Air Pollution

3/11/2014

Describe how we can reduce the amounts of CO2 in the atmosphere

Answer

- Factories
- Dust/dirt
- Exhaust from vehicles, etc.

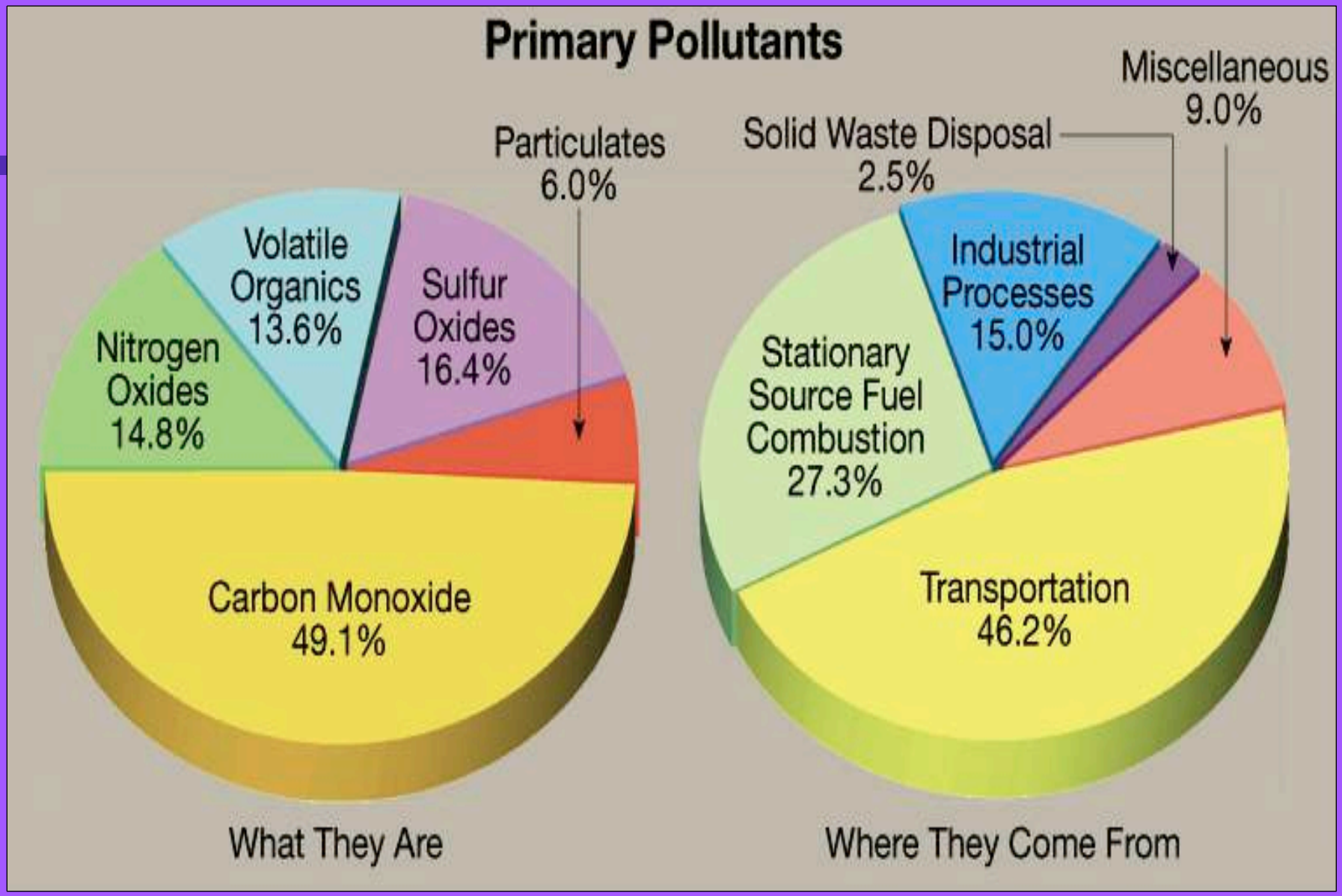
Air Pollutant Types

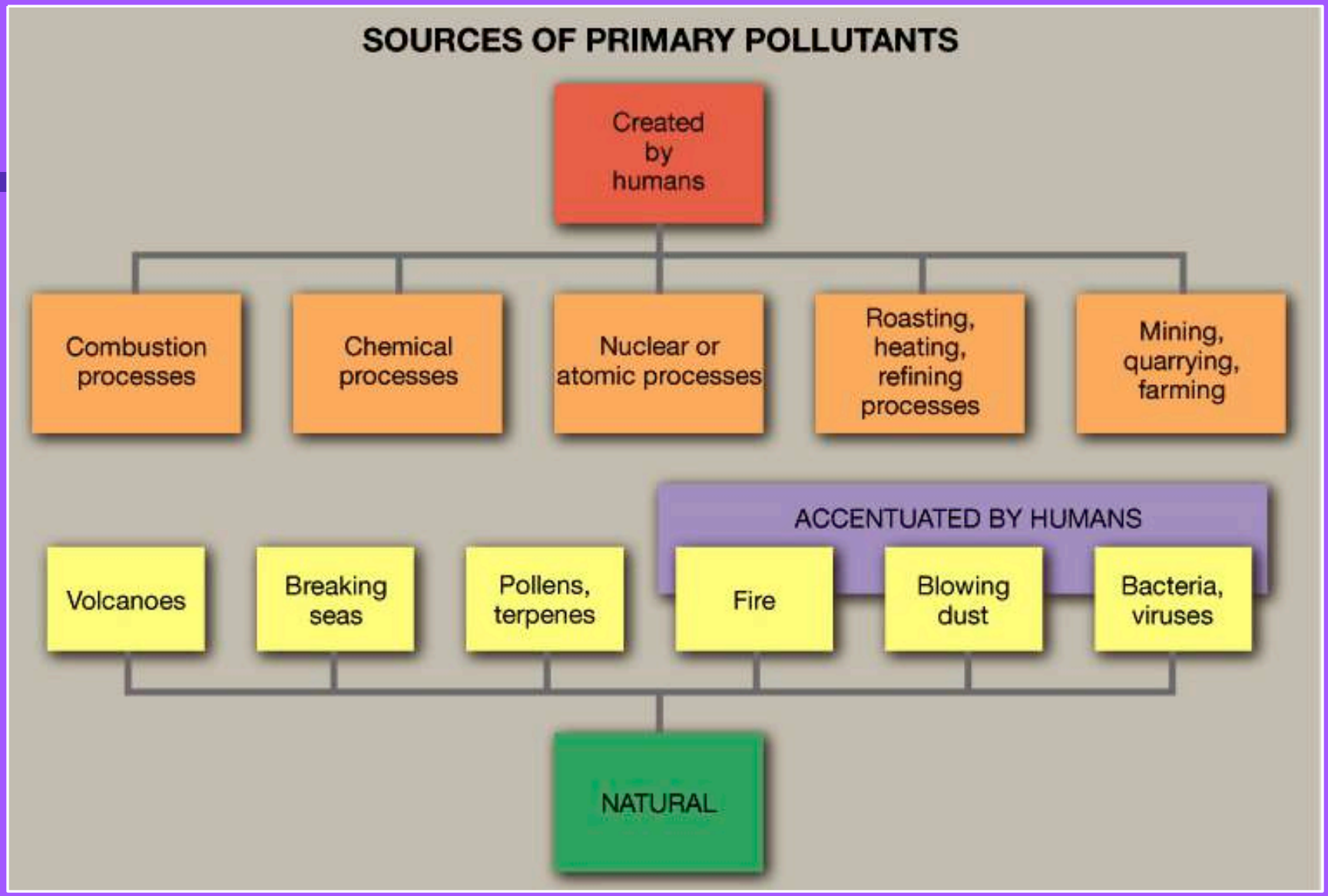
- **Air pollutants** are airborne particles and gasses that occur in concentrations that endanger the health and well-being of organisms.
- Pollutants can be grouped into two categories:
  - (1) **primary pollutants**, which are emitted directly from identifiable sources, and
  - (2) **secondary pollutants**, which are produced in the atmosphere when certain chemical reactions take place among primary pollutants.

Primary Pollutants

The major primary pollutants include:

- particulate matter (PM),
- sulfur dioxide,
- nitrogen oxides,
- volatile organic compounds (VOCs),
- carbon monoxide, and
- lead.


Primary Pollutants
Particulates 6.0%
Volatile Organics 13.6%
Sulfur Oxides 16.4%
Nitrogen Oxides 14.8%
Carbon Monoxide 49.1%
What They Are
Miscellaneous 9.0%
Solid Waste Disposal 2.5%
Industrial Processes 15.0%
Stationary Source Fuel Combustion 27.3%
Transportation 46.2%
Where They Come From


SOURCES OF PRIMARY POLLUTANTS
Created by humans
Combustion processes
Chemical processes
Nuclear or atomic processes
Roasting, heating, refining processes
Mining, quarrying, farming
ACCENTUATED BY HUMANS
Volcanoes
Breaking seas
Pollens, terpenes
Fire
Blowing dust
Bacteria, viruses
NATURAL

Secondary Pollutants

- Air pollution in urban and industrial areas is often called **smog**.
- **Photochemical smog**, a noxious mixture of gases and particles, is produced when strong sunlight triggers **photochemical reactions** in the atmosphere.
- The major component of photochemical smog is **ozone**.

Controlling Air Pollution through Regulations

- The **Clean Air Act of 1970** mandated the setting of standards for four of the primary pollutants—
  - particulates,
  - sulfur dioxide,
  - carbon monoxide, and
  - Nitrogen
  - as well as the secondary pollutant ozone.

Have Regulations Helped?

- In 1997, the emissions of the five major primary pollutants in the United States were about 31 percent lower than 1970.
- In 1990, Congress passed the **Clean Air Act Amendments**, which further tightened controls on air quality.

Table 13–2 Air Quality and Emissions Trends, 1988–1997

Pollutant	Percent Decrease in Concentrations	Percent Decrease in Emissions
Carbon monoxide (CO)	38	25
Lead (Pb)	67	44
Nitrogen dioxide (NO_2)	14	1
Ozone (O_3)	16	*
Particulate matter (PM_{10})	26	12
Sulfur dioxide (SO_2)	39	12

*Ozone is not emitted directly into the atmosphere but rather is a secondary pollutant.

Air Pollution Occurrences

- Two of the most important atmospheric conditions affecting the dispersion of pollutants are:
  - (1) the strength of the wind and
  - (2) the stability of the air.

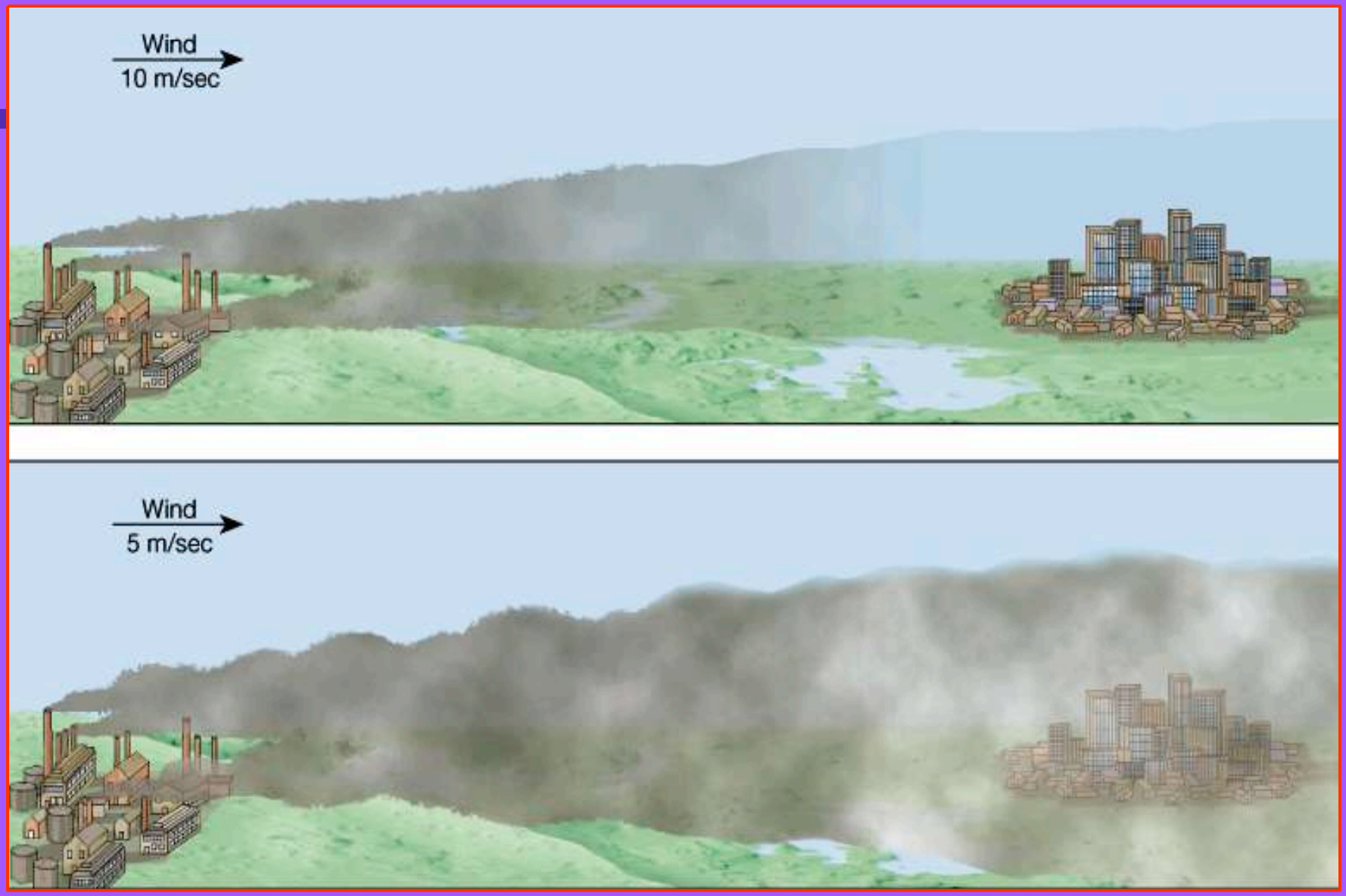
Air Mixing

- The vertical distance between Earth's surface and the height to which convectional movements extend is called the **mixing depth**.

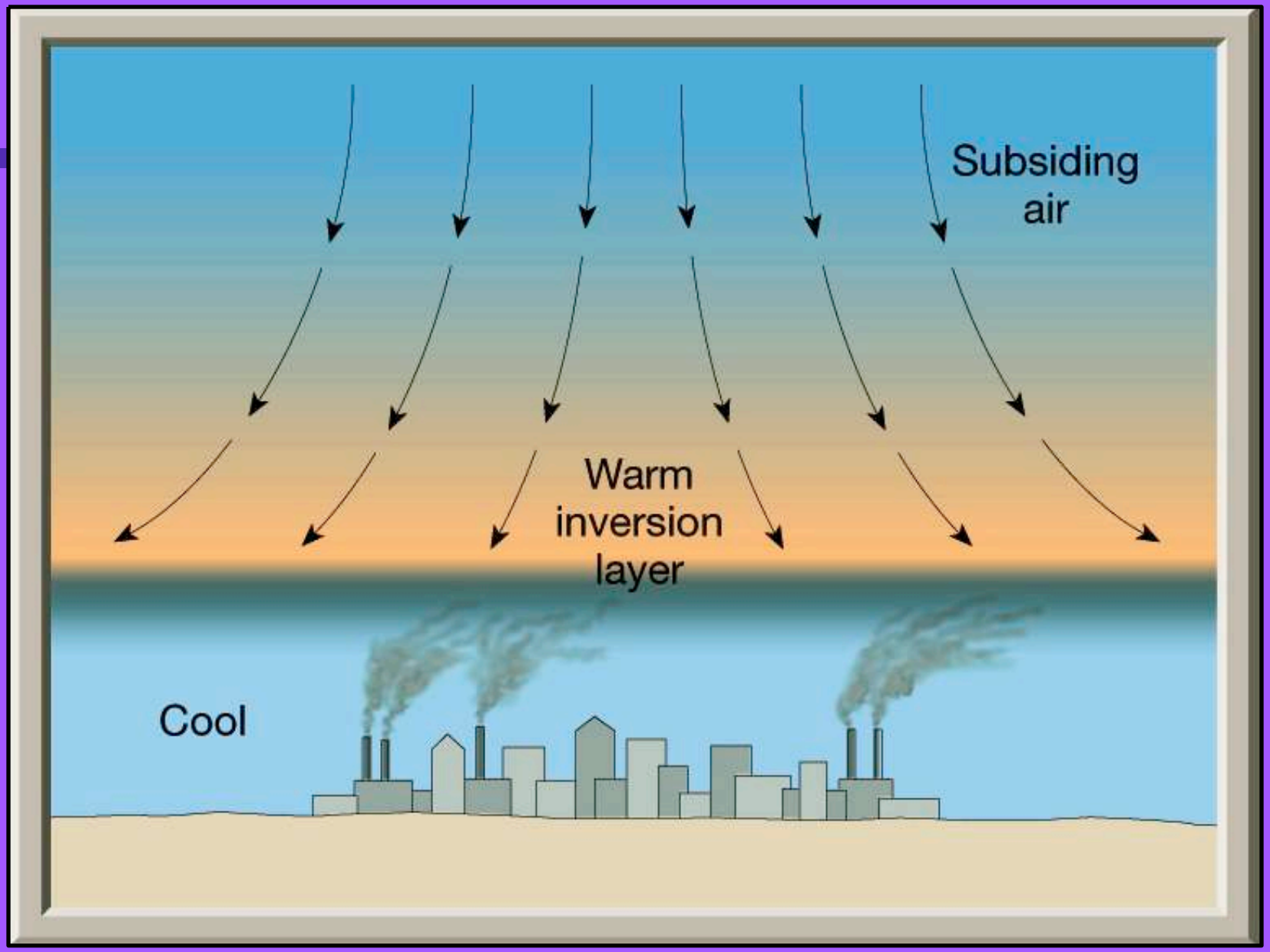
Inversions

- **Temperature inversions** represent a situation in which the atmosphere is very stable and the mixing depth is significantly restricted.
- **Surface temperature inversions** form because the ground is a more effective radiator than the air above.

Inversion



An Inversion Aloft



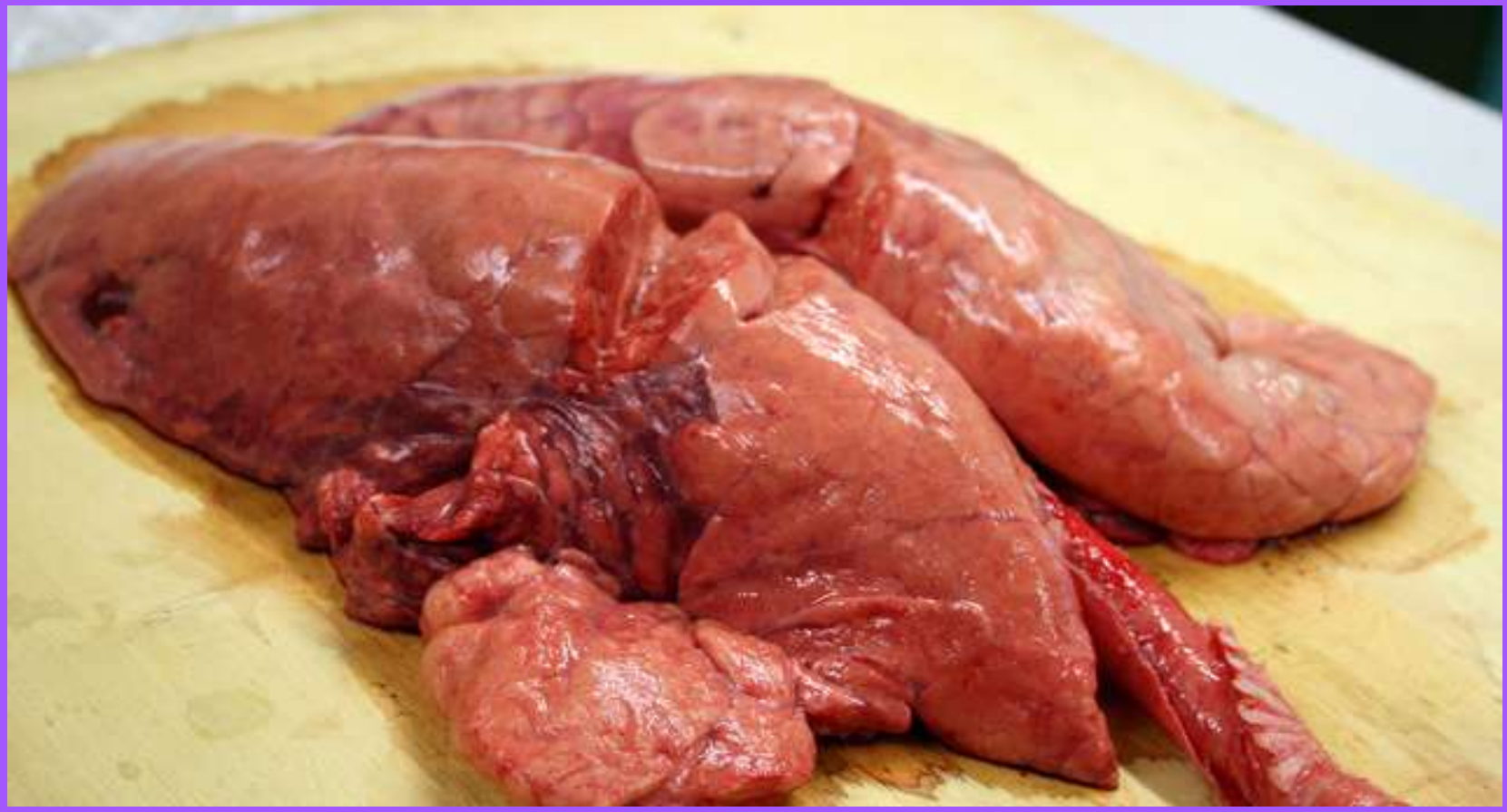
Acid Precipitation

- This acidic rain or snow, formed when sulfur and nitrogen oxides produced as by-products of combustion and industrial activity are converted into acids, called **acid precipitation**.

Acid Precipitation (cont.)

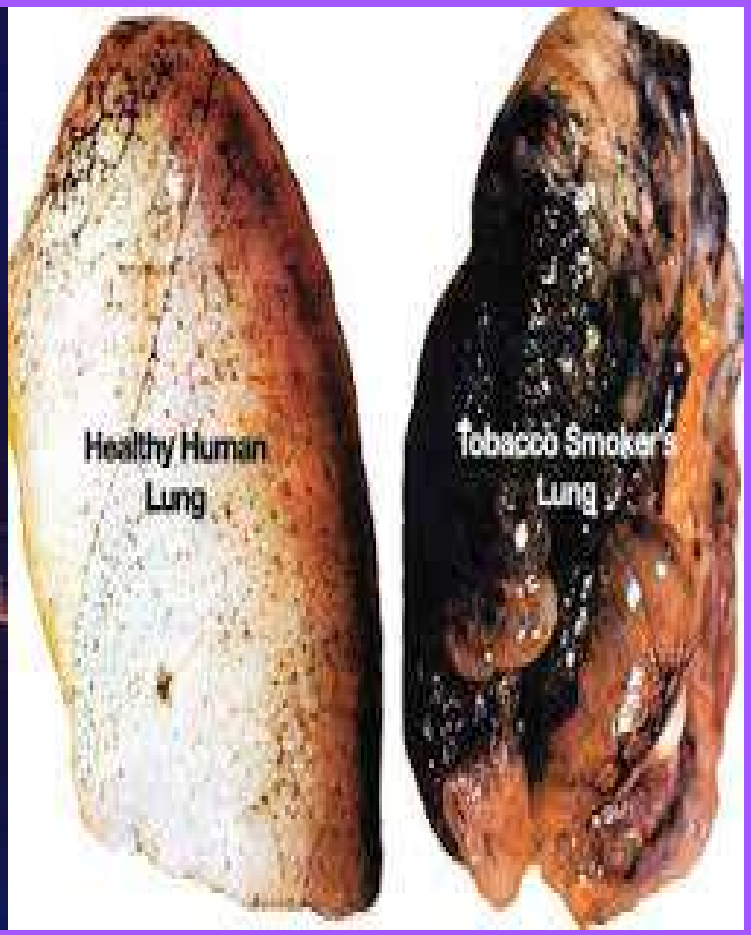
- Besides producing water that is toxic to fish, acid precipitation has also detrimentally altered ecosystems.

Healthy lungs



Asbestos

Lung cancer



Key Terminology

“Natural” air pollutionPrimary pollutants

Secondary pollutantsSmog

Photochemical smogPhotochemical reactions

OzoneClean Air Act (1970)

Mixing depthInversion

Surface inversionInversion aloft

Acid Precipitation