APPLICATION OF COMPUTER SIMULATION TECHNIQUES TO PROBLEMS IN AIR POLLUTION

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The need for a rationale for deciding between alternative air pollution control strategies has been apparent for many years, yet to date, none exists. The utility and power of the techniques of systems analysis and numerical or computer simulation have been known for many years, yet, only recently, have they been applied to problems in air pollution.

In planning an epidemiological study of the effects of various pollutants it is reasonable to consider the potential contribution of simulation models of pollutant distributions. One such model has been utilized in this laboratory to simulate the distribution of total oxidants in the South Coast Air Basin in California. The advantages are clear in that knowledge of the spatial distribution of pollutants allows calculation of dose rates for the entire population within the mapped area. This in turn removes the important constraint, requiring that the sample population be located within a certain radius of an air monitoring station.

The computer program produces maps which graphically illustrate spatially disposed information, both qualitative and quantitative. As such, it is suited to a broad range of applications with only minor alterations. Raw data of any kind, be it physical, social, medical, economic, and so forth, may be related, manipulated, weighted and arrayed in any desired fashion. The concept, general design, and mathematical model for the program were first developed in 1963 by Howard T. Fisher at Northwestern Technological Institute. Since then, many others, too numerous to mention, have generously contributed ideas and improvements to the program.

The notion of mapping is that of graphically depicting spatially disposed quantitative information, in our case, concentration of total oxidants. The data consists of triplets (X, Y, Z) where X and Y are the abscissa and the ordinate data which define a point on the map surface and Z is the concentration of total oxidants at that point. The X, Y data must be continuous. Concentration data is also continuous, that is, is defined for every point X, Y on the map by a continuous mathematical function. Restricting ourselves in this way, the map which results is a contour map.

The program uses a "gravity" interpolation function, where, essentially, the concentration at an unknown point (X, Y) is directly proportional to the