

ENSC 412 *Air Pollution*

Lecture Week 1
Introduction, history

Readings for this week

- Text, chapters 1, 2, 3
- Fenger (2009). Air Pollution in the last 50 years (read for discussion next class)

History of air pollution

Pre-industrial times

- earliest man was nomadic in part to escape the smell of plant and animal wastes which we created
- when man learned to use fire, it was a source of products of incomplete combustion which polluted caves, dwellings and later cities (as early as Rome in 61 AD reported by Seneca, text page 1)
- early industrial sources included metallurgy, ceramics, and the preservation of animal products

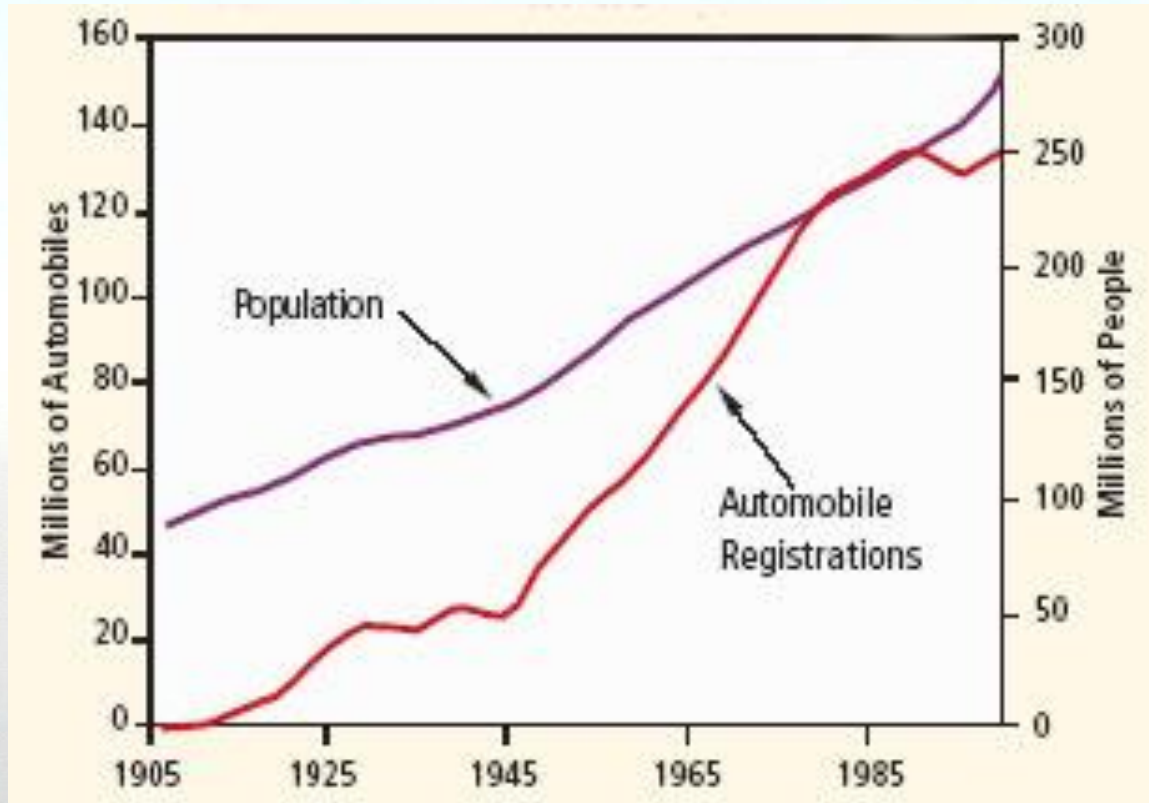
History: The industrial revolution

- industrial revolution came about in late 1700s due to the invention of the steam engine which could be used to power machinery
- steam boilers were fired mostly by coal (some oil)
- major air pollution problem of the 1800s due to smoke and ash from burning coal or oil in fixed and mobile (ships, trains) steam power plants, and for home heating.
- Britain recognized the problems and in the early 1800s, and by the mid 1800s had enacted legislation aimed at controlling emissions, especially in London.
- London had several severe air pollution episodes in the 1800s in which ``smog" (SMoke + fOG) was blamed for thousands of deaths.

The 20th century

- by early in the 1900s, the chemical industry was emerging as a major concern.
- by end of 1800s into the 1900s, there were some developments of engineering controls of air pollution developed (mechanical stoker, scrubber for removing acid gases, cyclone and bag house dust collectors, electrostatic precipitator for particulate control, etc.)
- as cities grew in size, the air pollution problems increased.
- steam engine replaced by electric motor - pollution source was now at the electricity generation stations.

The 20th century- cont'd



- advent and explosive growth of automobile use in 1900s responsible for most significant air pollution problems in many areas today.

US Population and automobile ownership trends since 1907.

Source: <http://www.fhwa.dot.gov/publications/publicroads/04sep/09.cfm>

The 20th century- cont'd

- in the mid 1900s, natural gas pipelines supplied the cleaner fuel to homes, etc, phasing out coal and oil burning for space heating.
- in the latter half of the 1900s, most developed countries were experiencing severe air pollution problems in larger urban areas, and began to enact air pollution legislation.



The 20th century- cont'd

- 1948 Donora, PA 20-40 died due to air pollution episode; 1952 London smog episode was attributed to 4000 additional deaths
- in the past 4 decades there have been great advances made in modelling transport and dispersion of air pollution, in monitoring air pollution, and in understanding photochemistry and chemical transformations of air pollutants.
- in the 1970's people first started thinking of air pollution from a more holistic / ecological perspective.

The 20th century- cont'd

- in the 1980s and 90s global pollution problems (stratospheric ozone depletion, and global warming) came to the forefront.
- international conferences (Montreal, 1987 - to control CFCs), Rio in 1992, and Japan in 1997 to deal with GHGs.
- recent (21st century) very high pollutant levels in the developing world (China, India, etc.) as a result of rapid industrial development and limited environmental regulation