

The Need for Alternative Fuel Sources: Biodiesel and Other Options

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Diesel Engines

- 94% of all goods in the United States are transported by vehicles with diesel powered engines
- Used for their power, reliability, and durability
- Can be recognized by their emissions of sooty, foul smelling exhaust

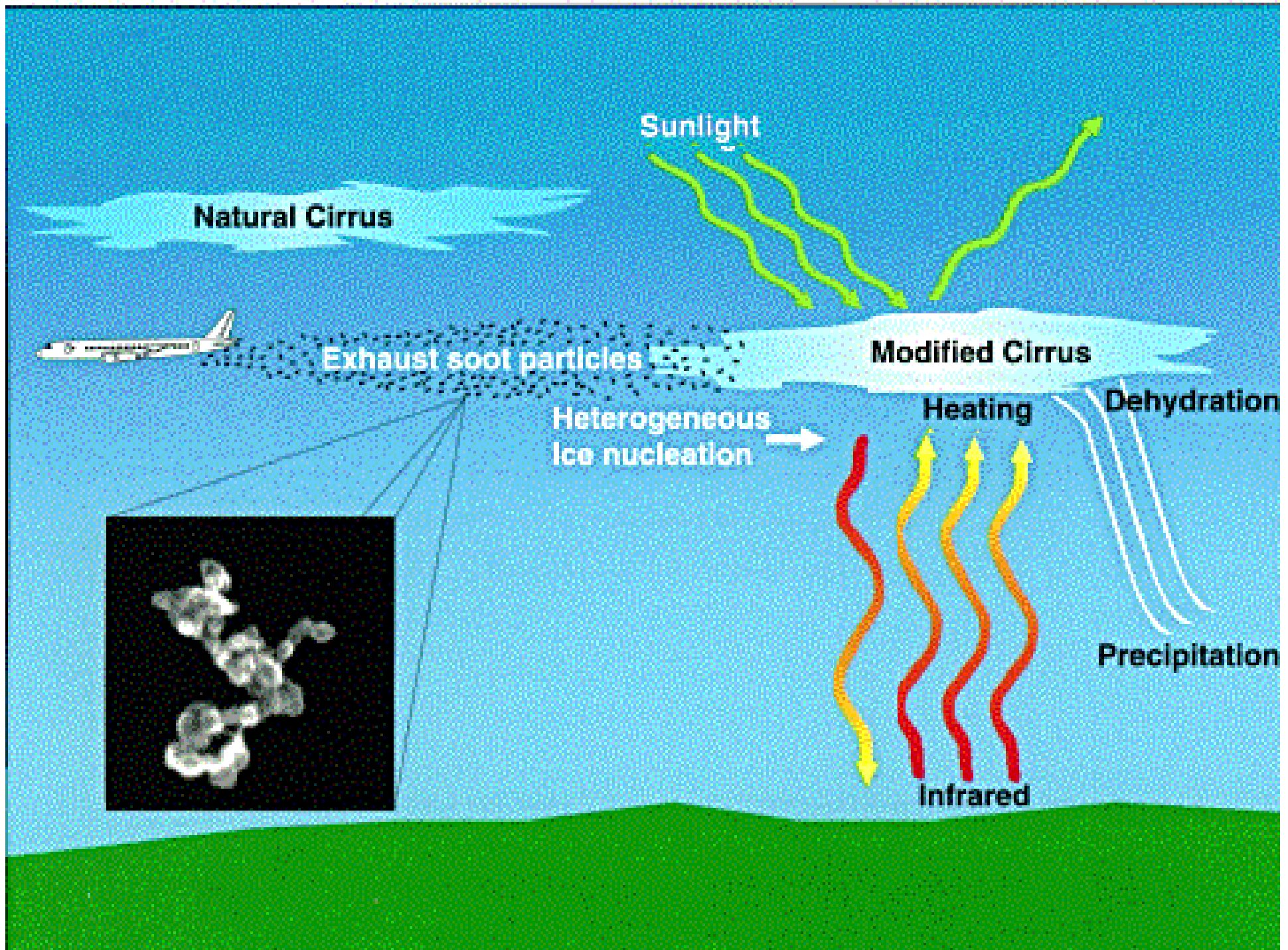
Diesel Exhaust Contains:

- Unburned Carbon Compounds
- Carbon Monoxide and Dioxide
- Nitrogen Oxides
- Sulfur
- Polycyclic Aromatic Hydrocarbons

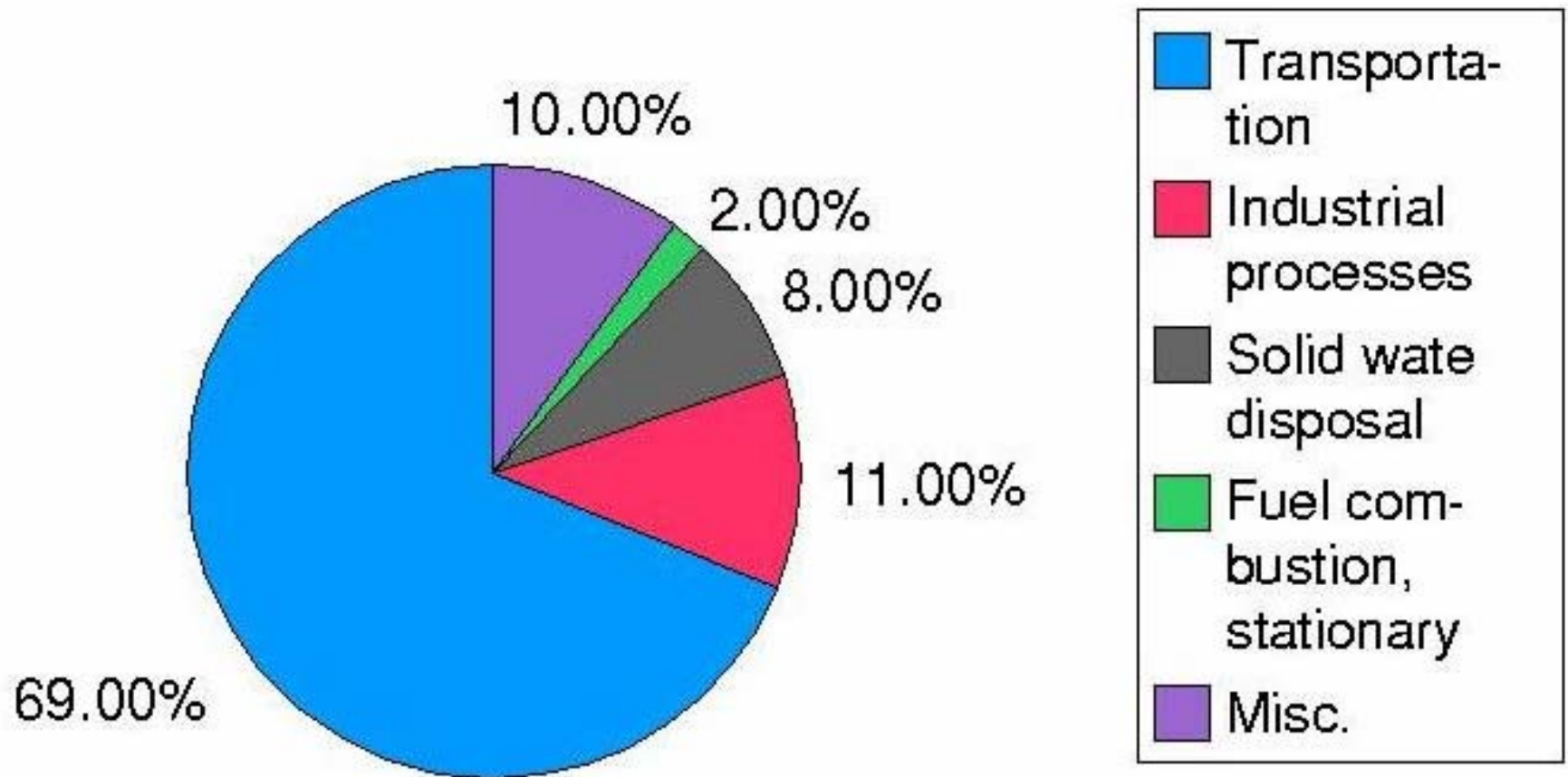


Unburned Carbon

- Becomes eye and lung irritants when emitted to the atmosphere
- Soot is able to bypass the body's main immunodefense mechanisms, and become imbedded deep in the lungs
- Prolonged exposure can cause lung disease and asthma
- Responsible for corrosion, harm to vegetation, a reduction in visibility, and affects the climate



Carbon monoxide



Carbon Monoxide

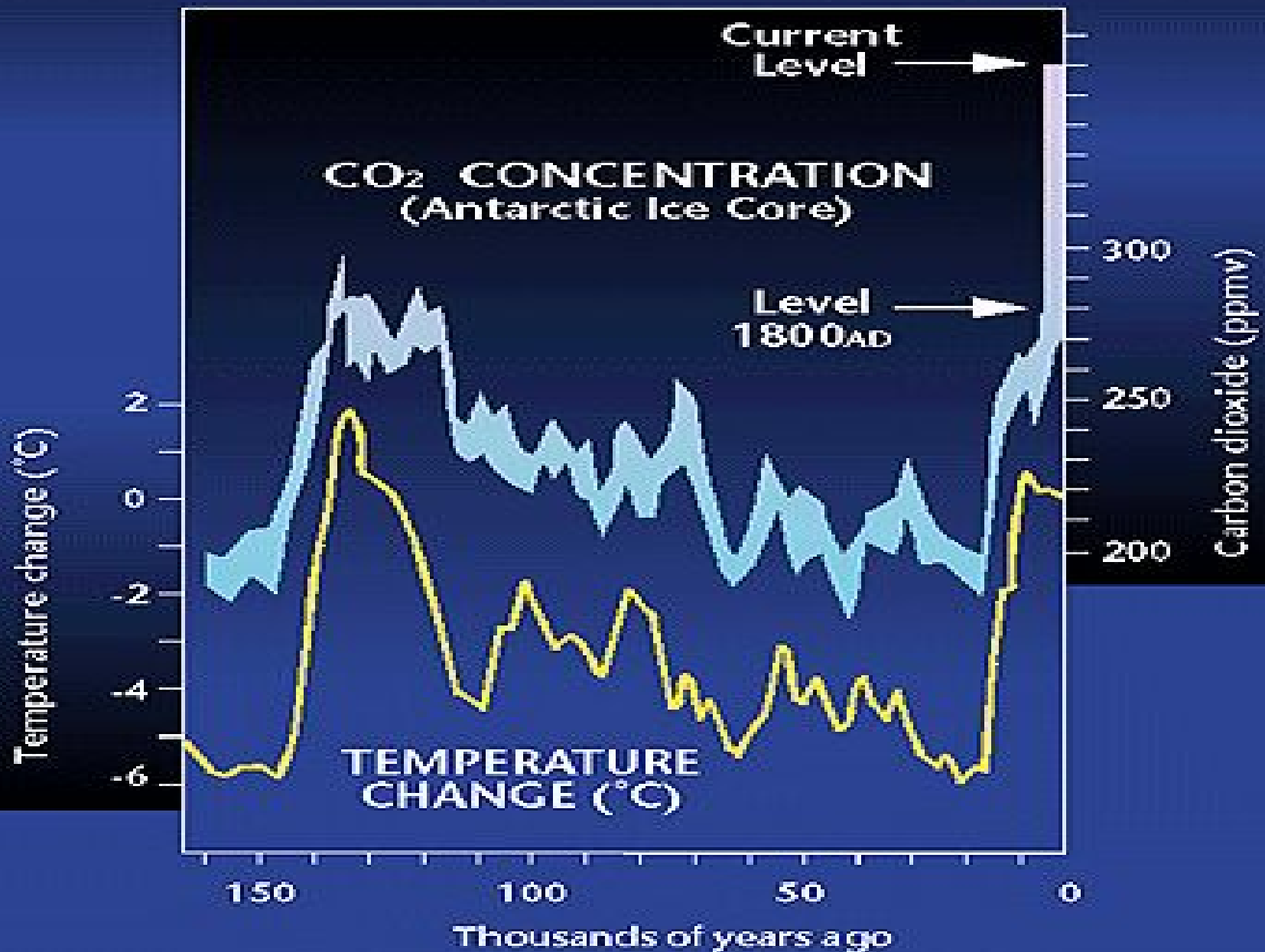
- Reduces air quality
- Human exposure to CO reduces the ability of the blood to carry oxygen to the body's vital organs
- Low-exposure can cause dizziness, headaches, fatigue, and chronic flu-like symptoms
- High-exposure can cause death



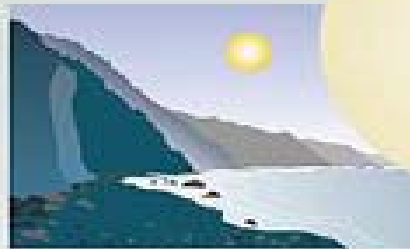
Carbon Dioxide

- Disrupts the Earth's natural carbon cycle
- An increase in Carbon Dioxide results in a decrease of infrared radiation able to escape the atmosphere
- Acts as a greenhouse gas and promotes global warming
- Absorbs heat in the atmosphere

Atmospheric Carbon Dioxide Concentration and Temperature Change



Temperature



Sea level rise

Precipitation



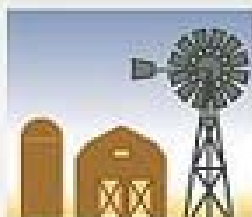
Impacts on...

Health



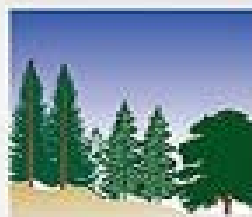
Weather-related mortality
Infectious diseases
Air-quality respiratory illnesses

Agriculture



Crop yields
Irrigation demands

Forest



Forest composition
Geographic range of forest
Forest health and productivity

Water resources



Water supply
Water quality
Competition for water

coastal areas



Erosion of beaches
Inundation of coastal lands
additional costs to protect coastal communities

Species and natural areas



Loss of habitat and species
Cryosphere:
diminishing glaciers

Nitrogen Oxides

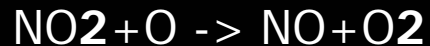
- Harmful to vegetation: reduces crop growth and production yield
- Reacts with water and oxygen in the atmosphere to produce acid rain
- Contributes to global warming by absorbing infrared radiation, and by contributing to the destruction of the ozone layer
- Creates tropospheric ozone

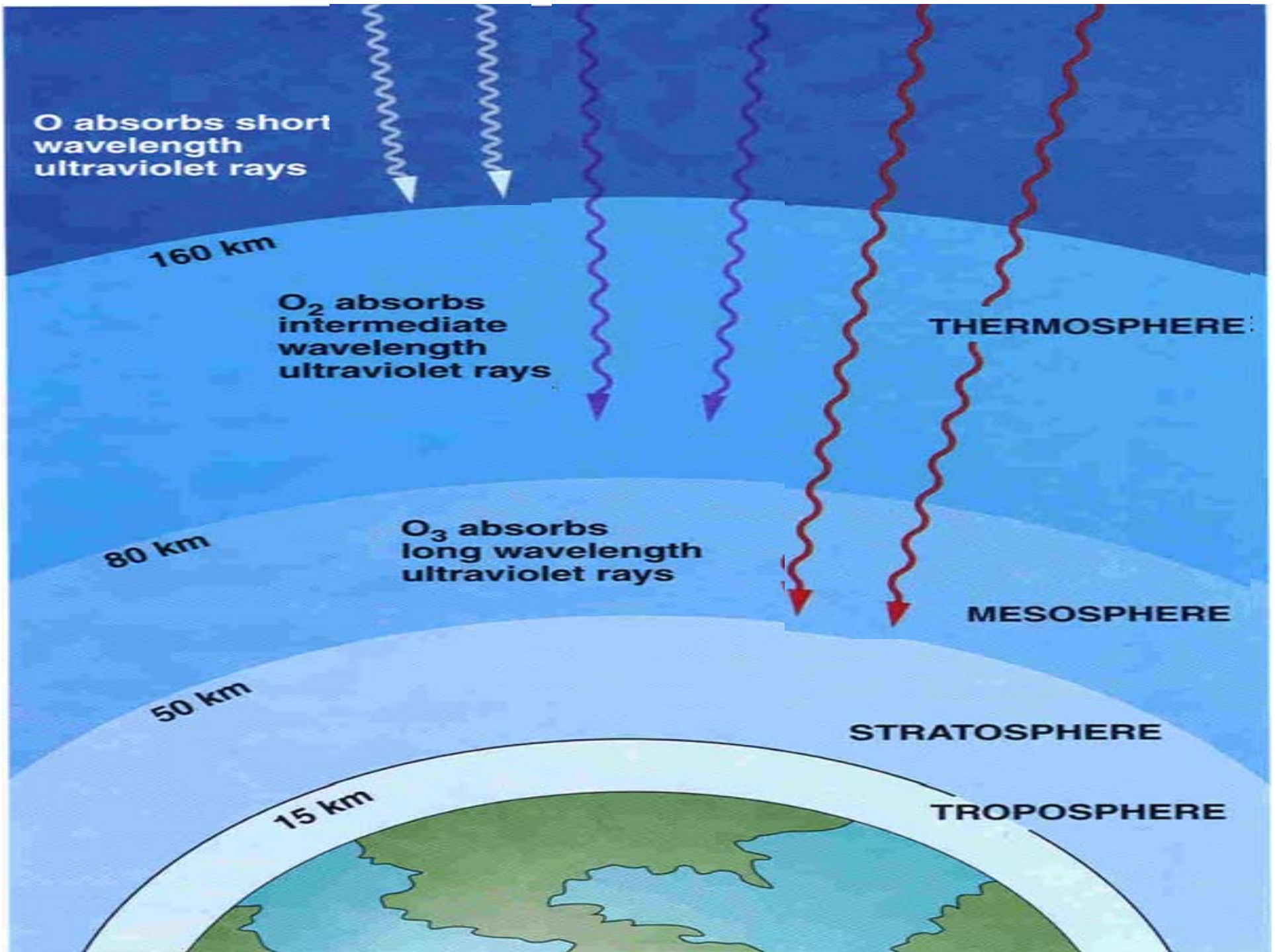
Ozone Layer Destruction

Ozone is formed by continuous reactions between oxygen and oxygen radicals

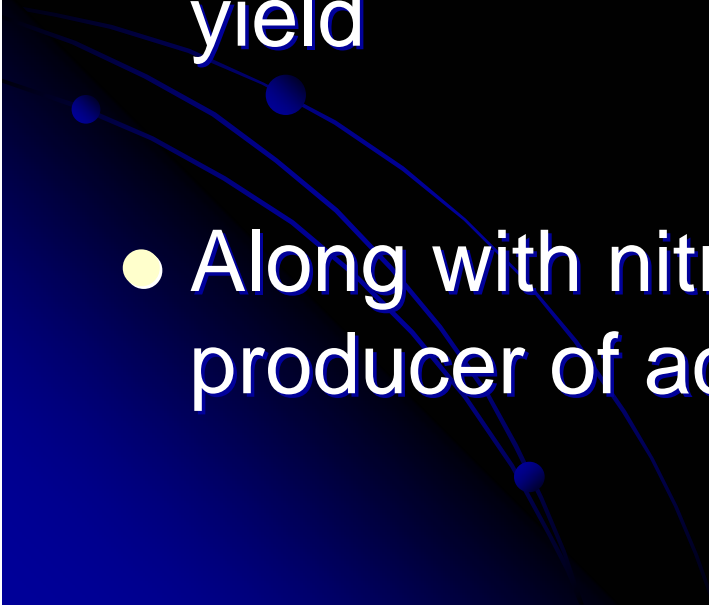


Nitrogen oxides in the atmosphere readily react with the oxygen and free oxygen radicals to create nitrogen di- and trioxide, depleting the oxygen and free radicals available to form ozone





Sulfur Emissions

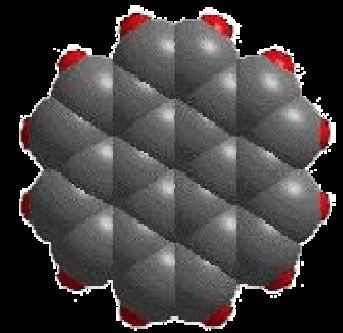
- Effects the respiratory tract and can aggravate cardiovascular disease
 - Harms plants, trees, and decreases crop yield
 - Along with nitrogen oxides, is the primary producer of acid rain
- 

Acid Rain

- Sulfur and nitrogen dioxides react with water vapor and oxygen in the atmosphere to form sulfuric and nitric acid
- Returns to the Earth in precipitation, altering the pH of bodies of water, soil nutrient balance, endanger entire ecosystems, and corrode surfaces

Polycyclic Aromatic Hydrocarbons

- Identified as possible carcinogens
- Contaminate ground and surface water
- Highly toxic to aquatic life and birds
- Remains in ecosystems for extended periods of time due to ability to bioaccumulate

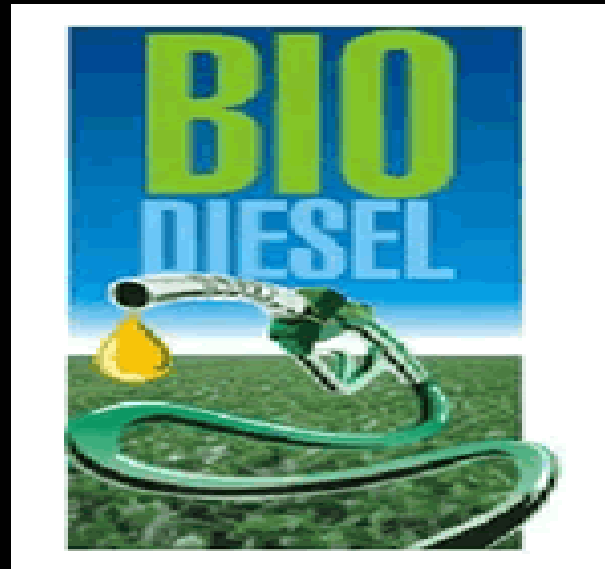


Alternative Fuel Sources

- Hydrogen Fuel Cells
- Ethanol
- Electricity
- Biodiesel



Biodiesel is a clean burning alternative fuel source derived from soy beans whose use has been approved by the Environmental Protection Agency.

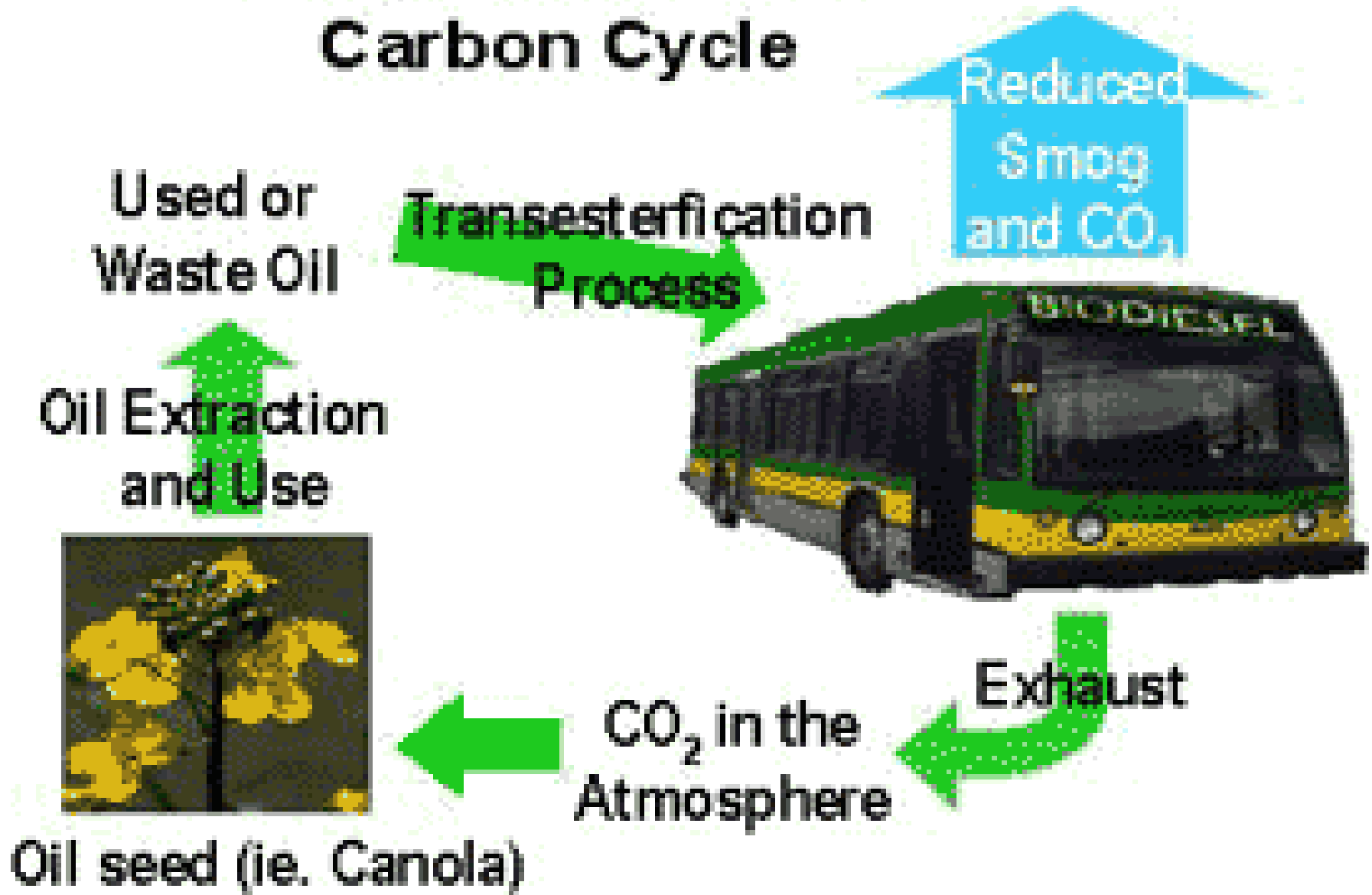


Biodiesel benefits the environment, the performance of vehicles, and the economy.

Environmental Benefits

- Cleaner burning alternative to plain diesel
- Completely renewable: composed of mono-alkyl esters and fatty acids derived from vegetable oil
- Helps conserve natural resources: for every unit of energy needed to produce biodiesel, an additional 3.24 units are created
- “Biodiesel is less toxic than table salt, and degrades faster than sugar.”

Biodiesel and the Carbon Cycle



AVERAGE BIODIESEL EMISSIONS COMPARED TO CONVENTIONAL DIESEL, ACCORDING TO EPA

Emission Type	B100	B20
<u>Regulated</u>		
Total Unburned Hydrocarbons	-67%	-20%
Carbon Monoxide	-48%	-12%
Particulate Matter	-47%	-12%
Nox	+10%	+2%
<u>Non-Regulated</u>		
Sulfates	-100%	-20%*
PAH (Polycyclic Aromatic Hydrocarbons)**	-80%	-13%
nPAH (nitrated PAH's)**	-90%	-50%***
Ozone potential of speciated HC	-50%	-10%

Performance

- Biodiesel has the same vehicular performance as diesel in mild temperature, and actually performs better than diesel in cold temperatures
- Current engines do not require any modifications to use biodiesel as opposed to diesel



Economic Benefits

- Tax incentives are offered for the production and use of biodiesel
- Would eliminate dependence on foreign oil
- Production and consumption of biodiesel is increasing

Sales of Biodiesel

2004	--	25 million gallons
2003	--	20 million gallons
2002	--	15 million gallons
2001	--	5 million gallons
2000	--	2 million gallons
1999	--	500,000 gallons



Why not use Biodiesel instead of diesel



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