Climate science update

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The US is warming, especially along the coasts.
While the wet gets wetter & the dry gets drier
This map denotes the approximate location for each of the 22 separate billion-dollar weather and climate disasters that impacted the United States during 2020.
CLIMATE ESSENTIALS 2021: CLIMATE CHANGE MITIGATION

Image credit: L.A. Cicero
CLIMATE CHANGE MITIGATION:

A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

- Energy technologies
- Electrification
- Carbon dioxide removal
- Energy efficiency
- Other GHG Emission Sources
  - Manufacturing
  - Land use
  - Agriculture
GHG emissions have been growing rapidly.
But they need to fall (to zero) even faster.
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Broad solution strategy

Gross positive GHG emissions
(CO₂, CH₄, N₂O, F-Gases)

GHG emissions (Gt CO₂e/y)

Business as usual emissions

2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Broad solution strategy

Gross positive GHG emissions (CO₂, CH₄, N₂O, F-Gases)

Mitigated GHG emissions

Other GHGs

Business as usual emissions

CO₂ emissions

GHG emissions (Gt CO₂e/yr)

2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Broad solution strategy
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Data: IPCC SR 1.5, 2018
What are the emissions for?

Data: WRI for 2016
What are the emissions for?

- AFOLU
- Industry
- Transport

Categories:
- Energy
- Buildings
- Industry
- Transport

Fugitive Emissions
- Ag Energy
- Cropland
- Deforestation
- Burning
- Rice
- Ag Soils
- Livestock
- Deforestation
- Rice
- Ag Soils
- Livestock

Unallocated Fuel

Data: WRI for 2016
CLIMATE CHANGE MITIGATION:

Most of the categories have elements that are mature, reliable, and affordable but there are still important gaps and all being deployed much too slowly.

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Energy technologies: Many attractive options

Wind & solar: cheaper than coal in much of the world.

Renewables growing rapidly but only 26% of global total in 2018 (11% in the USA).

Biggest technological limit is long-term storage.
Renewables are Surging

Figure 1: How The World Is Fueled

Source: ExxonMobil Corp., IEA

Source: BP Statistical Review of Global Energy
Note: ‘Other renewables’ refers to renewable sources including geothermal, biomass, waste, wave and tidal. Traditional biomass is not included.
Electrification - Rapid progress but still a small fraction

1996

2021

EVs ~ 2.5% of new car sales in 2019

Camilo Sanchez - CC BY-SA 4.0
Carbon Dioxide Removal

Natural climate solutions:
- can be win-win-win
- Require land, water

Industrial solutions:
- Already affordable in some applications
Energy Efficiency

Our biggest source of progress to date. Saves money and energy.

Compared to trend in 1973, US energy consumption in 2016 was down by 85%
Other emissions
What does it all cost?

Net = Expenditures – Avoided Damages + Increased Growth

Biden Administration: Proposed Expenditures
- Federal Expenditures next 10 years: $1.7 Trillion
- Anticipated Private, State, Local: $5 Trillion

A personal forecast:
Expenditures << Avoided Damages + Increased Growth
The rest of the puzzle

- Finance
- Policy
- A Global View
- Leadership
Risk & responses in a changing climate
Concerns about status-quo adaptation

Inequitable

Incomplete

Isolated

Maximizing benefits from adaptation

Multiple jurisdictions/organizations

Integrated approaches

Multiple hazards

Proactive deployment
