

A Forest of Futures

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|-------------------------------------|--------------------|-------------------------------------|-------------------------|
| <input checked="" type="checkbox"/> | Climate change | <input type="checkbox"/> | Child abuse |
| <input type="checkbox"/> | Food insecurity | <input type="checkbox"/> | Denial of human rights |
| <input type="checkbox"/> | Self-determination | <input checked="" type="checkbox"/> | Access to sanitation |
| <input checked="" type="checkbox"/> | Malaria | <input type="checkbox"/> | Conflict resolution |
| <input type="checkbox"/> | Gender inequality | <input type="checkbox"/> | Obesity |
| <input type="checkbox"/> | Opioid addiction | <input checked="" type="checkbox"/> | Literacy |
| <input type="checkbox"/> | Mass migration | <input checked="" type="checkbox"/> | Protecting biodiversity |



Climate change



Child abuse



Food insecurity



Denial of human rights



Self-determination



Access to sanitation



Malaria



Conflict resolution



Gender inequality



Obesity



Opioid addiction



Literacy



Mass migration

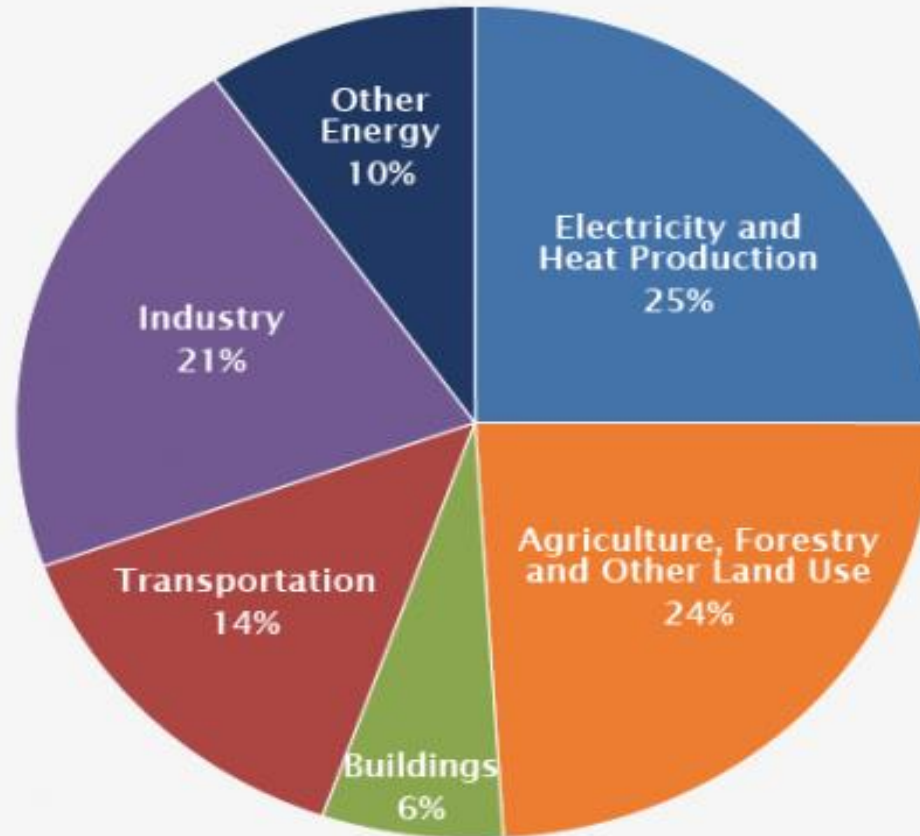


Protecting biodiversity



Climate change

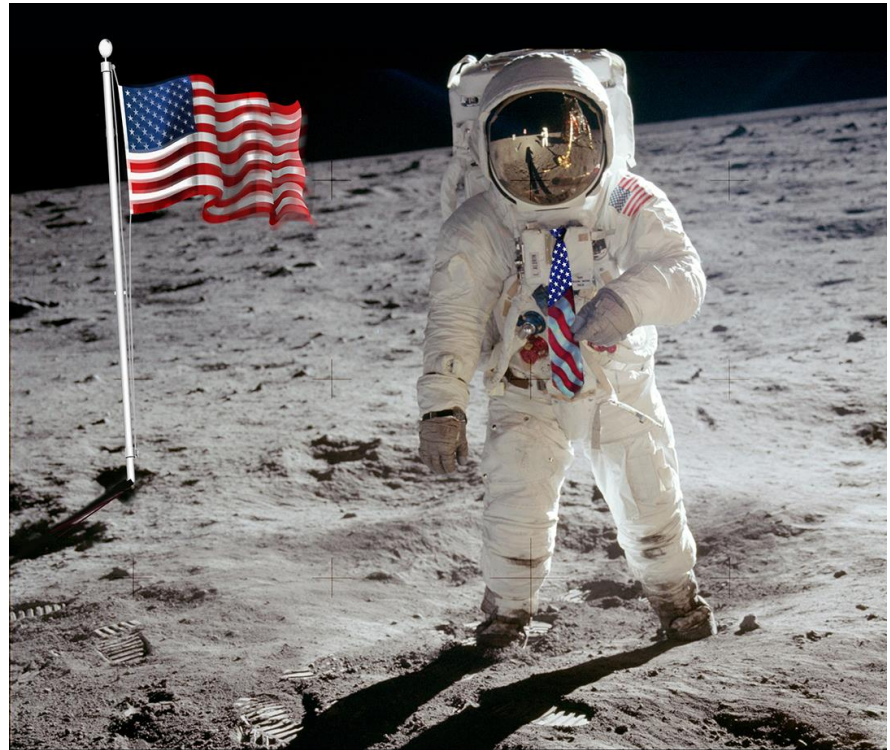
Global Greenhouse Gas Emissions by Economic Sector



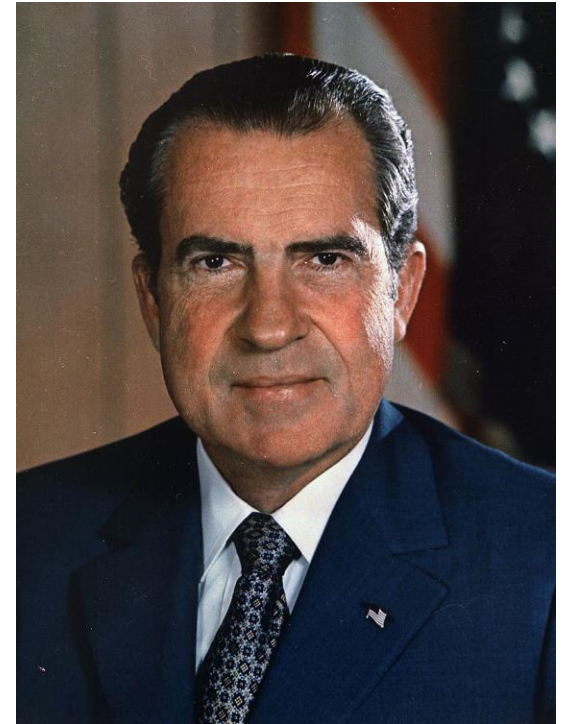
IPCC, 2014



Kennedy's moon shot, 1961

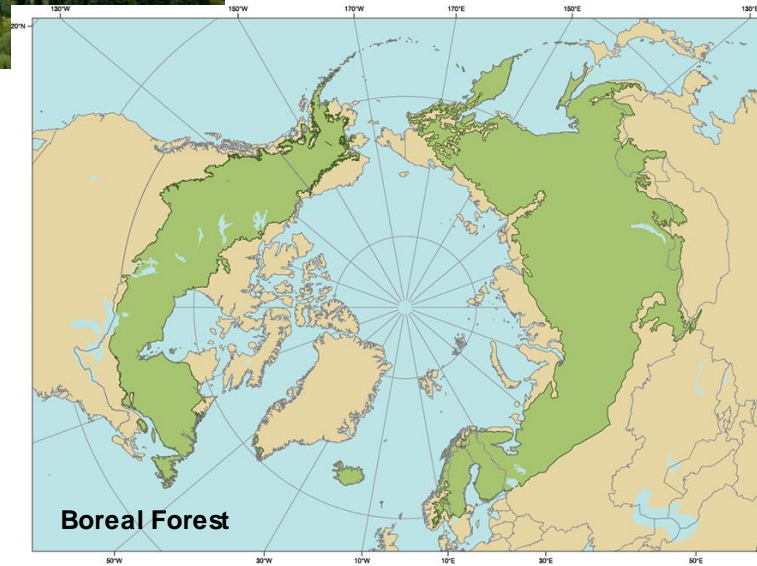


Nixon's war on cancer, 1971





Photosynthesis generates biomass and biological energy from sunlight

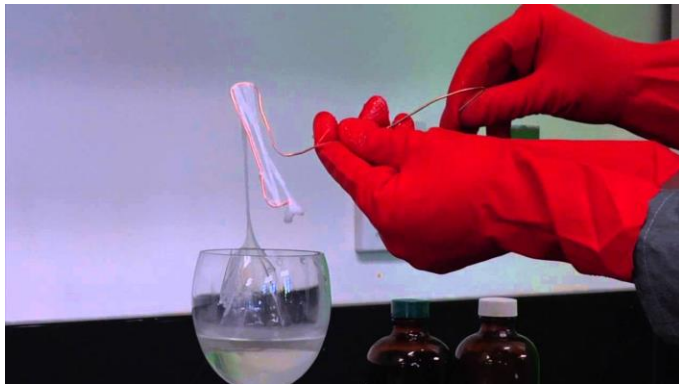


But the efficiency of this process is temperature-dependent

FUEL



BIOSYNTHESIS



WORK

HEAT



Mitochondria regulate the balance between heat production, biosynthesis and useful work



Engineering *Arabidopsis* to grow better in cool conditions



100 years



50 years

Bioengineering forest trees to grow faster in cold climates



Forest productivity → energy, construction, chemicals....

PV cells
wind turbines
hydro

Forest biomass

Algal biomass

Electrical
power



Agricultural and food residues

Biofuels represent a common end-point



Infrastructure already in place



No need to sacrifice agricultural land



Engineering the forest to meet our needs

- **stress resistance**
- **tailor-made products**
- **biomass > reproduction**



Engineering our society to meet those needs



agrarian



manufacturing



services



knowledge

