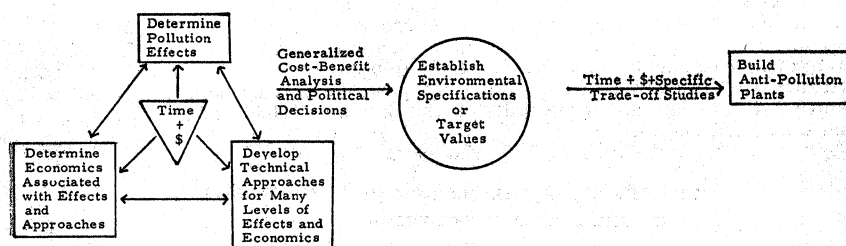


Accordingly, we believe that future work should be undertaken in two distinct phases.

The first phase must clearly attack the obvious sources of pollution, the autos and stationary sources, the primary sewage treatment plants, the industrial firms disposing of large amounts of toxic chemicals, etc. This phase is currently being undertaken or considered by the Federal Government and many State and local authorities.

The second phase is equally important, less obvious, and more difficult, because it will take a great deal of time and money with few tangible results. Its purpose will be to determine the effects of potential pollutants on the earth and its inhabitants; the technical approaches feasible for removing these pollutants; and the costs associated with the effects and the technical approaches. These investigations should be undertaken simultaneously so that information from one can be fed into the other two. The gathering and development of this data may take 10 to 15 years and cost a billion or more dollars. However, we need not wait until the end of the study for results. There can be intermediate steps when tentative specifications can be reevaluated or created. A graphic illustration of this overall approach is presented in figure 1.

FIGURE 1
THE SEQUENCE OF EVENTS FOR A WASTE MANAGEMENT STUDY



The development and analysis of this data is imperative. It will result in an understanding of the problem and the approaches to its solution which will, probably for the first time, permit political bodies to make decisions with full and complete data and with an understanding of what they can achieve, what it will cost, and what it will save.

Once the data is available, then we can begin the very difficult task of designing specifications based on tradeoffs or compromises between certain levels of improvement, our ability to pay for them, and our technological capability for creating them. This situation is in contrast to the best guess approach on which most of today's standards are based. For example, table 1 shows a brief summary of the present drinking water standards of the World Health Organization and U.S. Public Health Service. These do not agree with each other, nor with two California water plan values (for nondrinking water).

More important, the last column presents typical values for the water delivered by the metropolitan water district to several millions of users in the Los Angeles basin over many years, apparently without ill effects. Note how the

TABLE 1.—Selected values for water environmental standards

Condition	WHO International (1958) permissible limit	USPHS (1962) recommended limit	Proposed California water plan	Sacramento River maximum permissible concentration	Colorado River water supplied to the Los Angeles Metropolitan Water District
Dissolved solids parts per million..	500	500	400	525	704
Sulfate do.....	200	250	100	130	297
Chloride do.....	200	250	100	130	92
Sodium percent.....			50	60	63
Hardness as CaCO ₃			160	200	195

1 Softened from 330.

dissolved solids and sulfate content substantially exceed the recommended limits in all cases.

In light of such discrepancies, it is clear that we must know much more about the effects of wastes and pollutants before building expensive plants to enforce today's specifications. Further, we must know more about how a given body of water or air changes from area to area, and day to day. Figure 2 shows how the amount of dissolved solids in the Sacramento River changes as the river progresses downstream. Note how the dissolved solids vary from 60 parts per million to 250 parts per million and back again to below 50 parts per million. Many of these changes occur for natural reasons (i.e., highly saline rivers) rather than from manmade pollutants. Also, the values shown here are median values, a long way from the high and low points which may occur in times of storm or drought.

I believe it is clear from the foregoing that it is a task of the greatest importance to define specifically the kind of environment we want and to understand what various kinds of wastes are doing to that environment. Until we do, the only genuine response to the question of the adequacy of technology is—adequate for what?

All these formidable technical problems are paralleled, of course, by equally complex legal, political, and social considerations. Leadership of the Federal Government is mandatory to assign appropriate priority to waste management, among our other national objectives, and to set forth clear responsibilities and authorities so that the establishment of goals, and the implementation of programs to achieve them, can proceed in an orderly and expeditious fashion.

I know of no greater time and money waster than the "passing of the buck" from one governmental or industrial body to another. A brief outline of a plan we suggested in our California study as a possible starting point is presented in figure 3, to indicate a few thoughts on the possible division of authority among the interested bodies.

FIGURE 2

THE EFFECT OF VARIOUS COMMUNITIES AND RIVERS
ON THE MEDIAN DISSOLVED SOLIDS CONTENT
OF THE SACRAMENTO RIVER, 1951-1956

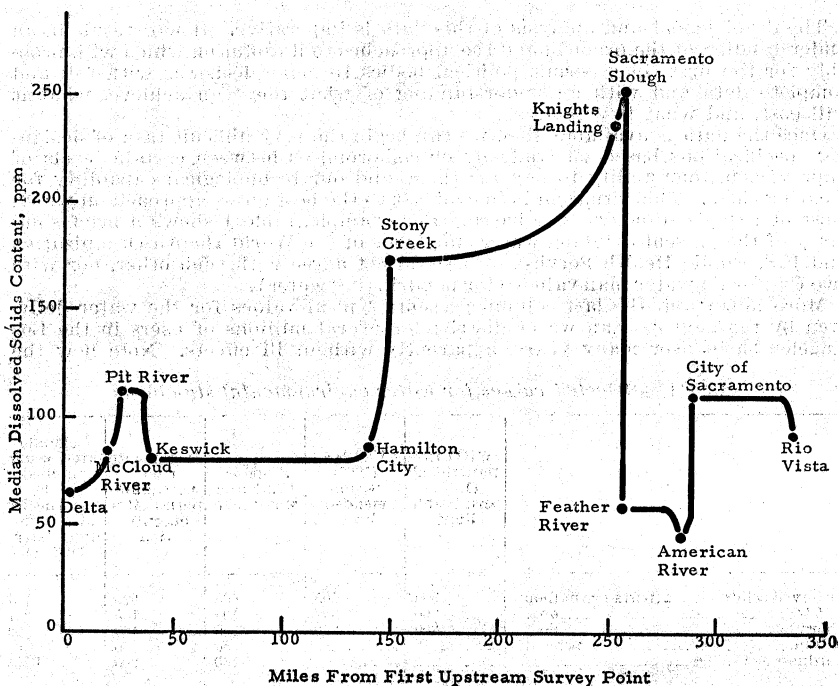
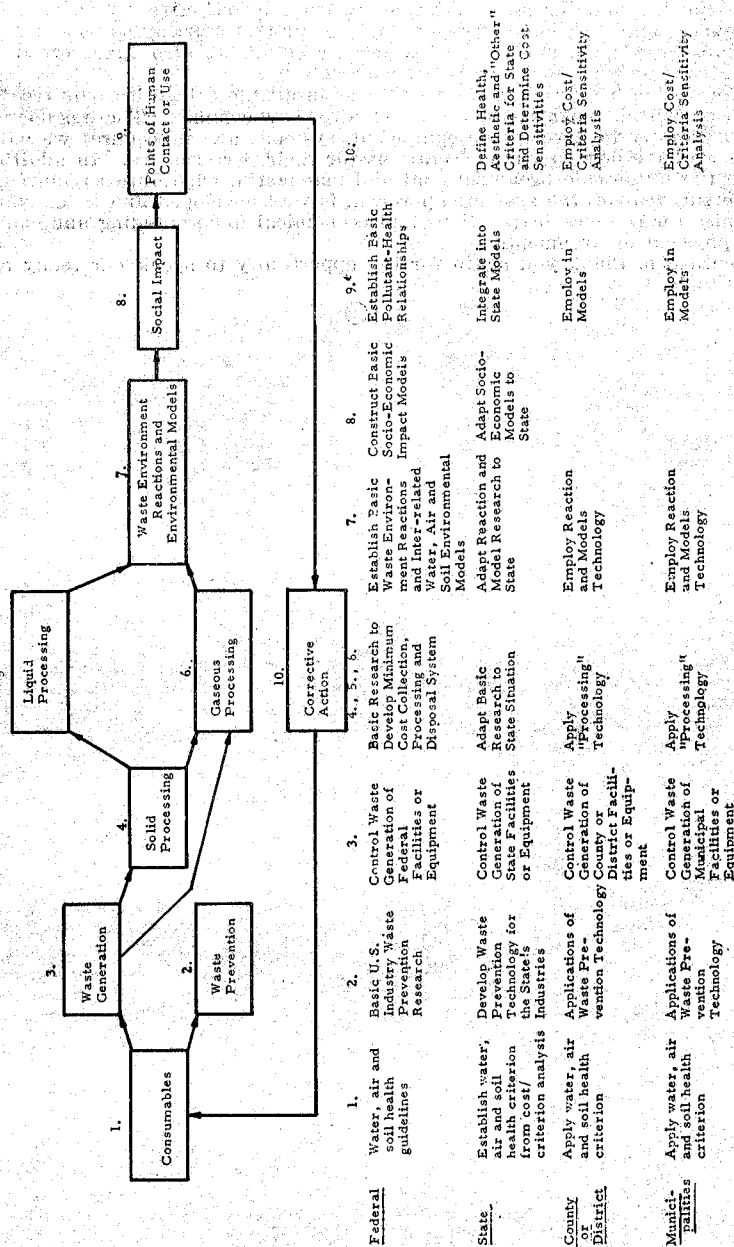


FIGURE 3
CONCEPT OF WASTE MANAGEMENT FUNCTIONS AS RELATED TO GOVERNMENT BODIES



*California Waste Management Study, Aerojet-General Corporation, 1965

In conclusion, I would like to offer the following observation. We have organized ourselves to make effective attacks on other gigantic problems—the defense of our country and maintaining our leadership in space exploration, to mention two—and we must organize ourselves to make an effective attack on pollution abatement and waste management. While our best starting point is a realistic, perhaps even grim, appraisal of where we stand, we also have certain assets that, if properly applied, can assure success.

The Nation has an abundance of talent in all the categories required for the solution of technological problems, no matter how complex. There is no question of our ability to develop the equipment, systems, and procedures we will need once we have defined our expectations for their performance. In addition, we have the large-scale organizational and managerial capabilities required. One powerful weapon, the systems approach, is well developed and holds enormous promise for the most expeditious and economical understanding and control of our physical environment.

Gentlemen, thank you again for the opportunity to speak out today on this vital topic.

