

Lecture 42. Control of air pollution. Environmental management.

Objectives:

1. Major air pollutants and their atmospheric effects.
2. Control of air pollution.
3. Review for final exam. Part 1.

Readings: Turco: p. 397- 404, 452-486; 447-450

1. Major air pollutants and their atmospheric effects.

Table 42.1 Air pollutants and the environmental effects with which they are associated.

Plus signs indicate a contribution to the effect; minus indicate amelioration.

Gas	Urban air pollution	Acid deposition	Visibility impairment	Greenhouse warming	Stratospheric ozone depletion	Atmospheric OH decrease
CH₄				+	+/-	+/-
CO	+					+
CO₂				+	+/-	
N₂O				+	+/-	
NO_x	+	+	+		+/-	-
SO₂	+	+	+	-		
CFCs				+	+	
O₃	+	+		+		-

NOTE: CO₂, N₂O and NO_x can either enhance or deplete stratospheric O₃ depending on altitude. CH₄ generally ameliorates O₃ depletion, except in the polar ozone hole.

Table 42.2 Current atmospheric properties, historical concentrations, and ranges of possible futures for important air pollutants (Graedel and Crutzen, 1992).

Gas	Anthrop. sources	Anthrop./total emission per yr. (10^6 ton)	Average residence time in the atmosphere	Average concentration 100 yr ago (ppb)	Current concentrations (ppb)	Projected concentration in year 2030 (ppb)
CO	fossil fuel combustion, biomass burning	700/ 2000	months	20 to 40? NH, 30 to 100? SH (clean atm.)	100 to 200 NH, 40 to 80 SH (clean atm.)	probably increasing
CO ₂	fossil fuel combustion, deforestation	7500/ about 7500	120 yr	290,000	350,000	400,000 to 550,000
CH ₄	agriculture, fossil fuel production	300 to 400/ 500 to 600	10 yr	900	1,700	2,200 to 2,500
NO _x	car emission, fossil fuel combustion, biomass burning	20 to 30/ 30 to 60	days	0.001 to ? (clean to industrial)	0.001 to 50 (clean to industrial)	0.001 to 50 (clean to industrial)
N ₂ O	fertilizers, deforestation, biomass burning	6/ 20	170 yr	285	310	350 to 370
SO ₂	fossil fuel combustion	140 to 180/ 200 to 280	days	0.01 to ? (clean to industrial)	0.01 to 50 (clean to industrial)	0.01 to 50 (clean to industrial)
CFC	aerosol spray, refrigerants	1/ 1	60 to 120 years	0	about 3 (Cl atoms)	2 to 4 (Cl atoms)

2. **Control of air pollution.**

NOTE: Recall that control of acid rain was discussed in Lecture 24.

Air pollution control is a complex political, economical and scientific problem.

Emissions reduction strategies:

achieve emissions reductions by implementing cost-effective management methods and technologies.

Recent international efforts:

Rio Summit on Environment and Development referred to as the "Earth Summit", June 1992:

More than 150 nations, including the United States, signed the treaty, which entered into force less than two years later, on March 21, 1994.

December 1 - 11, 1997, Kyoto, Japan, the Parties to UN Framework Convention on Climate Change agreed to an historic Protocol to reduce greenhouse gas emissions by harnessing the forces of the global marketplace to protect the environment.

- A central feature of the Kyoto Protocol is a set of binding emissions targets for developed nations. The specific limits vary from country to country, though those for the key industrial powers of the European Union, Japan, and the United States are similar: 8% below 1990 emissions levels for the EU, 7% for the U.S., 6% for Japan.

3. **Review for final exam. Part 1.**