STUDY ON AIR POLLUTION AND WATER POLLUTION

Air pollution

Air pollutants are dispersed in the atmosphere through convective and turbulent movement. In addition, some pollutants undergo chemical reaction with others, particularly in the presence of sunlight, where photochemical oxidants are formed by combination of certain hydrocarbon molecules with oxides of nitrogen.

The transport of air pollutants is studied using mathematical models, that can generally be grouped as follows:

- Point source models, used chiefly for industrial sources;
- Line source models, applied mainly to roadway, train and aircraft sources;
- Area source models, used for such large, two dimensional sources as windblown dust or wildfires; and
- Photochemical models, invoked to study the combination of transport and chemical reactions that produce photochemical oxidants.

The earliest point source model was originated in the early twentieth century, invoking a Gaussian dispersion model for buoyant pollution plumes to predict movement of pollutants, with consideration given to wind velocity, source stack height, emission rate and atmospheric turbulence.[6][9] This model has been calibrated extensively with experimental data for a variety of atmospheric conditions.

A roadway air dispersion model was developed starting in the late 1950s and early 1960s in response to requirements of the National Environmental Policy Act and the U.S. Department of Transportation to understand impacts of proposed new highways upon air quality, especially in urban areas. Several research groups were active in this model development, among which were: the Environmental Research and Technology (ERT) group in Massachusetts, the ESL Inc. group in California and the California Air Resources Board group in California. The ESL group received a contract from the United States Environmental Protection Agency to validate a line source model[7] using sulfur hexafluoride as a tracer gas. Some of the earliest uses of the model were in court cases involving highway air pollution at the Arlington, Virginia portion of Interstate 66 and the New Jersey Turnpike widening project through East Brunswick, New Jersey. Area source models were developed in 1971 through 1974 by the same groups pioneering the line source models, Similarly photochemical models were developed primarily in the 1960s and 1970s, but their use was more specialized and for such regional needs as understanding smog formation in the Livermore and Los Angeles air basins of California.

Indoor air pollution is a specialized aspect of this subject, whereby air contaminants are effectively trapped in an enclosed space occupied by humans. The most significant pathways for this type of pollution are: (a) Radon accumulation in buildings; and (b) tobacco smoke produced within buildings **what about off gassing of consumer and building products (carpets, furniture, sheetrock etc?).** A final aspect of air pollution worth noting is the effect of certain acidic air pollutants such as sulfur dioxide upon sculpture and artworks made of limestone or similar materials.

Water pollution

Aerial view of riverine sediment loads in Madagascar including plume influx to the Indian Ocean. Source:NASA. 2000

See main articles: Thermal pollution, Water pollution

Chemical water pollutants are either discharged into surface or groundwater (point sources) or originate as soil deposition, thence carried to water bodies by surface runoff. Common examples of such chemical water pollutants are mercury emanating from mining activity, certain nitrogen compounds used in agriculture, chlorinated organic molecules arising from sewage or water treatment plants [2] various acids which are the externalities of various manufacturing activities. Contaminants discharged into the atmosphere from industrial stacks and other sources can also contaminant water bodies which are distant from the original source.

Physical water pollutants are either (a) particles much larger than molecular scale or (b) physical factors such astemperature change, both of which while not inherently toxic, cause a variety of harmful effects. The most obvious of physical pollutants are (a) excessive sediment load, mostly arising from over-intense land use practices and (b) rubbish discarded from human manufacturing activity (e.g. plastic bags, bottles). While these materials are not so harmful to human health as chemicals or pathogens, they comprise the majority of visual impact of water pollution. In the case of thermal pollution, these point source discharges typically affect the metabolism of aquatic fauna in adverse ways.

Radioactive substances are really merely a special sub-class of chemical pollutants, and by mass represent the smallest of the contributors to water pollution; however, their potential for harm allows recognition as a separate class. In fact, most discharge of radioactivity is not from the

negligible escape from nuclear power plants, but rather arises from agricultural practices such as tobacco farming, where radioactive contamination of phosphate fertilizer is a common method of introduction of radioactive materials into the environment.

Common pathogenic microbes introduced into natural water bodies are pathogens from untreated sewage or surface runoff from intensive livestock grazing. One of the most common disease agents is *Giardia lamblia*, a parasiticprotozoan common in fecal material of many fauna including humans; this microbe is particularly insidious, due to its resistance to conventional sewage treatment. This and other protozoans and bacteria are important causes of illness and mortality in developing countries where population density, water scarcity and inadequate sewage treatment combine to occasion widespread parasitic and bacterial disease.

Thermal pollution is the act of altering the temperature of a natural water body, which may be a river, lake or ocean.[8]This condition chiefly arises from the waste heat generated by an industrial process such as certain power generation plants. The concept is most frequently discussed in the context of elevating natural water temperature, but may also be caused by the release of cooler water from the base of reservoirs into warmer rivers. Elevated river temperatures can also arise from deforestation or urbanization that can reduce stream shading. Thermal pollution is one parameter of the broader subject of water pollution.There can be significant environmental consequences of thermal pollution with respect to surface receiving waters such as rivers and lakes; in particular, decrease in biodiversity and creation of an environment hospitable to alien aquatic species may occur. Regulation of thermal pollution has been more elusive than for other forms of water pollution, although straightforward mitigation measures are available, especially in the case of elevated temperature discharges.

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