

eral Government. For these reasons, we believe it to be of the utmost importance not to "cut corners" with respect to either numbers or competence of research staff.

It has also been proven extremely valuable to use Cooperative Projects Agreements with various local authorities to allow actual plant-site studies by both in-house and contract researchers. Such installations have been initiated at Cincinnati, Cleveland, and Lebanon, Ohio, at Lancaster, Pomona, and Whittier Narrows, California, and here at the District of Columbia. Other such field sites will be used when appropriate.

Field Evaluation, Demonstration, Experimental, and Model Plants

The solution of water pollution problems will require the application of existing techniques, plus additional research and development for new and improved techniques. Research and development generally goes through a series of steps ranging from exploratory studies through laboratory research, field evaluation, and demonstration. In the past, our efforts have been mainly in laboratory research and there has been a recognized deficiency in the application of research findings. The application of research findings requires that someone undertake the construction and operation of a new type facility which is very often very expensive and which is associated with a greater risk of failure than with processes which are already proven in practice. The construction of remedial facilities in water pollution control is the responsibility, to a considerable extent, of local authorities who may have limited financial resources. Often these authorities feel that they cannot afford the risk associated with trying new methods. It may very well be in the best public interest for the Federal Government to design, construct, and operate full-scale facilities to develop and demonstrate new ways of pollution control. Such facilities could be built in cooperation with existing or new municipal installations or at Federal installations. Examples of full-scale projects which may have to be built or financed to assure an effective water pollution control program are:

1. Latest techniques of waste treatment.
2. Methods to control nitrates and phosphates which cause fertilization of lakes; included would be procedures for removing these nutrients from lakes and streams.
3. Methods for handling, conditioning, and disposal of impurities removed from waste streams.
4. Systems for waste water purification and reuse including ground water recharge.
5. New processes for industrial waste treatment to serve as models to industry and State regulatory authorities on how pollution can be reduced and controlled in an economical manner.
6. In-stream treatment methods.
7. New instruments for surveillance and operational control.
8. Methods for control of pollution from combined and storm sewers.
9. A total waste management program in a model community including construction of needed facilities.
10. Methods for water conservation.
11. Control of irrigation return flows.
12. Control of acid mine drainage.
13. Methods to prevent boat and ship pollution.

Acceleration of research

There are a number of elements necessary to carry out a research program. These include:

1. Manpower
2. Facilities and equipment
3. Funds
4. Time

It goes without saying that the most critical element is the manpower. Here, I am most concerned with the creativity aspect. A successful program depends on ideas and imaginative methods by which these ideas can be developed and applied. The role of funds, facilities, and equipment is perhaps the best understood, although it is well to point out that whereas funds are necessary to carry out a program, an increase in funds does not necessarily result in a proportional increase in output of results. The time necessary to accomplish