

Before discussing, in more detail, specific problems in environmental pollution and the research efforts underway in the Bureau of Mines in its search for solutions to these problems, I would like to address myself to some of the interesting questions designated in the report as issues worthy of consideration by the Congress. Many of the issues fall beyond the scope of Bureau involvement, but on others we do have definite ideas that I would like to present to you.

While the Bureau of Mines has a significant role in pollution prevention, we do not set the standards which the public must comply with. Standards are set by Federal, State and local agencies based on factors such as effects on plants, animals, and humans. The Bureau does advise, on the basis of our research, as to whether standards can be met with available resources and, preferably, at the lowest possible cost to the public. In other words, if a public agency is undecided from a health standpoint as to the maximum amount of sulfur compounds, for example, it should permit as emissions from fuel-burning appliances, then we can advise as to the impact of any regulation on the availability of fuel resources.

We doubt seriously whether new technological developments can proceed effectively without waste-management systems analyses. In fact, we view this approach as indispensable in determining significant "pay-off" areas to which the technological effort should be directed. The problems involved in pollution abatement are national in character and technologically complex. To achieve success requires the utilization of the most sophisticated techniques available. We have applied this approach to our automobile exhaust studies, and we are convinced that the rewards will be great, even though our investigations are concerned with only a small part of the overall problem.

Since the private sector of the economy is highly responsive to competitive factors, the setting by the Federal Government of new standards would likely disturb existing markets for fuels. Industry would undoubtedly make strong research efforts to meet these standards in order to retain or strengthen its markets.

Basic research on pollution abatement of all kinds is usually not supported heavily by industry since the benefits that may accrue frequently cannot be applied solely to the organization supporting the research, and the monetary benefits are not particularly rewarding. For this reason, Government will doubtless have to continue to play a dominant role in this research area. Institutions of higher learning, in cooperation with Government agencies, also can make valuable contributions. Unfortunately, the Bureau does not have the authority to contract with universities in most of its research areas.

We believe that the opportunities are unlimited for approaching a recycle type of industrial society—one in which materials are used over and over and over again. Many of the constituents in environmental pollutants are worth conserving, and since conservation is a major role of the Bureau, we are alert to the possibilities. For example, the recovery of the sulfur from the sulfurous gases resulting from combustion of fossil fuels would solve the critically short supply of sulfur that now exists on a world-wide basis. Likewise, the scrap automobile and discarded refrigerator that in abandoned form blight the landscape contain many valuable metals that should be recovered and put to renewed use.

The issues raised in the Advisory Panel Report having direct implications to the Federal Research and Development Program, especially those which apply to the Bureau of Mines, were carefully reviewed by us. Many of the problems concerned with pollution abatement have social connotations that tend to obscure definitive answers as to the comparative merits of short- or long-range remedies through research. Under the present budget structure of the Bureau, we believe our research effort is properly balanced between those studies that lend themselves to the application of previously developed techniques with the view toward an expeditious solution of the problem and those that require a more extensive investigatory period where ultimate success is more uncertain.

The question whether the research effort is properly distributed among the various facets of a common problem is always difficult to assess, and the different sources and types of pollution represent a classic example of the task that confronts management in the effective direction of a research program. We believe that the systems approach will provide material assistance in this area, and it is one of the reasons that we so strongly endorse this method.

The ultimate goal of the Federal research establishment in determining the appropriate stopping place as you move from basic or applied research into the