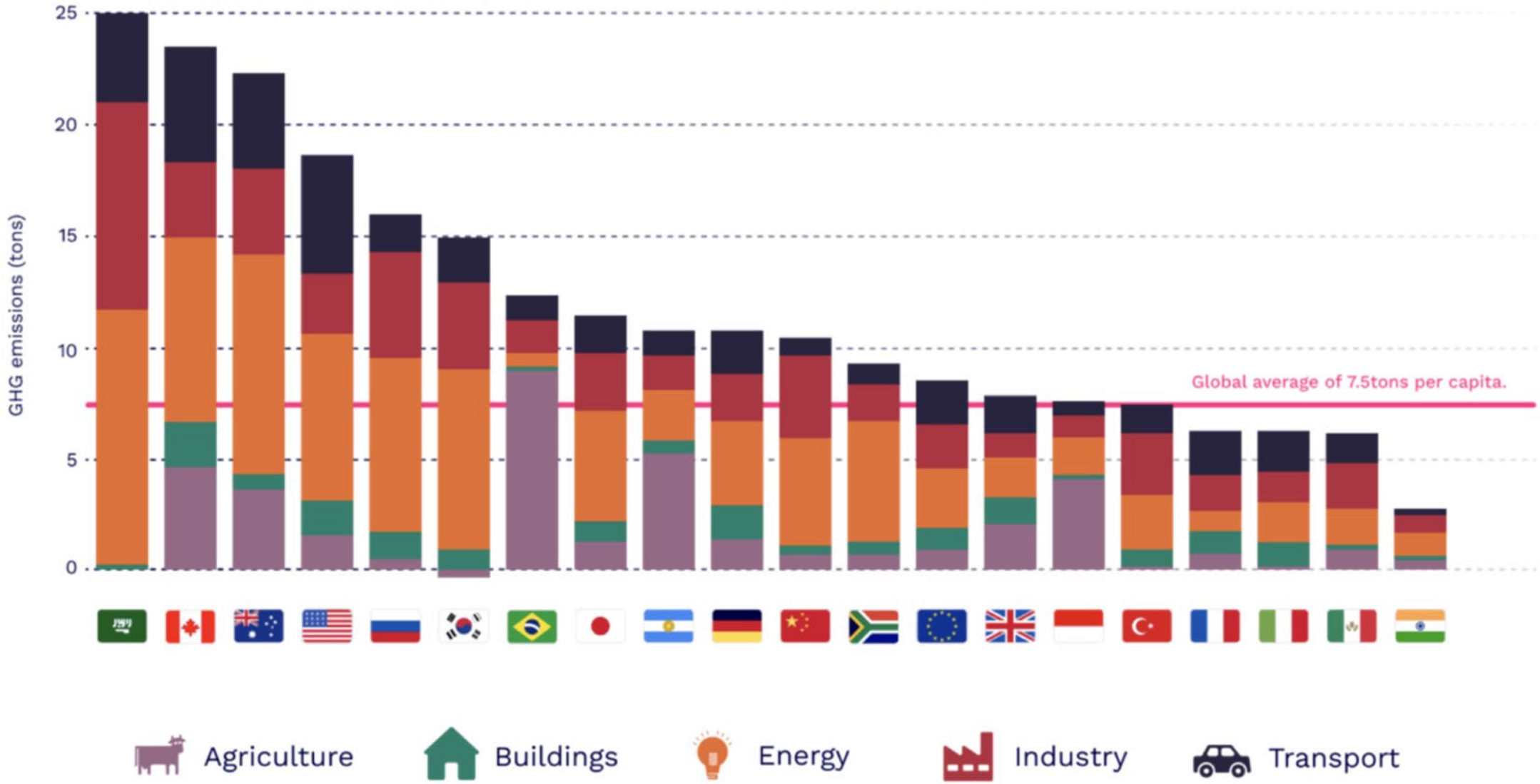
A Look at Annualized “Human” Carbon Emissions by Country





Graphic from Wisevoter Website

A Look at Global Carbon Emissions by Sector



Graphic from Brookings Institute Website

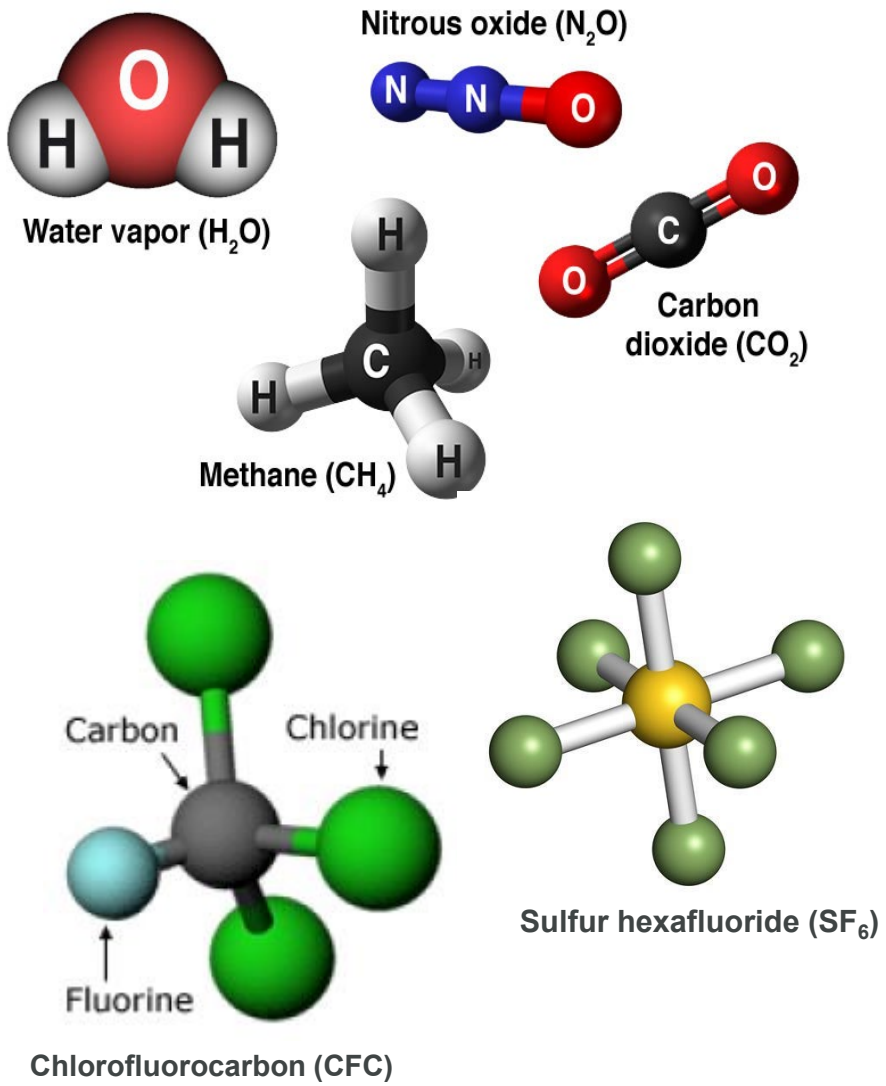
GLOBAL WARMING POTENTIAL (GWP) - Equivalencies

Comparison of other gases to the effect of Carbon Dioxide

The column on the right shows how much that chemical would warm the earth over a **100-year** period as compared to carbon dioxide.

For example, **sulphur hexafluoride is used to fill tennis balls**. The table shows that a release on **1 kg** of this gas is equivalent to 22,800 kg or **22.8 tonnes** of CO_2. Therefore, **releasing ONE KILOGRAM** of sulphur hexafluoride is about **equivalent to driving 5 cars for a year!** (2)

Greenhouse Gas	Formula	100-year GWP (AR4)
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298
Sulphur hexafluoride	SF_6	22,800
Hydrofluorocarbon-23	CHF_3	14,800
Hydrofluorocarbon-32	CH_2F_2	675
Perfluoromethane	CF_4	7,390
Perfluoroethane	C_2F_6	12,200
Perfluoropropane	C_3F_8	8,830
Perfluorobutane	C_4F_{10}	8,860
Perfluorocyclobutane	c-C_4F_8	10,300
Perfluoropentane	C_5F_{12}	13,300
Perfluorohexane	C_6F_{14}	9,300



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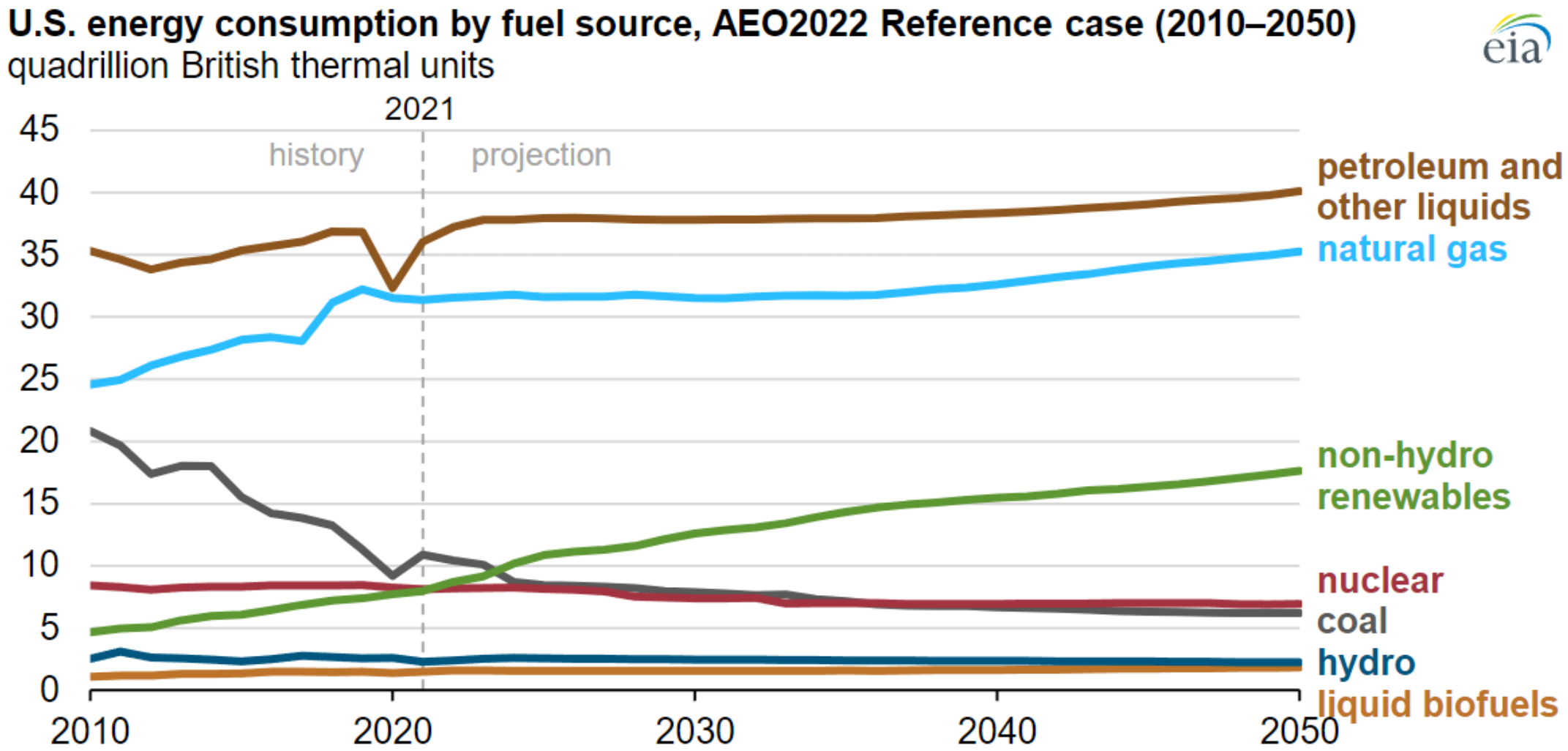
The Status of Alternative Energy

Challenges and Horizons for Sustainable Technologies

Energy Consumption in U.S. (2010 – 2050)

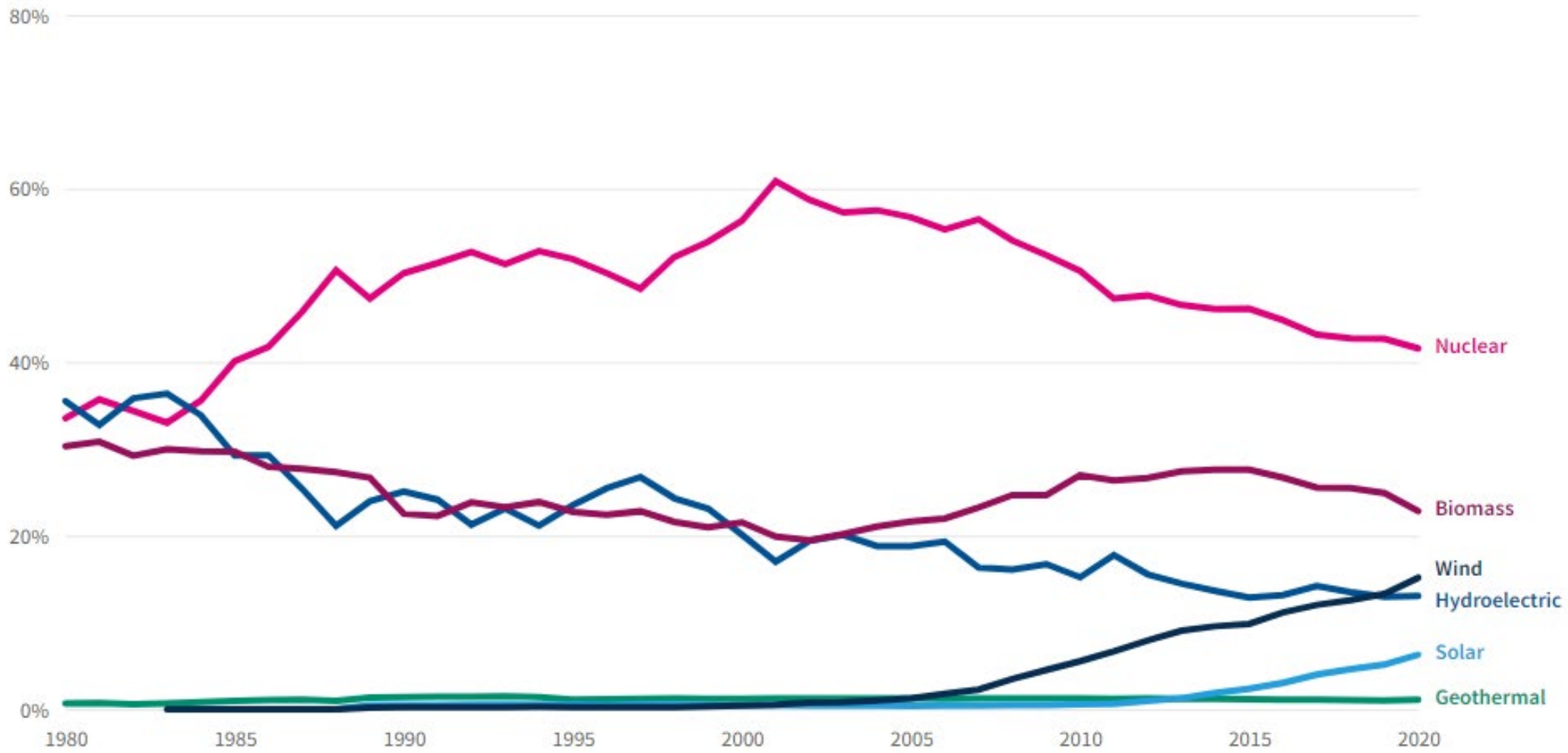


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)
Note: Biofuels are shown separately and included in petroleum and other liquids.

Graphic from EIA Website

The Status of Renewable Energy Consumption in United States

(including Nuclear Power)



COMPOSITION OF RENEWABLE AND NUCLEAR ENERGY CONSUMPTION

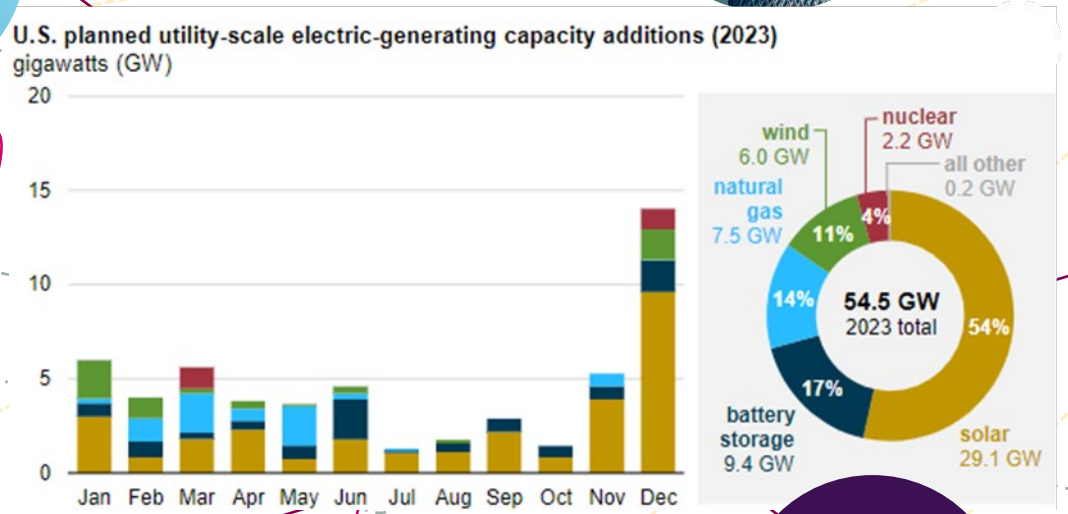
Graphic from EIA Website

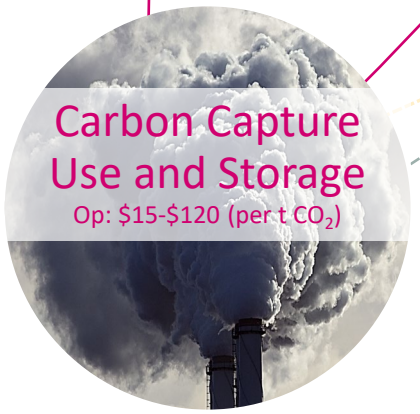
Indiana - Mammoth Solar Farm

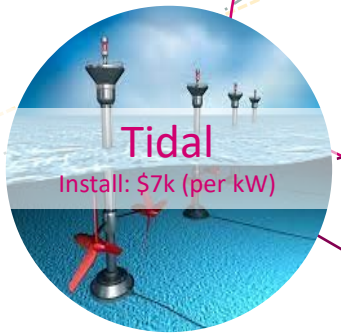
- The Mammoth Solar farm will be built across Starke and Pulaski's county lines, and the initial construction site will be in a rural area about 50 miles (80 kilometers) southwest of South Bend. Doral Renewables is building the solar farm as part of an agreement with American Electric Power
- The 13,000-acre Mammoth Solar farm will become partially operational by mid-2023 and it will start off producing 400 megawatts of electricity, enough to power 75,000 households.
- The Mammoth Solar farm, which will have a total of 2.85 million solar panels, is expected to be fully operational by 2024, at which point it will generate a total of 1.65 gigawatts of electricity.

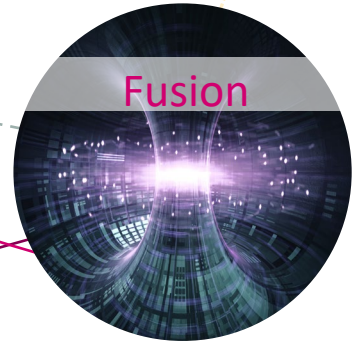
This is currently the largest solar farm installation in the United States

Alternative Energy – Current & Future





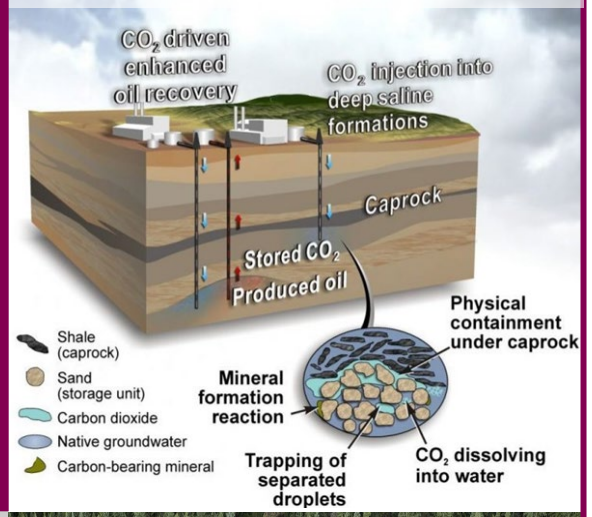


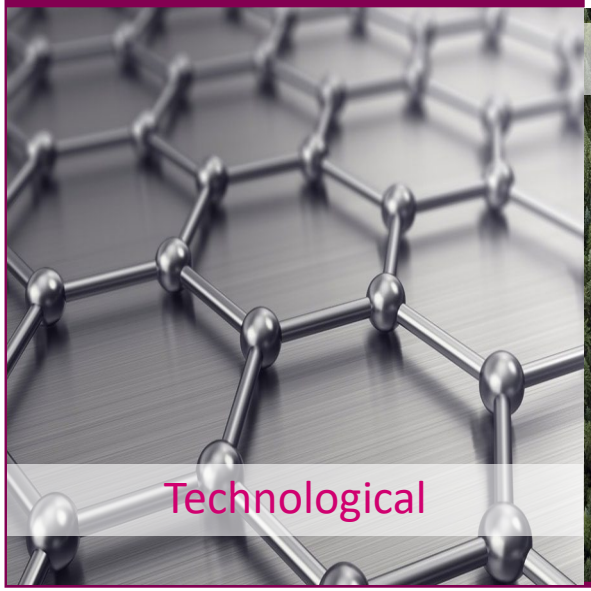


What can we do with Current Carbon Emissions?

Carbon Capture, Use, And Sequestration/Storage

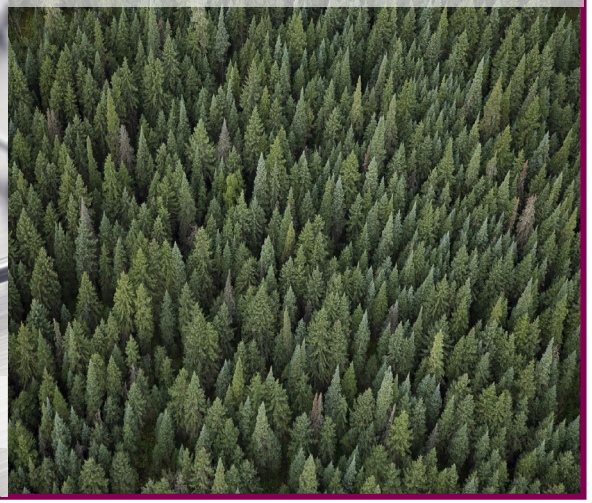
Geological





Technological

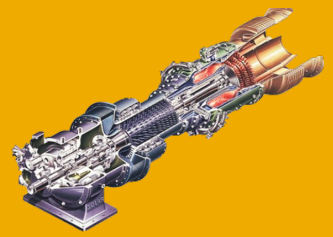
Biological



- Carbon capture, use, and sequestration/storage technologies can capture more than 90 percent of carbon dioxide (CO2) emissions from power plants and industrial facilities.
- Captured carbon dioxide can be put to productive use in enhanced oil recovery and the manufacture of fuels, building materials, and more, or be stored in underground geologic formations.
- Twenty-six commercial-scale carbon capture projects are operating around the world with 21 more in early development and 13 in advanced development reaching front end engineering design (FEED).
- Carbon capture can achieve 14 percent of the global greenhouse gas emissions reductions needed by 2050 and is viewed as the only practical way to achieve deep decarbonization in the industrial sector.
- The use of carbon dioxide as a raw material to produce graphene, a technological material. Graphene is used to create screens for smart phones and other tech devices. Graphene production is limited to specific industries but is an example of how carbon dioxide can be used as a resource and a solution in reducing emissions from the atmosphere.

Other Technology to Consider

Electric Boilers



Turbine (CHP)

Geothermal

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AstraZeneca's Approach

Ambition Zero Carbon 2025

Who are We?

We are a global, science-led biopharmaceutical business and our innovative medicines are used by millions of patients worldwide.

Oncology • Respiratory • Specific Cardiovascular, Renal and Metabolism

Our purpose:

We push the boundaries of science to deliver life-changing medicines.

Our Values

- We follow the science
- We put patients first
- We play to win
- We do the right thing
- We are entrepreneurial

Our strategic priorities

- Science & Innovation
- Growth & Therapy Area Leadership
- People & Sustainability

AstraZeneca

CALQUENCE® (acalabrutinib) 100 mg capsules

TAGRISSO® osimertinib

farxiga® (dapagliflozin) 5mg & 10mg tablets

Qtern® (dapagliflozin/saxagliptin) 5 mg/5 mg tablets

kombiglyze XR (saxagliptin and metformin HCl extended-release) tablets

BEVESPI AEROSPHERE® (glycopyrrolate 9 mcg/formoterol fumarate 4.8 mcg) Inhalation Aerosol

Symbicort® (budesonide/formoterol fumarate dihydrate) Inhalation Aerosol

ONCE-DAILY xigduo XR (dapagliflozin/metformin HCl extended-release) 5/1000 mg tablets

Nexium® (esomeprazole magnesium)

Lynparza® olaparib tablets 150 mg

LUMOXITI® moxetumomab pasudotox-tdfk for injection

BRILINTA® ticagrelor tablets

onglyza® (saxagliptin) 5 mg tablets

CRESTOR® rosuvastatin calcium

SymlinPen® (pramlintide acetate) pen-injector

IMFINZI® durvalumab Injection for Intravenous Use 50 mg/mL

Pulmicort RESPULES® (budesonide inhalation suspension)

FluMist Quadrivalent Influenza Vaccine Live, Intranasal

To address greenhouse gas emissions, we follow a hierarchy

Ambition Zero Carbon 2025

Aim: no residual emissions
Strategy: secure supply of credits

Avoid

Through green design and new ways of working

- Circularity: Assets, Products, Processes
- Asset strategy

Reduce

Improve efficiencies and change energy use behaviour

EP 100

- Continuous Improvement (ISO50001)
- Assess & Invest: NRRGG Capital Fund

Substitute

Substitute energy use with renewables and lower impact fuels/vehicles

RE 100 EV 100

- Ren. Energy PPAs & Fuel Switch /Electrification
- Electric Vehicles
- Low/Zero GWP refrigerants

Compensate

High-quality carbon removal projects for residual/ accidental emissions

- Value Chain CO2 Removal Technology – very high unit cost

Environmental protection

The health of the planet impacts all life

Our ambition

Accelerating the delivery of net-zero healthcare, proactively managing our environmental impact across all activities, and investing in nature and biodiversity

Connection to health

Supporting a healthy environment improves health outcomes and helps prevent the onset of certain diseases likely to become more prevalent in a changing climate

Contributing to the Sustainable Development Goals, a universal blueprint for prosperity for people and the planet, now and into the future.

SDG 6 | Clean water and sanitation
SDG 7 | Affordable and clean energy
SDG 12 | Responsible consumption and production
SDG 13 | Climate action
SDG 15 | Life on land
SDG 17 | Partnerships for the goals

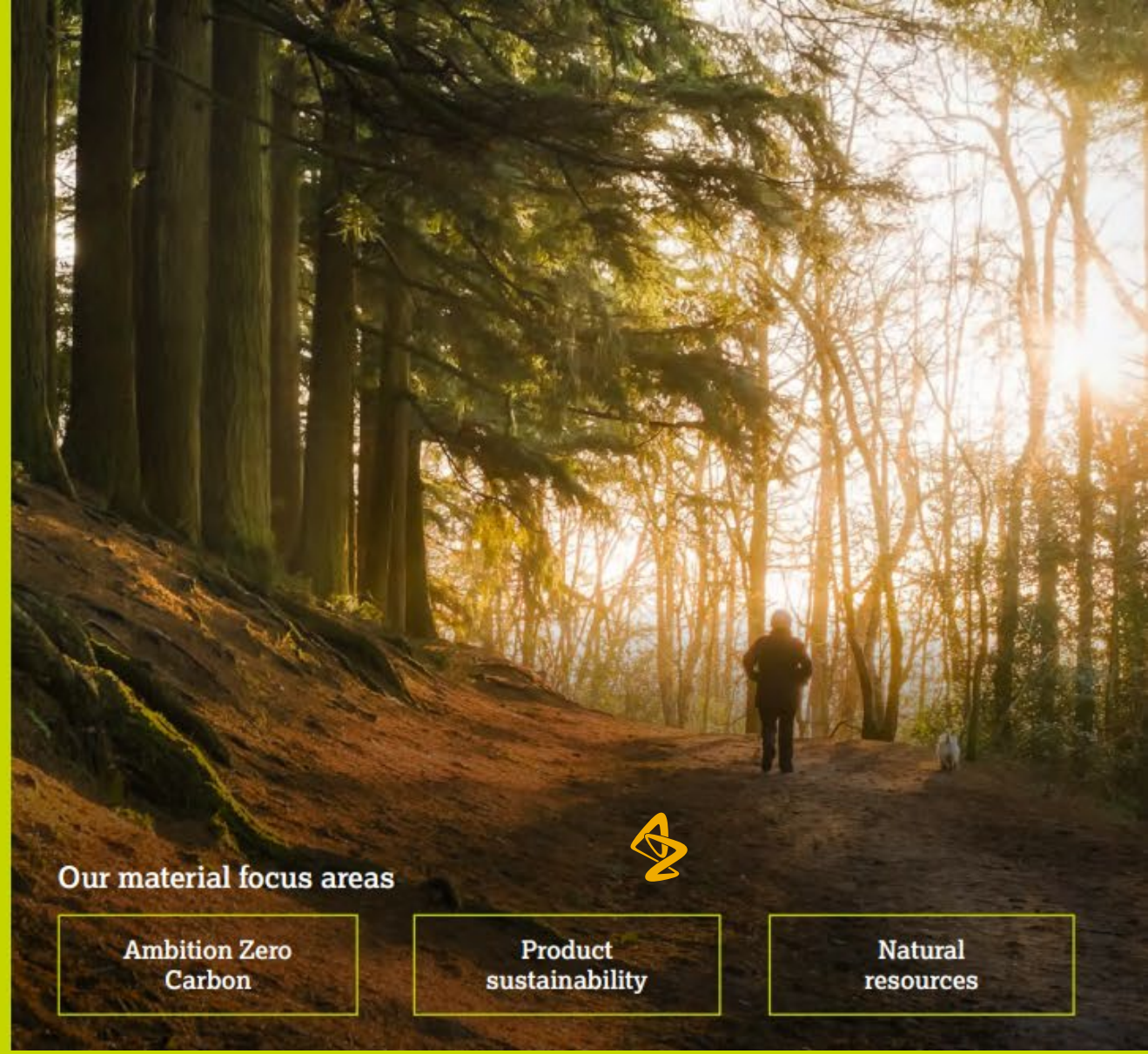
2022 performance

>10.5 million
trees planted in Australia, Indonesia, Ghana, US and the UK since 2020

97.5%
of paper-based product packaging materials used were supplied from sustainable sources achieving the 2022 target[1]

750+
material suppliers with a critical role in patient supply screened to understand climate vulnerability in the upstream value chain for 10 selected medicines

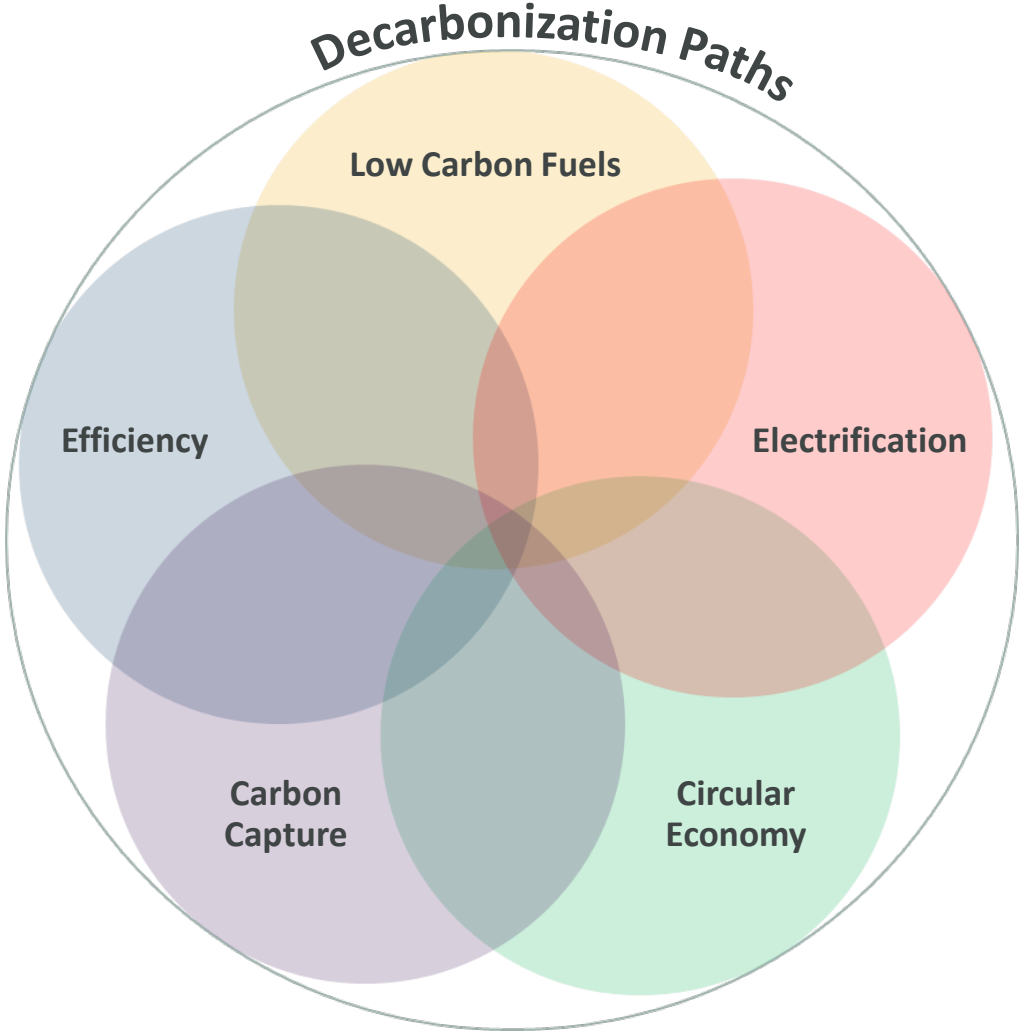
480+
suppliers partnered with to assess and disclose their greenhouse gas emissions to the CDP Supply Chain programme



"AstraZeneca announces $400 million investment in reforestation and biodiversity in support of climate action and human health"
– Announced June 28, 2023

"AstraZeneca announces innovative partnership with Vanguard Renewables to decarbonize its United States sites"
- Announced June 13, 2023

Ambition Zero Carbon – Mt. Vernon Campus



3 MW Solar Farm installation completed in July 2023, consisting of ~8,760 panels on 15 acres, which will substitute 15-20% of imported electricity consumed.

Electric Boiler Technology installation in 2024 that will offset remaining 11,800 mT $CO_{2\,(eq)}$

Mt. Vernon's Glidepath to Zero Carbon

Mt. Vernon
Leading the Way
In Sustainability Initiatives

Electricity

Solar
Energy

3 MW designed capacity

Offsets 15% annual electricity requirements

Electricity Offset:
15%
4,900 MW of Electricity

Eliminate
Burning Natural Gas

Install two eBoilers to achieve Ambition CarbonZero by 2025

100% electrically feed by renewable energy

Offsets annual burning of 225,000 dT of natural gas

Site CO_2 Offset:
100%
11,800 mT of CO_{2e}

Natural Resources

Renew
Building/Facility Infrastructure

Renewed working environment to promote wellness while reducing natural resource demand

Digital lighthouse / smart metering site

Site Energy Offset:
19%
19,000 MW of Energy

Regrow
Biodiversity

Over 1,500 trees in community – removes 45 mT of carbon over 20 years

Fortifying habitat for plant & animal species richness onsite

Species Richness:
>100
Flora/Fauna (identified to date)

Water

Conserve
Water Reuse

Increase utility water cycles / minimizes chemical usage to decrease water discharge.

Studying stormwater retention & reuse

Water Usage Offset:
5%
4.0 million gallons

Water
Chill Water Systems

Replace/control optimization on chiller system

Cooling tower replacement

Improve electric demand

Water Usage Offset:
3%
1.5 million gallons

Waste

Zero
Waste to Landfill Initiative

Compactor installed for Café & Administration

Green Team Composting initiative

Landfill Avoidance:
99%
800 mT Waste-to-Energy

Circular
Economy

Reuse, recycle & sell materials back into economy

New products from waste initiative

Circular Rate:
50%
1,050 mT Reused/Recycled

*"Almost all **scientific** inquiry **begins** with an observation that piques curiosity or raises a **question**"*