

Biomass Burning

- Biomass burning is common in developing countries, especially in tropical places and savannas
 - Serves to clear land for agriculture and pastoral lands and remove dry vegetation to promote agricultural activity
 - Agricultural waste and wood are burned for fuel as well to use for cooking and heating
- Biomass containing 2 to 5 petagrams (1 petagram = 10^{15} grams) of carbon is burned annually
 - Produces large amounts of trace gases that play important roles in atmospheric chemistry and climate
 - Emissions of CO and CH₄ affect oxidation efficiency of the atmosphere by reacting with Hydroxyl radicals
 - Emissions of nitric oxide and hydrocarbons leads to high levels of ozone concentrations in the tropics during dry season
- Produces a lot of smoke and aerosols
 - Visibility calculation from class can be used
 - Can serve as cloud condensation nuclei
 - Substantially influence cloud microphysical and optical properties, which could affect radiation budgets and the hydrological cycles in the tropics
- Widespread burning can disturb biogeochemical cycles, like nitrogen
 - 50% of nitrogen in biomass fuel can be released as molecular nitrogen
 - this pyridenitrification process causes sizeable losses in fixed nitrogen in tropical ecosystems
 - researchers discovered that bacteria in soil enhance production of the greenhouse gas nitrous oxide, which is caused by increased concentrations of ammonium in the ash
- biomass burning is very big in India and Africa
 - majority of fires are man-caused
 - traditional slash and burn/shifting agricultural
 - burning during major harvesting period (March to May) contributes up to 60% release of toxic gases such as CO and NO₂, which is a precursor to ozone
- when wood is being burned, large amounts of CO₂ are being released, greenhouse gas
- particulate matter can cause respiratory problems, ash
- the impact of fire emissions on surface CO levels is widespread, but NO₂ is more restricted to origin of fires
- Biomass + air → carbon dioxide + water vapor + nitrogen + heat
- (from our textbook) burning of vegetation also produces CH₃Cl, which is a natural precursor to ClO_x
 - ClO_x in the stratosphere influences atmospheric ozone concentrations
- Economic and social implications stem from taking away developing countries' way of life and the way they have been farming and clearing land for generations

- For them it is the cheapest and easiest way to clear land as well as produce energy to cook their food
 - Traditional methods of cooking and living
- Researchers studying Southeast Asia fires in 1997 developed a fire combustion model to determine emissions
 - Dependent on the ecosystem and fire temperature
 - Knowing this helps accurately estimate environmental impacts of the greenhouse gases
 - Useful model for determining the contribution of biomass burning to total production of greenhouse gases (a requirement for Kyoto Protocol)
- Method to fix the problem is to find alternative fuel sources for cooking and energy, and a new means of clearing land instead of slash burn method
 - Or even incentivize the countries not to burn savannas and forests

<https://www.ncbi.nlm.nih.gov/pubmed/17734705>

<https://pdfs.semanticscholar.org/presentation/40c5/a5c80a6cf1d60c816b3299cfeba765e4090c.pdf>

<https://earthobservatory.nasa.gov/Features/BiomassBurning/>

<https://timesofindia.indiatimes.com/home/environment/pollution/Biomass-burning-a-major-source-of-pollution-in-India/articleshow/45093405.cms>

<https://www.sciencedirect.com/science/article/pii/S1352231017306854>

our textbook