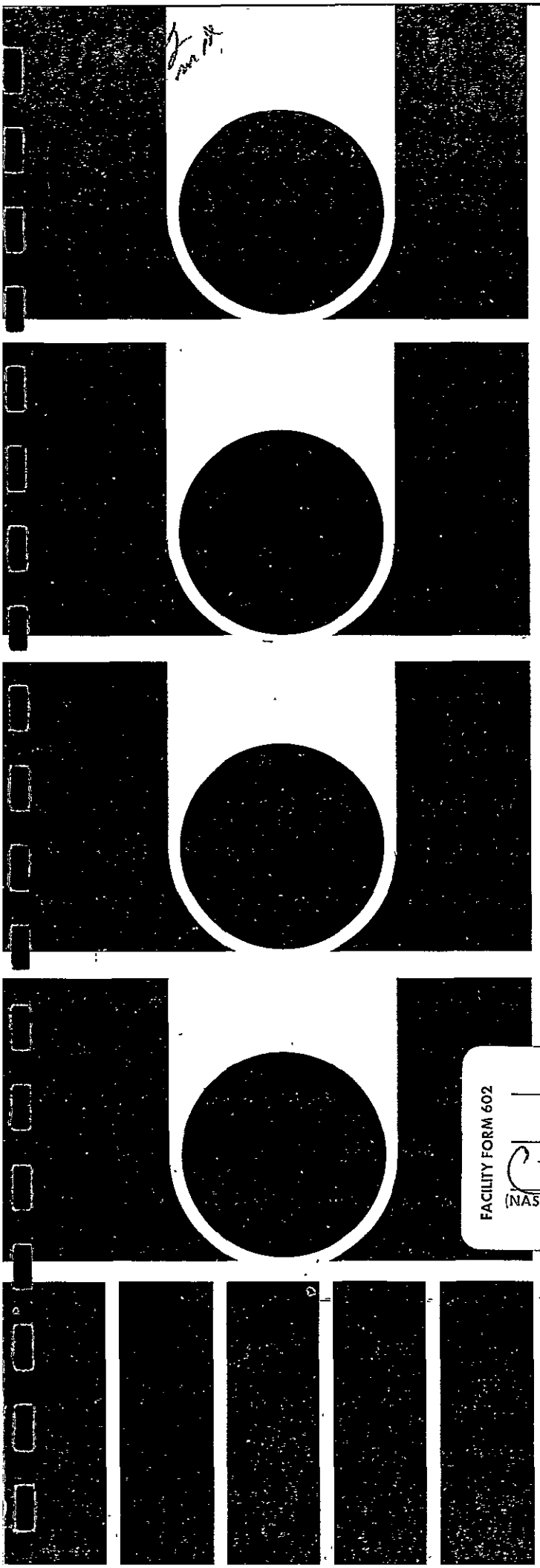

SPECIAL REPORT

NASA Contract NASW-2171

CHALLENGE: THE ENVIRONMENT

Proceedings of the

ARAC ENVIRONMENTAL CONFERENCE
Held October 29-30, 1970

Published by

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CHALLENGE:

THE ENVIRONMENT

Report of the Conference on

Problem-Oriented Approaches to the Environment

by

Government

Industry

Banking

Conservation

Law

October 29-30, 1970

Sponsored by

Aerospace Research Applications Center

and its new division

Environmental Systems Applications Center

Edited by
William B. DeVille
Environmental Project Director
Environmental Systems Applications Center
Indiana University Foundation
Bloomington, Indiana

Foreword

The Environmental Systems Applications Center (ESAC) was created as an operating division of the Aerospace Research Applications Center (ARAC) to prepare a broad-range information system designed to help industry and government to meet the urgent demands of environmental management and protection.

ARAC is a not-for-profit arm of the Indiana University Foundation. ARAC was organized in 1962 as one of the original Regional Dissemination Centers, with contracts from the National Aeronautics and Space Administration; the Center's mission is the dissemination of scientific and technical information to the scientific and industrial communities. ARAC has for several years seen the possibility of applying the information-handling capabilities of the organization to the broad area of environmental problems.

It has become increasingly obvious that practical approaches to environmental problem-solving must include other information fields, in addition to those of science and technology. The ESAC information system was designed to survey and integrate the spectrum of information relevant to environmental problems. The unique character of ESAC lies in its ability to synthesize information from these areas:

SCIENCE
TECHNOLOGY
LAW
ECONOMICS
PUBLIC POLICY

The synthesis of such an enormous mass of diverse information is only now possible by the use of automated information systems, and because of the recent emergence of appropriate data bases.

This Conference on the Environmental Challenge was organized for the mutual education of the participants and ourselves concerning the role of information in our national goal to achieve and protect a livable environment. Many organizations and persons assisted us in the funding and organization of the Conference. We gratefully acknowledge organizational support in a list of Sponsors in this report.

Thanks is owing to the many ARAC and Indiana University staff members who gave their time and efforts to handle the many hectic details of organizing and running the Conference.

This report contains the edited transcripts of the Conference sessions, and a summary of Governor Craig's luncheon remarks. The editor owes a debt of gratitude to Mrs. Pam Hussen, who transcribed the Conference tapes, and to Mrs. Betty Silverstein, who typed the final draft.

The editor accepts full responsibility for any alterations, omissions or errors in the edited transcript. He particularly apologizes for failure to reflect the style of some of the speakers in the Conference proceedings.

William B. DeVille

SPONSORS

Conference on the Environmental
Challenge
October 29-30, 1970

We gratefully acknowledge sponsorship and assistance in organizing the Conference from the following organizations:

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY

INDIANA DEPARTMENT OF COMMERCE

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THE CENTER FOR LAW AND SOCIAL POLICY

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SOUTHERN INDIANA, INCORPORATED

THE NATIONAL AUDUBON SOCIETY

THE CENTER FOR ADVANCED STUDIES IN SCIENCE, TECHNOLOGY AND SOCIETY

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WELCOME BY DR. DAVID R. DERGE

Acting President, Indiana University

It's a pleasure to be here and see a problem attacked directly, during a time when Indiana University is celebrating its 150th year of attacking problems directly. Most of you know that this is our Sesquicentennial year, and among the various things we have tried to do is to act as host for important educational, cultural, and public events. We will take the liberty of recording in the record that this meeting was an important one that occurred during this Sesquicentennial year.

I think it's particularly important for this group and for the Aerospace Research Applications Center (ARAC), and now ESAC, to address the problems of a deteriorating environment for several reasons. First, the volume of literature available on this problem is growing rapidly and at an accelerating pace. Secondly, the literature as it grows, grows in a wide and disparate variety of disciplines, many of whom communicate poorly or not at all with one another. So we have, in effect, an information handling problem, which ARAC, in its institution in 1962, was designed to do in a slightly different area.

It is our high hope that ESAC, following the information handling capability already established by ARAC, can attack this very serious problem. Personally, I am very interested in seeing this done because, from a public affairs point of view, it seems to me that no one is for pollution or deterioration of the environment; but, like

sharks and landslides and abuse of children, all of those people who are against it are not necessarily against it in a sensible fashion. The nonsense about the deterioration of the environment, I'm sure, will at least equal--and perhaps exceed--the hard careful thinking. The difference between the mishandling of environmental problems or their successful resolution may very well hinge upon the ability to bring to bear on these problems systematic information, systematic information which clarifies the problems and points the directions in which our society should go.

Once again, we are delighted to have you on our campus at this time attacking a problem of this magnitude, and we hope that your conference is entirely successful.

WELCOME BY DR. BYRUM E. CARTER

Chancellor of the Indiana University
Bloomington Campus

I'm not quite sure what I'm supposed to do now. I was told that I was to officially welcome you, and you are already officially welcomed. When I met Acting President Derge outside, he told me that what had happened was that there had been a coin flip and that I was to speak briefly on behalf of pollution. While I think it would be interesting to make that kind of effort with this group, there are some scattered members of the Indiana University faculty included out there, and I don't think I would become very popular with them.

I am very pleased that you are here. I think that the basic point has already been made by Acting President Derge. I have been struck in recent months myself by volumes of literature on our environmental problems, some of which, I must admit, I find frightening and perhaps even misconceived. Much of this literature pays little attention to the human costs which would be involved in the extreme measures which are proposed for tomorrow. I find a great deal of it a bit like the kinds of things I seem to have to deal with, with student government or with other student pressures, which are related to solving problems of some complexity by tomorrow morning. One of those happens to be the car plan, and I was discussing it with students yesterday afternoon at 5:10. So I want to assure you that some of the problems that people are talking about, and are impressing upon industry as problems, we live with as well.

I hope that I will have the opportunity to see the proceedings

of this conference, since inevitably I'm going to have to flee very quickly. I hope sometime that ARAC is able to send out an address given here a short time ago by Philip Handler, the President of the National Academy of Sciences, which addresses itself in some of the most persuasive language I have heard to the problems of science, technology, and the environment. We are delighted to have you here, and I will add my official welcome to that already given to you. Thank you.

WELCOME BY DR. JOSEPH DiSALVO

Director, Aerospace Research Applications Center

ARAC will enter its eighth year of existence in about thirty one days. Those of you who are familiar with the information business will probably recognize this as extreme longevity for any organization in that endeavor.

We think we have learned from the kinds of experience we have had in working with a variety of information users. As Dr. Derge indicated, we are now trying to apply our know-how to develop a system which can be responsive to needs pertinent to the theme of this conference.

We greatly appreciate the interest displayed in our new environmental information system by the conference participants. It is our hope that, today and in the future, we will be able to profit from your comments and advice. We believe that the preservation of environmental quality is an urgent mission. The potential contributions of ARAC and ESAC to this mission lie in the development of useful information tools. We urge you to help us evaluate the information needs of this environmental mission, and to evaluate and criticize the future development of our activities.

CHALLENGE: THE ENVIRONMENT

PANELISTS:

Lee M. Talbot
Senior Scientist
Council on Environmental Quality
The Executive Office of the President

Richard Stoner
Vice-Chairman of the Board
Cummins Engine Company, Inc.

James Moorman
Staff Attorney
Center for Law and Social Policy

Robert Aldrich
Environmental Systems Coordinator
The Chase Manhattan Bank

MODERATOR:

William B. DeVille
Environmental Project Director
Environmental Systems Applications Center
ARAC/ESAC

LUNCHEON SPEAKER:

The Honorable George Craig
Lawyer
Former Governor of Indiana

THE COUNCIL ON ENVIRONMENTAL QUALITY AND FEDERAL POLICY FOR THE ENVIRONMENT

Dr. Lee M. Talbot

It is a great pleasure for me to be here. It is a particular pleasure, I might add, to be on the kind of program where one is not expected to give a long prepared speech through which most of the audience will suffer and sleep, but rather where one can exchange views with the other panelists and with the participants--which is by far the most productive way to approach any exchange of information.

What I will try to do very briefly now, in line with the moderator's request, is to outline some of the activities of the Council to which I belong, emphasizing the general areas where environmental information requirements are most important.

Some of you, in particular Professor Caldwell (who is somewhat responsible for its form), are acquainted with the Council on Environmental Quality. But for those of you who are not, I will describe it briefly. The Council is a branch of the executive arm of the federal government. It is responsible to and reports directly to the President. Its basic aim is to insure that environmental considerations are given adequate weight at all levels of governmental activity, particularly in basic planning and in decision making. The President has called it "an environmental conscience for the country," which in light of some of the earlier remarks and, I'm certain, some of the later ones today, will seem to be a rather broad mandate.

The Council was formed by the National Environmental Policy Act of 1969, the signing of which was the President's first act of 1970. Its

mandates have been added to and clarified by subsequent acts and several Executive Orders. The basic mandates could be devided into several major areas. One of them is to gather information on the condition and trend of the nation's environmental quality, to document and define changes, and to evaluate these in terms of policies. This involves the need to interpret the causes and the basic factors underlying these changes. The second major area is to review and evaluate the existing or the proposed activities and policies of all parts of the federal government in the light of environmental quality. An ancillary activity to that is the mandate to coordinate the activities of all the federal agencies in the realm of environmental quality. The third major area is to advise and assist the President in environmental quality matters. As a part of that we are to prepare an annual report on the status of the nation's environment--some of you have seen the first report which came out a couple of months ago. The fourth major area is to develop and recommend policy in the area of environmental quality. As an ancillary to this and the others we are authorized to conduct investigations, surveys, and analyses of virtually anything involved with environmental quality and the rest of the mandates. Another area that is particularly pertinent to questions of information is the mandate to develop or see that systems are developed to monitor the environmental quality of the nation: that is, to assess the conditions and trends, to enable us to predict the impact of proposed activities of the government and private organizations and to determine the effectiveness of programs for environmental quality. And one other area, which I think is particularly important, is to advise and assist the

President and other agencies in achieving international cooperation in environmental quality activities. Because of the obvious recognition that we share the environment with the rest of the world, environmental matters don't stop at national borders.

The character of the Council is that of an advisory group; it is not an operating agency in the sense of the proposed Environmental Protection Agency or the Department of the Interior. Basically, it serves as a focal point for environmental policy in the federal government. It serves to maintain an overview of what the government is doing within this general area.

Our concern is with the long-term problems. It would be all too easy to spend all our time chasing after brush fires--immediate problems that are constantly popping up--and this does take a great deal of our time. Things like nerve gas dumping and mercury pollution are examples of the kinds of brush fires that rise with regularity. But our real concern is with the long-term strategy to try to get at the causes of these problems, rather than to put all our effort on cures after the problems have happened.

I would like to give several specific examples of the way in which the Council operates. One example was a brush fire--mercury pollution. Last spring it was suddenly recognized that mercury pollution represented a great threat. The Council called together the different agencies of the government that were involved, or that we thought were involved, with the mercury problem and held an initial meeting to find out where we stood. What we discovered was that there was a whole series of agencies, to some degree duplicating one another; and that a great

deal more was known and was being done about mercury than we had realized. Therefore, we requested that they prepare reports on what each of the agencies was doing--which they have done. We have tried to bring these together into a summary or synthesis. At the same time we have gone to the private sector and various scientific groups to find out what they knew about it, and we have submitted the total package to the National Academy of Sciences for an in-depth scientific evaluation of the adequacy of our present knowledge, the adequacy of our current activities, and with a request for their recommendations on what should be done now to fill the gaps in knowledge and in control. This has also been an international activity, involving cooperation particularly with the Japanese and the Swedes. Out of this will come, depending upon the recommendations, possible legislation, possible recommendations for additional activities on the part of the various government agencies, and so forth.

Another example, a different type of activity, again one which has an extremely important information component, is ocean dumping. Last spring, in a Presidential message, President Nixon requested the Council to make a study of the status of ocean dumping of wastes and to come up with recommendations on what might be done. The Council did this, again following the general pattern of getting an interagency task force to put together what is known and what is being done by the federal government, and then getting assistance from the private sector, private industries, state and local governments, and the scientific community. From these the Council assembled a report, which some of you have seen, and which was presented by the President to the Congress several weeks

ago. The report summarized the status and made specific policy recommendations, which are now the policy of the land regarding ocean dumping. This, we feel, is probably one of the strongest antipollution stands that the nation has ever taken. The policy absolutely bans unregulated dumping of materials in the ocean and strictly limits or brings to a halt the dumping of any materials that are harmful to the ocean environment. It also extends internationally, in that we have taken the view that Americans should be responsible not only for their own environment, but for what we do to other people's environments. Therefore, this applies to Americans or American flagships anywhere in the world.

There is a third example I would like to mention rather briefly. The President has mandated us to see that an environmental monitoring system is developed. We are in the process of a study, part of which has been subcontracted to the Mitre Corporation, a systems engineering group with which some of you are acquainted, to develop a nationwide system of environmental quality monitoring. We might wish to discuss this later because it has many specific information components. What it will amount to ultimately, starting, we hope, next spring or summer, is an attempt to bring together many of the existing activities in monitoring different variables, different parts of our environment, which will play a major role in helping the Council assess the quality of the environment and the nature of specific environmental problems.

In contrast to the brush fire programs which have been discussed, the Council is directed by law to a continuous program of consultation with all agencies of the federal government. Section 102 of the

National Environmental Policy Act of 1969, Public Law 91-190, requires all federal agencies to prepare a statement of the environmental impact of every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. This environmental impact statement program is, again, something Professor Caldwell of Indiana University has been involved with at the legislation drafting stage.

The purpose of this aspect of our work is to assure that environmental considerations are built into the very basic planning and decision making of government. The section requires that every federal agency, whenever it is proposing an action, policy or legislation which will impact on the environment, must prepare a statement on the environmental impact and submit it to the Council. This statement must evaluate the expected environmental impact; it must define the resources that are irrevocably committed; it must show the relationship between short-term gains and long-term environmental losses from this activity; it must evaluate alternative courses of action; and it must show that there has been consultation with relevant federal agencies, state, and local organizations. The final report, with the comments of these other agencies, must accompany the proposed legislation or action through the whole budegetary process.

This has been, in my view, the most effective single activity that has happened yet in getting environmental considerations effectively built into government activity, and this quite clearly goes far beyond the federal government in that it also involves permits. For example, the Atomic Energy Commission gives permits to private

industry to construct atomic power plants; therefore impact statements must be prepared for each such construction. The government is involved in large numbers of subsidy programs, grants-in-aid, tax programs, and so forth with state and local governments, which are also covered by the requirement for impact statements. This, then, is a particularly effective mechanism for getting environmental considerations built into the basic way we do business in the nation. And it clearly requires a large body of information on the environmental impacts that does not as yet exist.

This has been a once-over very briefly, and I look forward to following up on these matters later on in our discussion.

POLLUTION CONTROL AND THE DIESEL ENGINE: CUMMINS ENGINE COMPANY

Richard Stoner

Ladies and Gentlemen, the first thing I would like to develop with you is a little philosophy about environment as we see it from our point of view, and then look at the various roles that we believe government, industry, and the company with which I am associated should play in the environmental quality picture.

Some of you may have seen a recent article by James Reston, Vice President of the New York Times, in which he raised some fundamental political, economic, and philosophical questions concerning ecology. Rather than taking the usual question that comes up in the physical and technical sense, I'd like to pose a few of those questions to you because I think they are significant in our discussion here today. The first question he raised was, "What personal and corporate uses of private property are considered to be in conflict with the public interest in a healthy environment?"; his second, "Could reliance be placed on incentives or punitive measures to secure compliance with regulations?"; and his third, "Who should pay for reducing or eliminating pollution?" He goes on to say something which I think is very significant to us: "These are the deeper environmental questions that few politicians have ventured to raise, for some of these questions challenge not only the private interests of powerful forces in this country, but also the long-established concept of the rights of private property in a capitalistic society."

I mention this article because I think it emphasizes the dual

approach which my company, Cummins Engine Company, has taken towards improving our environment. It is our belief that generally in this country we are faced with a very clear decision. Either we are going to fulfill our moral obligation to lead the way in air, water, waste, and noise pollution within the decade of the 70's, or the people (I think led by our youth, many of whom are in this room) will force the government to enact legislation which requires all of us to do the job we will not do by ourselves. I think that is the simplest statement of our environmental quality problem. But you know technology alone will not solve this problem. We must implement and we must motivate action of a philosophical and a political nature before our physical advances will ever have a chance to become effective. Likewise, any commitment that we make, I feel, must be made on several fronts simultaneously if it is to be successful. Government, industry, and the public all must play an equally important role, but they are widely varying roles.

Let us look briefly at the background. In the past, most of us in industry have operated effectively with the clear economic goal of producing a competitive product or performing a service at the lowest possible cost to the consumer or the user. But now we have a new phase; a new word, sociability, has clearly become the planning goal for industry of the seventies. Sociability has real meaning today because we recognize that stopping pollution is the number one technological challenge to the transportation industry in this decade. Those of us in the transportation industry have responded to pollution about as well but no better than all industry. Until a few years ago

we were not concerned greatly with engine exhaust emissions. The problem was concentrated, we thought, in the few, highly populated industrialized areas, the urban centers of our nation. Then we became acquainted with California's smog problem. It became so great that the state government in California was forced to issue the first automobile exhaust emission standards. If you will, recall what happened to industry when that occurred. Industrial and general public reactions were less than enthusiastic. We protested. What did we say? We said that cost would be too high. We said that time requirements were too short. We said the standards were impossible to achieve.

Yet, today, what's happened? The transportation industry is rushing ahead, successfully I think, to meet the latest standards. At the same time, we are fighting a negative, rear guard action against proposed standards with the same old arguments. They are too costly, they are too restrictive in time to achieve, and, yes, impossible to achieve. That's why the transportation industry has not solved the pollution problem. We are opposing the proposed standards, and we are scrambling to meet them at a time when our goals must become, and our technical efforts must be directed toward, the reduction of engine emissions and noise to the lowest possible level which technology will permit.

We must keep in mind, however, that emission control effort is massively expensive. Who will pay? All of us will pay. Increased costs will not stop with the manufacturer. Equipment purchasers, and finally the ultimate consumer, will feel the cost of any emission

control effort. This is not because manufacturing costs will be passed along in their entirity. It is primarily because high horsepower to weight ratios and high engine performance and low emissions are not necessarily compatible according to our present understanding of the state of the art.

Well, what must be done then? Somehow, out of today's rhetoric must come not just governmental pledges nor industry programs, but a total committment to improve environmental quality. In this growing effort government can provide guidelines and help define priorities, but it is those of us in industry who must take on the leadership role and commit now, today, both our human and financial resources to guarantee clean air, clean water, and open spaces as fundamental rights for each one of us. Surely if we have the brainpower and the resources to go to the moon in the short space of ten years, we can bring our environmental violation into tolerable limits within a similar period of time.

But what is industry's role? Although industry is guilty of the charge that we have not led in the control of pollution and that we have not given sufficient attention to the harm that our manufacturing plants and products are having on the quality of our environment, there is, however, a growing movement among responsible industrialists; and if the effort can be expanded and maintained, I am confident that we can have clean air pure water, and decent living conditions for all people.

As a first step, those of us in industry must take whatever action is necessary to stop noise, air, water, and waste pollution resulting from our manufacturing processes. The technology is available

to us; it must be put to work. The cost will be enormous. Unfortunately, some enterprises will not survive. But that is part of the necessary cost. Second, sociability must be a priority design criteria in planning all new products, new plants, and new services. Third, those of us who produce products that pollute must modify present product lines so they are as emission free as society requires. Products which cannot be modified must be abandoned and replaced by new ones with a high sociability factor. Cost consideration must be secondary to health and safety. Fourth, industry must fund more basic research to develop new technology which goes beyond that presently known.

We have great faith in the adaptability of the internal combustion engine. It has served man well over the years. And, if we are as creative in making social improvements as we have been in improving its efficiency, we can extend its useful life for years to come. However, and I think this is very important, if the technology cannot be found we must be prepared to bury our old friend just as the University of Minnesota students did last spring when, some of you recall, they buried a new car with a gasoline internal combustion power plant, and they buried it because they thought its time and usefulness had passed. We must replace this internal combustion engine with a new, less offensive power plant. The noted presidential science advisor, Dr. Lee DuBridge, cautioned us, however, that such a power plant has not yet been invented or at least has not yet proven to be reliable, economical, or capable of the high performances we require.

Perhaps at this point I should interject some observations of my own on this often discussed subject, the successor to the internal

combustion engine. I think it will serve to illustrate some of the misconceptions which occur on pollution and which actually hamper progress.

I continually hear people discussing the gas turbine as a successor to the internal combustion engine. As I am sure we are all well aware, the gas turbine engine is an internal combustion engine; combustion gases are the working fluid, and this is a definition of the internal combustion engine. And while the gas turbine may offer more efficient combustion and less noise, the exhaust still contains nitric oxide. This just happens to be a natural by-product of the combustion process, regardless of the efficiency. In fact, the more efficient the combustion, the more nitric oxide is produced. Furthermore, the exhaust also contains carbon monoxide and hydrocarbons. So the gas turbine is not the cure-all for all our ills immediately, as has been said by some. On the plus side, however, I might add it appears possible to reduce nitric oxides sooner with the gas turbine than with the gasoline or diesel engine. Therefore, we are continuing research in this power form. There is the need, however, to separate what I would term wishful thinking from scientific fact. It is important for all of us to understand clearly what vehicle emissions are all about. As many of you know, we published a booklet, "Clean Air and the Diesel," which attempts to explain the role of the diesel engine in the air pollution problem. We have also tried to discuss some of the common misconceptions about air pollution. I will be happy to supply you with copies of it.

Moving on to another area, I would like to outline what we see as government's responsibility before I take up the responsibility of my own company. Perhaps it is worthwhile to state first that

Cummins' position includes our intention to back responsible government regulation and incentives. Government's primary role, as I see it, is to make pollution a priority public issue of our decade, to provide incentives, and, where necessary, to set requirements for industry and consumers to meet their responsibilities to eliminate pollution as a threat to our nation's survival.

But how would we implement this? First, I think economic incentives should be devised that encourage all industries, large and small, to accelerate their antipollution efforts, the idea being to make normal economic factors provide the nation with the direction so urgently needed in the conservation task ahead of us. Second, I think there should be the establishment of a program of penalties for those who pollute, whether it is the producer or the end user, if he is at fault. Income from a tax based on the amount of the offending pollutants and emissions could be used to fund research on pollution control devices and purification systems for the good of the entire community. When the consumer realizes that it costs more to own a product that pollutes, or that he will be fined if he deactivates the emission control device on his engine, he will demand from us a clean engine, and he will operate a clean engine. If we produce a product which, in its production phases, pollutes the water or the air, we should likewise be fined, and this pollution tax should be in direct relation to the extent that we pollute. Third, we recommend that the government earmark funds for cooperative studies to determine what levels of pollution we can tolerate and maintain a good environment, thereby determining the standards that are required.

We are not well enough informed on the interaction of various emissions, especially how they affect our health, how they affect our living conditions, what amounts we can safely tolerate, and at what rate the atmosphere cleanses itself. These are studies which should be related to specific emission guidelines. We do not know enough about this area. No one is adequately informed today. Industry does not have the facilities to make these environmental studies giving proper consideration to all the factors. I think these are governmental responsibilities of the highest order. Government's efforts must be coordinated and not diffused through the establishment of inefficient and ineffective offices in a number of bureaus. The efforts must be singly directed and brought together and receive the top level attention the problem demands.

Let me tell you about the steps that we have undertaken as one industry to insure that we are producing the most pollution free engine possible with today's technology. Our commitment is to eliminate to the extent technically feasible the pollutants, the noise, and the waste resulting from our plant operations and all of our products. We will not do this job as quickly as some will think. We will take this action, not waiting for an adjustment in government requirements or for government incentives, but in an attempt to fulfill our responsibility to improve the quality of our environment. Diesel improvement starts with an engine that has emission characteristics superior to most vehicles and vehicular engines today. As you know, studies of the Health, Education, and Welfare Department reveal that diesels contribute only about 1% of the total pollutant emissions and

that most of these are not health hazards. That is due to two factors: one is the low number of diesel vehicles and the second is the fact that in the items that are pollutants and are actually harmful to us, the diesel engine is lower in production of those than the gasoline engine. For example, the diesel is inherently low in unburned hydrocarbons, a principle contributor to chemical smog; and in carbon monoxide, which we all know is a known poison, the diesel engine has practically no carbon monoxide in its operating process. That is the reason it has been used for years in underground mining. Smoke is definitely a problem with the diesel engine. It is not harmful to us but esthetically we don't like it; it's a nuisance; I don't like to see it; none of us do. It is carbon, soot, it's dirty, it falls to the ground. But it's a nuisance and that's one we must eliminate, that's the one we associate with the diesel engine along with odor.

We are funding an accelerated program for development of clean and quiet engines, including new power forms. Cummins has adopted emission control standards more severe than any current regulations as a design criteria for all of our new products. Our ultimate goal is to produce engines that are completely socially acceptable. By this we mean engine emissions and noise will no longer cause problems for environmental quality. An immediate target is to reduce smoke substantially below the present governmental smoke standards, thus removing diesel smoke as a nuisance. We will apply this new target across the broad spectrum of our power applications, not only on highways but off-highway uses in construction, industrial, and marine equipment as well as on-highway truck engines. Our technical center

is currently studying promising methods of emission and noise control, and is hard at work today exploring new techniques in this area. We know, for example, that the major contribution to reducing smoke will be made by applying what we have today, known technology, to every design detail of the engine. This includes manifolding; it includes cylinder porting, or what we know in the industry as "good swirl"; it deals with combustion; it includes low pressure drop, improved combustion chamber shapes, modified fuel introduction timing, valve geometry and timing, swirl plates, and improved injectors. Yes, technical, but the technical features are what are necessary to improve this. In the test cells at our technical center we are constantly testing each current engine model and component part for possible modifications which will control or eliminate smoke and noise.

We will have an engine which produces what we term no visible smoke available at the end of this year and across our line early in 1971. Other areas in which we are effectively engaged along this line include turbocharging and aneroids. We expect to see a substantial increase in the number of turbocharged engine models and we are also using aneroids on more models. Turbochargers and aneroids regulate the flow of air and the flow of fuel until the turbocharger develops the necessary revolutions per minute, permitting more air to be involved in the burning process. In the area of fuel research we have just entered into a working agreement with a major oil company to study the effects of various diesel fuel properties on the environment. We do not believe normal fuels have a large effect, but we plan to identify what effect they do have. In addition to improving the basic

engine, we are also investigating an exhaust catalytic muffler and this exhaust catalyst will remove pollutants that still remain. Also, we recently purchased the rights to an electronic process of filter line to remove carbon particles from our exhaust. We are now exploring its possibility for application on all our products.

New engine design: in all new engine models currently being developed emission and noise control are primary design criteria. We will be marketing this year, and continuing through next year, a new line of engines with no noticeable or visible smoke. What about new power forms? Power forms will be required in the 70's and the 80's. We believe that, under our current design and research activities, it is possible to make the diesel completely socially acceptable. But we are still investigating, as we always will, new forms of power in the event that these new forms should prove to be a better solution. For example, we have a gas turbine engine program, gas turbines under development in our technical center. We will have prototypes in operation in early 1972.

What will these clean engine commitments mean? They have been made with the full realization that the risks involved may include reductions in profitability, increased capital investments, increased initial investment for the consumer, and a massive educational job to sell the new concepts and their importance to customers and to operators. Frankly, we are not in any position to brag about these things. We should have done them ten years ago. We didn't. But is important to understand, I think, that we have now made the basic commitment to go as far as we can in eliminating contamination of our environment--not

just meeting the standards imposed by governmental units or agencies today, but the standards as they will exist in 1973, '75, and beyond.

Today we all face a fundamental challenge, one that will tax not only our technological creativity but also our determination to succeed. Because we all have so much at stake in the preservation of our environment, I can only hope that we have the courage to make the necessary political, economic, and philosophical commitments that are needed to succeed, and they exist in all those areas. We have committed ourselves to go as far as we can in eliminating the contamination of our environment. This must become a personal cause, however, of the highest magnitude for each one of us. We all must join in this commitment, because I think we all join in concurring with philosopher Lewis Mumford's observation that any square mile of inhabited earth has more significance for man's future than all the planets in the solar system.

THE ROLE OF THE COURTS IN ENVIRONMENTAL DECISION MAKING

James Moorman

How many of you are lawyers? Well, there are a couple. I tell you it is refreshing to be able to talk to a group of people who aren't lawyers. I want you to remember one thing about lawyers, though, as I'm talking, and also remember this about the courts, as I will bring it up again: Lawyers don't know anything outside the law. They know absolutely nothing about science and technology and the other areas of expertise which decision makers must deal with. So, while I am going to assume you don't know very much about the law, you must realize that I know absolutely nothing about most of the substantive issues involving the environment.

I am going to talk about three things, briefly. First of all, the role of the law and courts in environmental decision making. Second, how the courts face technical and scientific problems in an environmental case. And third, about the position of the expert in our society as an initiator of an environmental decision making process such as a lawsuit.

At the moment, we are in a fabulous age in the creation of environmental law. New laws, regulations, judicial opinions, and legal articles by legal scholars on environment are raining down on us daily. I would like to mention and invite your attention to three laws in particular which I think you should all study and consider, because they are very important in our fight--if you want to call it a fight--to protect our environment. The first is the Federal Water Pollution

Control Act, the second is the Federal Air Quality Act, and the third is the National Environmental Policy Act. The first two of these acts, the Federal Air and Water Pollution Control Acts, are very similar. They require the states to establish plans to enforce those standards. These laws are quite elaborate. The promulgation of the standards involves conferences, hearings, federal approval, and perhaps judicial review. We have set up a large number of bureaucracies in state and federal government to implement these laws.

We now need to take a look at what we have done to determine whether or not it will work, or to what degree the air and water quality laws will work. Many lawyers have written articles which are somewhat cynical. They do not believe that systems so complicated can achieve their stated goals. We now need to hear from economists, scientists, engineers, and people from the area of public policy. And we need to know if the programs work, how they work, and how we can make them work.

I am not going to say very much about the National Environmental Policy Act because you have already heard quite a bit about it this morning. I do want to say that it is a mojor innovation signed into law on January 2, 1970, by President Nixon. It does essentially three things: establishes the Council on Environmental Quality, which Lee Talbot works for; declares a national environmental policy which is binding on all federal agencies; and, third, establishes the procedures such as the Section 102 Statement of Environmental Impact, about which Dr. Talbot spoke, as a mechanism to force agencies to consider the impact of their actions on the environment. I have one question about this mechanism, however, which I would like to raise with the audience:

Will it work? Can we really make an agency think the unthinkable, that is to say, those things which are wrong with the projects? This year the Army Corps of Engineers sent a couple score of reports to Congress on flood control projects without environmental impact statements. One of the Congressional committees balked and told the Corps of Engineers that it must send the environmental impact statements up before the committee would act on these projects. The Corps said, all right, we'll prepare them and send them up. I will take odds right now that the Corps cannot find anything seriously wrong with any of its projects in any of those Environmental Statements, anything significant enough to suggest that the projects should not be authorized by Congress.

The Federal Water Pollution Control Law and the Air Pollution Control Law and the National Environmental Policy Act are just major examples of many of the laws which are being passed. The passage of these laws has also been accompanied by a large wave of environmental litigation. Three years ago, an environmental lawsuit was almost a nonexistant beast. Today there are hundreds. They have been brought by citizen groups, essentially, all over the country; and I emphasize the term citizen groups because the suits that I am referring to have not been brought, necessarily, by the property owner seeking damages for a personal injury, or by the public prosecutor. Of course, giving the public prosecutor his due, the attorneys general of the states and the United States attorneys are beginning to stir and bring actions of their own.

The groups that have brought these lawsuits to which I refer fall into two categories, and I think we should be aware of what those

two categories are. First, there are what I will call conservation groups. Second, there are what I shall call groups of scientists. Referring to the first category, probably most of you have heard of the Sierra Club, which has brought a large number of lawsuits pertaining to this or that aspect of the environment. Probably none of you have heard of the West Virginia Highlands Conservancy, or any of hundreds of other groups which are organized around the country and which are involved now in litigation. These groups represent, I contend, an enormous reservoir of discontent on the part of a large segment of our society with the way decisions are made by business and government in respect to projects that affect the environment.

The second category, the scientific groups, are also very interesting. The most prominent one you may have heard of is the Environmental Defense Fund, which has brought a large number of suits involving DDT and other matters. Essentially, the Environmental Defense Fund is a group of scientists who went out and hired some lawyers to represent their point of view in the decision making process. They are not, however, alone. There are other groups, some oriented around one particular problem, some oriented around one particular issue. I would suggest that the motive of the scientist who begins to initiate court action and other decision making processes is this: He is very upset at the way decision makers use data and scientific expertise. He is upset because in many areas the decision maker will not take seriously the expertise and advice of scientists which is contrary to the pet project of the decision maker.

Most of the lawsuits which are brought to protect the environment

involve serious problems of a technical and scientific nature. They also involve a problem in decision making, and I think that it is instructive to keep that in mind. Practically all of the suits involve a situation where decision makers, whether they be corporate or governmental, have isolated themselves in some way from the influence of certain segments of society, and have gotten themselves in the habit of doing what they jolly well please without paying much attention to this problem or that problem. Quite often highway departments have large budgets and very few restraints on the routing of their highways and the projects they design. The idea has gotten around that once a highway department has its money, there is really no way you can talk it out of building the road, no matter what you put under its nose, unless you go to court. That is a very bad situation, and I predict that unless decision makers who have large projects, such as power companies that buy land and then announce that they are going to build a plant as a fait accompli, develop a more considerate form of decision making, the uproar is just going to continue and get louder; and there will be more lawsuits, and there will be more political actions of every type.

So, that's my prediction, that the environmental lawsuit is here to stay. This being the case, what will the courts do with it? Well, that raises some very interesting and difficult problems. The problems are interesting and difficult because they represent the meshing of law and science and technology, and the problems are very severe. I believe the reason why the problems are severe will become clear if I go through some of the characteristics of courts as decision makers.

I am going to start at the very beginning and remind you that a court is a decision maker. When a court has a problem it must make a decision, and it will issue an order. We tend to think of courts as being slow, ineffective, technical, bound by a hundred thousand rules called precedent; but we must remember that the court is a decision maker, that the court can issue and order, and that order will be obeyed.

Now, while the court is a decision maker, we must also remember that a court never initiates action; the court will never initiate an environmental protection program itself. People always bring it problems. The result is, therefore, that the court will always be in the posture of reviewing someone else's decision. That is, the decision of somebody else must initiate the program or the course of conduct which affects the environment. That person who makes the decision, obviously, is not going to take his decision to court; the person who is upset with it will take it to court, and then place the court in the position of reviewing a decision that someone else has made.

I would like to point out that the court has practically no capacity in the field of science and technology, and it has practically no capacity to develop expertise in the field of science and technology. This goes back to my point that lawyers don't know anything; and all judges are lawyers. The way the courts handle problems of expertise is by having presented to them the expert witness who gives the court its opinion. We cannot dump on a court raw data or knowledge, so to speak. It's of no use to a court. The data must be distilled and rationalized by an expert, and even that is not enough. After the expert has had his say, the lawyer must take his statement and engage

in an "argument" to demonstrate the relevance of the expert's opinion to the issues of law before the court. So to get scientific knowledge and data before a court so that we can bring it to bear upon a problem, we have it doubly refined by process of expert, then lawyer.

Even with this refining process, courts are very troubled when confronted with a scientific or technical decision. It is very, very difficult for them to decide such an issue. If I give you an example, I think you will understand why. Let's assume that a judge was given the task of deciding between two contending groups of scientists what was truly the molecular structure of DNA. Stating the problem that way, you know very well that there is no possible way that a judge could decide such a question with any confidence that he knew what he was doing. He would have to be a qualified scientist in the fields involved; in fact, he would have to be able to duplicate research on points which troubled him--and that just is not the case.

One group of cases that involves the environment illustrates this point, and interests me very much. It is cases which involve substances which have been distributed in the environment, and which have been accused by one group of scientists or another of being carcinogens, or cancer-causing agents. Most of the evidence which is presented in these cases involves statistical evidence based upon experience with laboratory animals. The court with one of these cases discovers very quickly that no scientist will say, based on this evidence, that the substance in question does or does not, as a matter of strict scientific causation, cause cancer in man. Let us assume that the law which the judge, faced with that situation, is acting on, is a very general one

which requires him to "protect the public" or something to that effect. What can we expect the judge to do? Well, we can expect him to evade the issue. We can expect him to resort to several techniques which will allow him to evade the issue. Some of these techniques are as follows, and there are many. The judge may create the presumption that, when you have evidence that a substance causes cancer in test animals, you just assume that it causes cancer in man unless you have direct evidence rebutting that assumption. Or the judge may take up several techniques to test the credibility of the various contending sides in the issue to see if he can determine whether one side is clearly more credible than the other. The judge may decide that the burden of proof lies on one party or the other. That gives him an opportunity, of course, to decide the issue in favor of the party that does not have the burden of proof, if he cannot decide between the two sides. If he is reviewing a government agency, he may decide that the administrator's expertise must be accepted unless it is shown to be irrational. That means, essentially, that you can have assembled all the Nobel prize winners in the world to argue your case and, if the government has put a credible face on its position, the judge does not have to reverse that position.

One thing is sure, however. We can be certain that the judge is not going to wait until everybody is convinced as a matter of scientific causation that the substance in question does or does not cause cancer. Internally, he is going to lick his finger and try to tell which way the wind is blowing in scientific research and calculate the consequences of his actions and, with the aid of one or more of the techniques

mentioned above, decide. There is really nothing else he can do.

Having said that, I would like to suggest what I think is the proper role of the lawsuit in environmental decision making. I think the courts should be used, and be open to use, to review decisions and conduct of corporate and governmental decision makers that affect the environment when a strong case can be made that the decision or conduct is both harmful to the environment and unlawful. And a strong case, I want to emphasize. It seems to me to be a waste of resources in the close case to have both sides marshall enormous quantities of evidence and present it to a judge who then really has no idea what to do with it. I'm not saying people should give up in a close case, but I think other forms of decision making must be relied upon in those cases.

Now, I want to say one other word, before I sit down, about the position of the expert who initiates a case or a decision making process. I have been distressed by the fact that when scientists have brought to the attention of the public, and have gone to court in regard to some matter involving the environment, that they have incurred the wrath of various institutions, ostracism, emotional reactions, and so on. And I have also been disturbed by the fact that they have often been frowned upon by their fellow scientists, who believe they must take a passive role. The fact is, however, that scientists, or the people with technical information, cannot take a passive role if it is true that good decision making demands in all cases that the decision makers have and take into account the broadest possible data base. We cannot rely on the person who has a vested interest in the decision to always bring forth the information which is contrary to what he wants to do. We are

faced with this situation constantly. Therefore, if we want good decisions, of necessity the person who knows and understands the consequences of some line of decision, but who has not been consulted, really must come forward and find the way to get what he knows and the data he is aware of and his expertise plugged into the decision making process. If he does not have this obligation or he does not do this, then we know in advance that decisions will in fact be based on data and information which are inadequate. It seems obvious as can be, but people resist it.

THE ENVIRONMENTAL SYSTEMS GROUP IN CHASE MANHATTAN BANK

Robert H. Aldrich

Today I'd like to discuss the role of the banks in the environment, and some aspects of my activities at Chase Manhattan: one, why is the bank establishing an environmental program; two, our objectives in establishing such a program; three, what action programs we are currently undertaking or plan to undertake in the environmental area; and four, and most important, to solicit from you and the other panelists ideas, concepts, and directions that the bank can follow.

To follow that outline, why is the bank becoming involved? Generally, the bank services a wide range of industry. Many industrial segments are represented right here in the audience. These industries are based upon such needs as those for food, clothing, housing, transportation, and education. A new need has recently developed, or at least been recently recognized: the need for environmental quality. And this need became recognized for these reasons: one, the system is really becoming saturated and we are very visibly aware of pollution problems; two, the public has become aware of the breakdown of our environment and has become concerned about it. Some studies that we participated in before I came to the bank showed public awareness rising at an extremely rapid rate, probably due in part to such activities in the private sector as that represented by Mr. Moorman, and to such governmental activities as that represented by Dr. Talbot. When people in the city of New York were questioned as to what they thought of a particular environmental problem, air quality, a full 93% expressed

extreme concern--and I mean extreme concern--over the quality of the air. Overall, in the United States, the data show that between 1968 and 1970, within a two-year period, awareness of environmental problems throughout the country rose from a level of about 59% up into the 70's. This awareness has grown to be a public issue. Whenever 49.9% or more think of a particular problem as being a problem, by necessity you are going to have political action; the government has stepped in with legislation and with a range of programs. So the bank recognized the need and decided to enter into participation in this area.

New needs in the economic world generally provide an opportunity for economic expansion and the growth of a new industrial base. In the past this is where banks and industry have made their profits and have realized that our gross national product has been based upon increasing fulfillment of services and equipment and products in the area of fulfilling needs. So we saw it as truly an opportunity for the bank and for industry to service this new need. However, this particular industry, the pollution control industry, in addition to the positive economic opportunities inherent in a growth business, also has significant and sometimes overriding negative impacts upon the economy of a company, of a whole industry, of a state, and of a local community. So you have a positive contribution to the economy on the one hand in terms of a new growth industry, and, in this case, a negative economic opportunity in terms of risks involved in the production of products or services inherently environmentally unsound.

The sudden burst of public consciousness which I referred to before,

which is a proper concern for environmental quality, has also given rise to a host of demands for quick and drastic action and crash programs to alleviate environmental problems. These programs will have economic impact, and it is this field, the field of economic needs and measuring economic impacts, that the bank can truly call "our bag." To become involved we felt it necessary, as you do, to have an understanding of the wider aspects of the pollution problem beyond just the economic requirements and economic measures. We felt a need to understand the technology, a need to understand the legal and social aspects involved, and we felt a real need to have an understanding of the economic aspects and to be able to provide our input into the economic impacts in this area. So that's why we got into it. The objectives of our program, certainly, include a recognition of our responsibility as a good corporate citizen and our role in the solution of technical and economic problems relatee to pollution abatement.

The resources available to us at Chase Manhattan, and how we can most wisely use them, must be carefully considered if we in banking are to have a significant impact upon environmental quality. Banks have limited resources, even though they are large resources. The allocation of these resources to priorities is of major concern to us. What I am saying here is that the policy of the bank is to allocate an increasing share of our resources to environmental quality. We want, as a second objective, to develop expertise within the bank to make available economic research and financial data which will assist industry, government and private groups in understanding the implications and opportunities for positive impacts on environmental quality.

I should like to describe some of the action programs of the bank. The first thing the bank did was to establish a basic technical understanding of industrial pollution problems through myself and a group within the bank that technically services a wide range of industries: including petroleum, textiles, paper, energy and chemical industries. We have had long association with such industrial clients and we have developed technical expertise within the bank and a great deal of liason in relationships with these various industries. So we set up the Environmental Systems group to coordinate our activity in the area.

The second thing we did was to set up an Environmental Action Committee made up of top officers within the bank whose purpose was to get major areas of the bank active and involved at all levels in environmental programs and to stimulate new ideas, particularly in the financial area, in order to bring our expertise to bear on environmental problems.

Third, an important part of the bank's program is to measure the impact of the bank's financing and the impact of our money upon the environment. We intend not only to measure the impact, but to do something of a positive nature; our objective is to allocate our resources toward directions that will lead to the solution of the problems.

We are in the midst of planning a series of educational campaigns for the bank's officers, designed to point up our commitment to environmental obligations and to acquaint them with new technical developments within the area of pollution control. In general this has been a very active area for us over the last few months--working, as we have been, in the development of new concepts, new programs and new ideas for

solutions to environmental problems.

Section 102 of the National Environmental Policy Act of 1969, which requires the government agencies to submit a report on the environmental impact of all major federal actions, may some day have its analogue in the banking world, in terms of looking at threats to environmental quality by business or industry as a credit resk and requiring industry to include an assessment of environmental risks in requests for bank financing.

It is this evaluation of the credit risk based upon environmental concerns that will be of most interest to us, and we are anxious to develop a program in this area. We plan to work with institutions, federal, state and local; we are also working with conservation groups in programs leading to improved environmental quality.

Most of all, we seek to develop an understanding and to pass on this understanding to the public and to other agencies in terms of who is going to pay the cost of environmental protection. I think it is important to reflect upon, as Mr. Reston did, the cost of environmental quality and who is going to pay for it. Basically, the public will pay the cost and will determine the level of environmental quality which it seeks. We are trying, in terms of allocation of funds, to establish priorities within our bank. In the area of air pollution, we are working with people in the auto industry; we are studying the SO_2 problem that we have in New York City; and we are studying incinerators. We have a solid waste study program. We are trying to develop programs with customers in more efficient ways of collection, to develop programs of recycling and programs of disposal of solid waste products. This is

a big problem today, certainly in the East Coast region where we are just out of land in terms of sanitary landfill or any other type of landfill operation. In the water area, we will be working with municipalities to try to develop programs in terms of their economic level limit for municipal waste treatment. For example, it may be possible to bring together municipal waste treatment and industrial waste treatment to common facilities for the private-public sector to draw on each other's debt base as well as on each other's technology for a more efficient handling of the water and waste system.

What financial tools for environmental programs are available to the banks? Several banks have tested various programs in terms of earth bonds, where they sell a particular environmental certificate of deposit and earmark those funds to go into environmental programs. We have not done this yet. We are evaluating such a program, but it looks like the amount of money that we could raise through this mechanism falls far short of the amount of money that we would choose to allocate into this area. I am not so sure we would go that particular direction. Another often-discussed possibility is preferential loans. People think banks can afford to reduce the interest rate or that some other preferential loan technique would solve pollution problems. This has been tried by some banks. Again, I point out that this technique probably would lead to too low an allocation of funds in the environmental quality area.

We frequently hear talk about growth in technology and growth in technology as basic reasons for our pollution problems. Gross national product could be held level through proper government restraints,

taxation, and other techniques. However, if you look at a no-growth policy, you would find that our increase in population that the hours of work would significantly decline. By 1980, the average work week would have to be 26 hours, based upon the economy as we see it today. The average level of living that we know today would have to decline if we went for a no-growth policy for gross national product. The resources would not be available to solve socially and economically critical problems that we face today. Viewed in this way, a no-growth economic policy would not even solve the pollution problem in terms of today's pollution levels. A no-growth policy would guarantee at least maintaining those levels, if not getting worse. There would be no money available to reduce the pollution levels, which is the goal and objective of industry as well as of government. And certainly, any improvement in the distribution of the standard of living within the United States and throughout the world could only be done through increased taxes. Certainly, if we had a no-growth policy, our international posture and our international economic base would be significantly affected.

On the other hand, if gross national product grows as it historically has done, or as we currently project, there will be some $225 billion added to the gross national product by 1975. The cost of cleaning up our environment and making a significant impact on our environment in this same period of time is roughly $50 billion over and above what we are currently spending. If we can increase our gross national product by $225 billion and can allocate roughly one-fifth of this to pollution control, this is a source of funds for the solution of our environmental

problem. It will enable us to increase our standard of living at the same time, and to allocate funds into other socially responsible areas.

I think the majority of us want both. We want a better standard of living for ourselves and a better standard of living for our neighbors within the United States, as well as throughout the world. I think there is no basic financial, economic, technical or pollitical reason why we can't have both. I think it requires a great deal of work on the part of all segments of society and a continuation of our efforts in this area. I hope we can achieve this with our environmental programs, and that environmental interest does not wane.

DISCUSSION: MORNING SESSION

DeVILLE: I am not going to attempt to summarize the content of the discussions we have heard this morning. I would like, however, to summarize the context of the remarks of the speakers. This is a pluralistic society. The founders of our Constitution and of many of our social institutions prided themselves on instituting checks and balances, mechanisms by which organizations could cooperate in something like the way Mr. Aldrich has suggested. We hope to try to live in an acceptable way as a society, and as individuals. There is no question at this point--as all of us have mentioned at this platform--that one of those areas of concern and interest is the question of a quality environment. The people we have heard this morning exemplify the pluralistic character of this society very well, I believe. We have representatives of the policy making area of the executive office of the federal government, of industry, of the law, and of banking and finance. The background of these people is also varied. We have Mr. Talbot, who is an ecologist; Mr. Aldrich, who is also a scientist, but a chemical engineer; Mr. Moorman is a lawyer; and Mr. Stoner is both a lawyer and an industrialist. The kinds of expertise which are focused here today have some overlap; and I think this is illustrated also in the mechanisms by which our society tends to operate.

I would like to throw open the resources of the panel to the audience at this time, inviting you to submit questions to the panel as a whole or to individual panel members. Perhaps it would be best

initially to address the question to an individual panel member and invite other members of the panel to respond as well if they are willing to do so.

DR. CALDWELL: Bill, I would like to start the dialogue with the panel by reacting to a statement of Mr. Moorman's and then ask him, if he will, to comment on it. The statement I am referring to is his comment on the National Environmental Policy Act and the so-called 102 statements the federal agencies are required to submit to the Council on Environmental Quality with respect to their spending programs and legislative programs for Congress. I was involved in the drafting of the Act, and of the 102 provision particularly.

Mr. Moorman, you raised the question as to the plausibility of the 102 statements; that is, to what extent can we trust agencies of government to present a full and honest statement of the environmental impact of their proposals? Well, of course the Senate Interior and Insular Affairs Committee, in drafting this legislation, was not naive about the probable behavior or the probable reaction of the federal agencies. We realized that they would not like these statements, by and large; we also recognized that few of them, at the time the Act went into effect, were equipped very well to do the job of preparing these statements. They would have to ask scientists, ecologists, engineers, and others for assistance.

But we felt the 102 statement would have this advantage: that it would not only force the agencies to go through the process of evaluating the environmental impact of any proposed major program, it would do one other thing; for the first time, it would open to the

public, and open to challenge, the validity of the statement. The effect of the Public Information Act is to make these 102 statements of environmental impact accessible to the public. They are available to the public and to the Congress; and the effective jurisdiction extends not only to the departments of the federal government but also to state governments, so that the environmental impact plan has now become a matter of public record, open to public scrutiny. At that point organizations like the citizen groups you spoke of are also in a position to challenge the statement. The 102 statements are open to challenge in Congress and the executive branch, and they can be brought into litigation by representatives of the public. So the first reaction I have to your point is that it was not contemplated that the agencies would necessarily tell the truth; but if they don't tell the truth, or if they do not do an adequate job, they do so at the peril of someone blowing the whistle.

The second point has not to do so much with responsibilities as with priorities. You spoke of the environmental impact statements of the Corps of Engineers. The Corps is one of the agencies that, strangely enough, had begun earlier than many other federal agencies to employ some ecologists and to inject some sense of concern for environmental impact into Corps projects. But I think that we would agree that concern for the environmental impact of a large number of these projects, even where the environmental impact could be minimized by careful design of the project, is really redundant, because the project as a whole may have comparatively little merit if judged on any kind of spectrum of national priority. So my second

comment is this: perhaps we ought not to look at the Environmental Policy Act as the answer to the question you raised about projects that were really unnecessary. Even if you could establish that the environmental impact was not particularly great, you still have hundreds of millions of dollars being spent on environmental manipulation projects, that use money that might otherwise be made available for urgently needed projects. But here we have to look, I think, at another technique: how you get a reassessment of national priorities, so that the hundreds and hundreds of millions of dollars that are allocated for these relatively useless projects can be diverted to the kind of efforts that are needed to protect the environment, to solve the serious problems of air and water pollution and problems of maintenance of open space. I realize this has been a rather long comment, but I think the two points are rather fundamental in understanding this important piece of federal legislation.

MR. MOORMAN: Professor Caldwell, I'd like to make a confession. Knowing as I did that you were involved with the creation of the section 102 environmental impact statement requirement, I threw out my comments fishing for a comment from you. It was an edifying comment, and I think everybody appreciated it. I am not going to comment further on it.

DeVILLE: Let me make one comment, interjecting this remark. Professor Caldwell is one of our foremost authorities in the areas of environmental policy and environmental management and administration. I could not begin to list the number of organizations for which he

has served as a consultant and advisor, but they include the Senate Interior and Insular Affairs Committee, which drafted the Environmental Policy Act of 1969; the Army Corps of Engineers; the International Organization for the Conservation of Nature and Natural Resources; and many others. I would urge any of you who are interested in problems of policy and administration in the environmental area to contact him here at Indiana University.

TALBOT: Professor Caldwell took the bait that I was reaching for. I might add just a couple of points to your well-taken comments, Jim. You pointed out the importance of the public's not being passive. One of the tremendous advantages that I see in this 102 procedure is that the public, when it gets worried about, for example, the Corps of Engineers channelizing one of the streams in its backyard, doesn't have to throw up its hands, or lie down in front of the bulldozer and get put into jail. You can write to the Council and ask us to make sure that a 102 form has been prepared for this particular action. You can request that you be kept informed of this and you can--as Professor Caldwell pointed out--challenge the statement subsequently. One of the challenges which has not yet been done--but I expect, Jim, your organization or others will use before too long--is on the validity of the agency's evaluation of alternatives.

We should remember that the environmental impact statement is a quite new procedure; the agencies, the Council, and the government in general are still feeling their way. We are constantly examining aspects of the procedure that are capable of change to make the system

work better. When the system got started, the agencies reacted in one of two ways. Some of them treated it as a bureaucratic exercise--my impression was that they hired good fiction writers--and the result was as expected. Other agencies did their best to comply, but in many cases they had no ecological or environmental capability. Quite a number of them contacted us and said, "This is all well and good, we'd like to do it, but how?" What we have been trying to do is to provide assistance for the agencies--both those that are honestly trying, and those that initially didn't. Those that didn't, we have contacted and pointed out our evaluation of what they had done. The more I have dealt with this procedure, the more encouraged I become about it; and a large part of this stems from the potential for citizen participation from the start.

I have another comment regarding Professor Caldwell's point about citizen response to, for example, a Corps of Engineers project. Some of these projects are regarded as porkbarrel projects; this applies not only to Corps of Engineers projects but, for example, Soil Conservation Service stream channelization projects and things of that nature. This means local politicians and local interests are involved. The most effective way to fight that is through local citizen concern in that area, because it is the citizens who keep the local politicians in the positions they are in. There is a need for--and there are--mechanisms for local citizenry to make their feelings known and to really change the system. I am personally extremely optimistic--more than I ever have been before in my life--that this can happen, and is happening.

JOHN SWARTH, Ball State University: I would like to address a question, if I might, to Mr. Stoner. Near the end of your talk you stated you should have done many things some ten years ago in regard to the sociability you referred to, but there is commitment now. If this is specifically in regard to your company's concern, then wonderful, well and good. But my question concerns this: I was reading within the last month in the Jack Anderson column, that in the recent past Mr. Townsend of Chrysler and Mr. Cole of General Motors and Mr. Roach of General Motors were very vigorously discussing the possibility of stopping, or at least delaying, the 1975 emission standards. I don't know if that is true, but I am wondering if, in regard to the auto industry overall, this would be a positive or sufficient kind of commitment. Recently the UAW superstructure, with the possibility of job displacement and the insecurity of the past, got on record as hoping that the internal combustion engine would not be with us by 1975. It seemed to me that they were more committed to environmental change than were some of the companies they work for. I don't know if you wanted to reply to this, but I would appreciate any comments in regard to what I just said, especially about the possibility that there may be vigorous lobbying by top management in the auto industry trying to delay the internal combustion standards which were suggested for 1975.

STONER: You asked several questions; let me take them in order. To begin with, I am not speaking for the automotive industry. The industry I am in is transportation; we are in diesel engine production.

As a matter of fact, General Motors is a competitor of ours, and I hesitate to be the spokesman for them. Chevrolet Division of General Motors is also a customer of ours, so I will also look at it that way. The second thing is, I think the automotive industry made a very serious mistake, to go back into history, when the safety regulations were first proposed. They took a position on the defensive basis that they could not comply with the regulations. They believed the consumer, you and I, would be opposed to safety regulations, and I think that was an erroneous position. I think what you state in regard to the proposals in the Muskie Bill dealing with the gasoline engine are correct, as far as it applies to the attitude that has been taken and the approach that has been taken by certain of the automotive industry leaders. Our position, as a company, is that we endorse the Muskie Bill. I personally went to Washington and conferred with various members of the Muskie staff; we think it certainly is a step in the right direction. We were for the federal preemption; Diesel Engine Manufacturers Association did endorse it and have taken that position. Although I said that ten years ago we should have done things we didn't, we have today a very interesting problem that I will pose to you. Recently we brought out an engine of 275 horsepower--or 250 horsepower with no visible smoke. We are unable to sell that engine of 250 horsepower because the ultimate customer, the consumer, wants it at 275 horsepower, even though then it smokes. Unless there are effective regulations to require him to operate it at the lower horsepower, he <u>will</u> operate it at 275 horsepower. And anybody in the industry producing a product that

sells to someone else must remember that the purchaser determines whether he will purchase your product or someone else's.

DeVILLE: Mr. Aldrich, might I ask you a question. This seems to me to raise the question of the economics of industrial altruism.

ALDRICH: I think Dick put it very well. I think the public will decide to a certain extent what they are going to buy in terms of environmentally sound or unsound products. However, this gets into the point of certain specifications on products, and I support the purpose of the Muskie Bill in terms of the 1975 standards. I think that the auto industry has a goal and objective which might be extremely difficult to meet within the technology involved. I have been out there to see them. I think they are strenuously attempting to get to these 1975 standards. I think there is some question whether they can make it or not within the economic parameters so far. But I think there is also some question as to whether the timing of this particular bill is going, in the long term, to have as positive an effect as a more flexible one. If all resources are allocated for the 1975 standard, perhaps we will be missing the boat in 1977 with an improved engine performance. I think that we are going to see some discontinuities develop within industry if there are different regulations and laws in different states of the United States in different communities. We are going to have competitive problems over the short term until we can reach some sort of leveling base on which our economy can work effectively as it has in the past on a competitive basis. This discontinuity could be a serious consideration,

and I think the government and industry have to take this into account. As Dick said, if he produces a 250 horsepower engine and can't sell it because his competitor somewhere else is allowed to produce a 275 and can sell it, you have a great discrepancy in the economy--which will lead to a complete disaster on the part of his company in trying to sell his product; and in addition to that he invested X number of dollars to obtain this 250 horsepower engine that he can't sell. I think these are very difficult issues.

TALBOT: There is a practical example that casts some light on this and on the role of legal activity. Last spring I visited the Newark airport. They were the first airport to enforce antipollution standards on the aircraft industry. When their law was passed the industry had told them it was utterly impossible to meet; there was no hope, it was too expensive, and it would take too long. Nonetheless, New Jersey went right ahead and carried out legal action against the seven major airlines. In two months they had met the standards. I think this says quite a lot.

SHERRY BRANDENSTEIN, student at I.U.: Mr. Aldrich, first of all, I wonder if you could tell us about what the Maine Bankers' Association is doing in relationship to environmental quality, and whether their policy is to be followed by some of the other banking associations across the country, particularly New York. And secondly, when you talk about the bank being involved in the population problems, I think there is an indirect way in which banks could be involved. At Chase Manhattan, isn't most of your work involved with corporations?

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ALDRICH: Yes.

BRANDENSTEIN: It may not be so involved with your bank then, but banks in general could have an effect on population. When a woman wants to get an abortion--a legal abortion--many times she has a hard time coming by the money when she needs it; if banks would be willing to make these types of loans, it would be very helpful. And the third thing I would like to ask about is, when you were talking about the American people wanting to increase their standard of living, I question what you translate that into, because it could mean four color television sets and three telephones in your home. I wonder what you mean by standard of living because I think that's a point that may be getting a new interpretation by people now, particularly young people. Surely environmental quality is part of our standard of living.

ALDRICH: Thank you. The policy statement by the Maine bankers is one which has gotten support from the Maine banking institutions, and has also been picked up by Vermont; so those two states have been active in it. It states explicitly that the banks within Maine will not fund or loan to private industries which could contribute to a detriment of environmental quality within their state boundaries. This has been picked up by Maine and Vermont and their way of implementing and interpreting it is to deal with environmental control protection agencies within those two states for technical advice. I have talked with groups of Maine bankers as to how they implemented this program; and it is an extremely difficult program

to implement, even more so than the Section 102 program, which is more specific and in which they bring a great deal of expertise to bear on the environmental problem. This would be a nice policy to adopt, a strong policy to adopt, but gets into some very difficult decisions on what are environmental problems and whether the bank should go beyond the law in establishing the environmental quality of a given project. I think the direction we at Chase Manhattan Bank are taking in trying to look at our loans, on the basis of credit risk involved in terms of environmental problems, is shooting along the same lines. I think you have to, to a degree, be able to measure the quality of a project in environmental terms. I think we are trying to go in that direction, and we are trying to develop within the bank expertise to educate our own people and to pass this education on to our customers, particularly our smaller customers. We can advise them about new technical programs--possible for them--to solve their pollution problems. We are trying to take a positive approach in this direction.

Your population suggestion is well taken. We are an industrial oriented company, but we do certainly deal with citizen groups. I think our biggest weapon in this area to attack the population problem would be one of education. I think your abortion idea deserves consideration, and I think this would be an area which we will look at to see if we can provide this kind of service.

As far as standard of living is concerned, I did not mean it in terms of standard of living as measured in just the sheer quantity of stuff that we can shove into our house trailer or into our house.

What I meant by standard of living is to raise poverty levels and to reduce the disproportion of economic standards within the United States and throughout the world. I think you and we agree that there is a disproportion of economic well-being throughout the United States and throughout the world. The way to overcome this in the most rapid and economic manner is to increase our total productivity--to raise the standard of the United States as well as of the rest of the world. There are social problems other than pollution, and we have to direct energy, finances, and resources toward those areas.

SUMMARY OF LUNCHEON ADDRESS

The Honorable George Craig

Former Governor of Indiana

Governor Craig was introduced by Mr. Claude Rich, Director of University Relations for Indiana University. Mr. Rich recalled the many years of public service Governor Craig has given his state.

Governor Craig addressed his remarks to our somewhat paradoxical conception of "progress." Indiana has achieved many of the fruits of progress in agricultural and industrial productivity. Indiana ranks high among all states in both categories of production. Indeed, the State of Indiana may be among the best balanced states in the nation. Indiana has its share of pollution problems resulting from increased population, increased productivity, and a generally high standard of living of its inhabitants; and Hoosiers are well aware of the level of pollution problems in other parts of the nation.

Governor Craig felt that it was still possible to control many pollution problems in the state before they become overly serious. But he cautioned, in a humorous vein, that this might require another form of progress--and that identification of a Hoosier politician as "progressive" has usually meant certain political death. Governor Craig expressed great confidence, however, in the level of determination and ability with which the American people approach a problem, once they are concerned about it. He commented that, were he governor again, he would spend twenty per cent of his time drafting legislative programs--and eighty per cent of his time consulting with the people

of the state, and educating them about the necessity and benefits of those programs.

Governor Craig commented that many pollution problems constitute "lobbying by proximity" for their resolution. He remarked that Congress, for example, tends to be more aware of the pollution of the Potomac in warm weather. He reminded the audience that the Thames River used to be so polluted that one of the manditory items on Queen Victoria's barge was a fan she could use to help dispell the odor. The Thames River is finally relatively clean. Public and official awareness of pollution problems is the first step toward solving them.

Governor Craig expressed appreciation for the aims of the Conference. He stated that a program devoted to the development of information services to help industry and government respond to environmental problems is a potentially very useful and important contribution by ESAC. He also expressed the hope that ESAC can involve its activities with widespread educational programs about the possibilities for management and protection of the environment.

REPRESENTATIVE BAUER: I want to make a comment on Governor Craig's remark that Indiana could use more air. I think we've got more than our share of hot air already. That's a purely nonpolitical statement.

Also, I want to make a comment before I raise a question I have for Mr. Moorman. I think it is one that hits basically at all those interested in pollution control and was brought to my mind by the remark of the young lady who said she thought Chase Manhattan ought to fund abortions. The thought behind that is that you can't correct pollution without reducing the number of people we have. I think there is a fundamental divergence of thought among people who are trying to meet this problem. One group believes that people necessarily pollute. I don't agree with that. The other group believes that people can take care of their environment and leave it even better than they found it. I think that we've got scientific proof of that from our space program, in which they envisioned that we could send people off to space for a generation and recycle or reuse the materials in the space capsule and survive. And I think what is dangerous about this thing is that, if we say that people necessarily pollute, it gives an excuse for us to say, "Well, we really can't beat the problem of taking care of our environmental waste now." It gives us the excuse that the only thing we can do is have fewer people or reduce the number of people. I just returned from Europe, and I found that there has been more pollution in one area in Spain, where they have a very low density of population, than there is in Japan, which has

almost three times the density of population. What I am trying to bring out is that when we're talking about getting people behind efforts, we have got to view the problems as solvable. Many times, when I first introduce bills in the legislature, people say, "Well, you know, we've got too many people; we can't solve this." I think it is a defeatist attitude. I think we're going to have to say that anybody who uses the natural resources can and must restore them to the next generation in as good or even better condition than they got. I strongly want to state the stand of a lot of people who believe that we are smart enough to use this world and pass it on as good as we received it. We don't have to say that this world is only for a small elite group and tough luck to the rest of us. Now, you can blame the young lady for this little diversion.

You mentioned, Mr. Moorman, that all environmental quality suits have been initiated by groups. My question is this: if it takes a group before you can have any protest, doesn't this indicate that we need built in somewhere along the line a system or a means whereby the individual has a right, without taxing or mortgaging his entire future, to sue a corporation, or the nation, or whatever, when he believes his rights are infringed upon? Perhaps we need a public environmental defender, or something like this. Perhaps only groups can initiate lawsuits because it takes a lot of money. How can an individual or two even dare to say, "Well, I'm going to start a suit against the State of Indiana?" I remember that, when I was a little boy, I went to my first court. There was an old farmer there; and they got up and said, "The State of North Dakota versus Oley Olson."

He said, "My God, how can I beat them?" and walked out. I think this is one of the problems that we have. If we are only going to be groups, how are we to be sure that these are not interest groups; and how are we sure that the individual is going to have a say?

MOORMAN: When I said that most of the suits had been brought by citizen groups, I was describing what has happened to date in environmental litigation. But I did not mean to imply that no individuals have brought suits.

BAUER: Have they been brought successfully, though?

MOORMAN: Yes, on occasions, I think so. The problem is, though, that environmental problems do tend to be large problems; and one of the indexes of the fact that they <u>are</u> problems is the number of people they agitate. Generally, very few people really have more than a small economic stake in the problem; for example, you may make $15,000 a year. How much of that $15,000 a year can you afford to devote to cleaning up the atmosphere? Well, you could pour the whole $15,000 into it; it's just an open sinkhole. What happens is that when there is a problem, people who are annoyed tend to get together, pool their resources, find a lawyer that will help them, find a few experts that will help them, and bring a suit. Now, if one individual does it, he of course must put up all the resources; but secondly, he has to assure himself that he is involved with a real problem, that he's not just a litigious person, or a crank. Let me give you an example. I took a long vacation during late

September and early October. When I got back to my office there was a note on my desk: Mrs. Smith wants you to sue NASA to prevent them from exploding an atomic bomb on the moon. Well, I don't know if NASA is going to explode an atomic bomb on the moon; I doubt it. If there is someone here from NASA, can he comment on this? (ANSWER: Very unlikely.) I have had another complaint about Mrs. Martha Mitchell, the wife of our Attorney General. She was having the GSA trim or remove the old trees around the Justice Department. The person who complained about this said to me, "What right does she have to cut our oak trees?" Well, you know, I calmed him down a little bit and got rid of him. She may have no right to do it; but the fact of the matter is, it's just not a serious problem. And quite often--and I'm not saying that every individual that starts out on a crusade is a Don Quixote tilting windmills--a disturbing number of the lone individual crusaders are just that. So, I think the fact that a problem has agitated a large number of people is an indication that there is a <u>real</u> problem, and it is more economic for them to handle the problem by pooling their resources.

MR. DUNIGAN: First, I'd like to say that I think the panel has been most relevant, as far as I'm concerned, and has done an excellent piece of work. I'm in the electric utility business, and I do touch these various areas. I have a question I'm not sure there is an answer for. Both Mr. Moorman and Dr. Talbot have been involved. This week, for example, there was a hearing in Indianapolis on the famous sulfur dioxide regulations that are now up for passing; this

is the third hearing, I believe. There was a day-long procession of people, most of whom accused my industry of dragging its feet. I managed to look like this myself on T.V., because this is the kind of problems the citizens publicize very well. Although I would agree in general with Dr. Talbot, sometimes this sort of fighting is no answer.

This industry has spent some fifty or sixty years trying hard to get reliability up to a point where it is about 99.9 percent, and also drive the price down. The industry is now faced with the immediate requirement--not the long-term requirement--of eliminating SO_2 from its stacks. To begin with, it is not established quite how seriously this affects health; but leaving that alone, there is no existing process which can be put into effect without greatly reducing reliability. Now, there is a large group of people at present backing this bill, and they tend to represent the activists. I believe in the activists, I think they have a very big part in this whole area; but I don't think they represent all the consumers. For example, suppose next summer we said all of a sudden, "Sorry, we're going to have a brownout or a blackout. We have SO_2 improvement and the air is going to be purer, but you won't have any electricity this afternoon." I doubt very much that the percentage of people pleased by the SO_2 remission would be very much of a total compared to the great numbers who would certainly become extremely irate--irate because we had made the poor judgment of plugging in a system which is about thirty percent reliable, compared to our 98 percent reliability. So this is the kind of problem we are faced with. I don't think there is any reluctance, even economically, Mr. Aldrich, to put the SO_2

control systems in; nor is there any reaction, Mr. Moorman, against any group of consumers or protestors. I agree with Mr. Stoner that there are individual problems in the industry peculiar to each industry. But then we arrive at this thing knowing that the only way to get this is through pressure, probably through a regulation; and yet to have such a regulation may be no answer. This is where we come to a conundrum. Some of the problems of air pollution are pretty well solved, actually, in our case. All of our major units but three are now 99 point 8 or 9 percent free of any visible emission. We have two more units to install in our big plants, and this will take us through the next six or eight months. My point is that we started this process two and one-half years ago and have spent something like $11 million with a known technology. Now we are faced with unknown technology--and we still have two years to do the whole job, and it's literally impossible. Now, that's my question: even believing in the desirability of it, what does one do when he is faced at this time with proposed regulations?

MR. ALDRICH: I'd like to take a crack at that. I feel that in the area of the SO_2 problem there is room for reaching an agreement between the local government, the state government, the federal government and the utilities themselves in terms of this reliability factor. There are two ways of reducing SO_2, as you well know, in the stacks. Number one is 100 percent reliable, or should be 100 percent reliable--that is the reduction of sulfur equivalents within the fuel, vis-a-vis coal, oil, or gas. That should have reliability,

as I say, if you have reliability of delivery of the low sulfur fuel. The second, and less reliable way, is the stack recovery processes which, admittedly, are under development and have not proven out their reliability. But they are coming along at a very fast rate, should have a significant reliability within the next few years, and should be included in the public utility plan.

I would think that the area of negotiation, the area of understanding between the authorities and the public utilities, would be to put less stress on the reliability of these pieces of equipment, but more on the actual installation of these pieces of equipment to solve the SO_2 problem, and yet be able to operate the plant if for some reason the reliability of the SO_2 equipment doesn't match the reliability of the power equipment. I'm very anxious to see more experimentation done along this line. I happen to be from New York, where SO_2 is a more significant problem than it is in the outer reaches, because we have a number of process fuel plants right within the local community. We are very concerned about this in our own ecology, although in other areas it is not as important. So I think here you might see some room between government and the utilities to get over this reliability hangup, which I also feel in talking with our own local public utility people. I think the public has to understand that the reliability of this equipment doesn't match the reliability of your power system.

MR. CALDWELL: Mr. Dunigan has brought up some of the problems of public utilities. I would like to raise another one, which has

quite different dimensions. Let me begin with a short story. Last Sunday Mr. Menke, a Trustee of Indiana University, and I went over to an adjoining county to look at a natural area in which the scientists in this University and Indiana State University have had a great deal of interest. There had been some concern expressed about the safety of this area because of the extension of high voltage transmission lines across the country; and one of them, as a matter of fact, passes within about a quarter of a mile of this extraordinarily beautiful natural area. Well, it missed the area, and many of us thought the area was secure, because the big transmission lines had already gone through. There was a big swath across the country, but when we arrived there last Sunday we were dismayed to discover that on the opposite side of this area another swath had gone through, apparently cut by another company, another power line marching over the hills and through the woods. It had apparently been two years or so since the swath had been cut; the natural area was filled with highly inflamable debris; some of it had been bulldozed, apparently, into the area. The area is being preserved for the people of this state and for ecological research and teaching; the corridor had not been considerably damaged, but there certainly was a threat to it because of this power line.

Two questions occur to me in this connection. They might have some relevance to our Environmental Systems Application Center searches here, and this might even be a help to the utilities industry, which has the problem, of course, of power delivery. We know that the issue of power lines and power plants has now become a

very controversial one around the country. A good many generation sites are being held up by the very kind of citizen suits that Mr. Moorman spoke of. There are increasing objections to high voltage power transmission lines, and some questions being raised; for example, it is in fact necessary to cut a great swath across the country in which these great steel towers that look as if they were built out of an erector set march through the countryside? Is it technologically necessary, even though you still have to carry the power line overhead? I became interested in this some time back in connection with the controversy over the power line to the Stanford linear accelerator in California. This issue involved the Pacific Gas and Electric Company, with which I have some sympathy because I hold some stock in that company, so that I wasn't a completely disinterested observer. The Atomic Energy Commission and Stanford University were involved, and the town of Woodside, California, which was willing to quadruple its tax rate in order to force an undergrounding of the lines. Well, the matter in fact got to the White House. A compromise was reached; the lines did not go underground, they went overhead--but you've got to hunt around to find them, because some innovative technology was used. Elsewhere in California, apparently, PG&E still cuts its big swaths--but between Stanford University and a relay station on the line you do not have a swath cut through the redwood forest, you do not have these erector-like towers. What you have are tall, single poles on which cable was strung by helicopter, so that there has been no marring of the environment.

I'm not singling the utilities out for special attention, but,

in fact they do receive special attention because they are an important industry; as Mr. Dunigan said, our country depends heavily on electrical energy. Is the technology available at the present time fully utilized in the industry or known to the citizens and legislators of the state, or the state Public Service Commission? Secondly, do we have, not a technical problem in the mechanical sense, but technical problems by way of laws or regulations whereby, in fact, competing utility networks may really disfigure the landscape? That is to say, in order to achieve one objective, low electrical rates, may we be destroying another objective in not only the aesthetics of the environment, but certain other values too? I would appreciate a reaction from the panel; or perhaps Mr. Dunigan might want to comment on this from an industry point of view. Do we have here a need for information that we don't have at the present time, with respect to the technological capability of the industry? And secondly, are we weak on the public policy front? Is the electric utility industry simply derelict in failing to take into account the effects of its activities, or is it to some extent the captive of other policies that have put it in a position of, in effect, engaging in an involuntary destruction of the countryside?

MR. MENKE: Let me add a brief word to that before someone makes a reply. I'd like to react from several points of view. First, as a citizen, and one interested in the aesthetics of the environment, this was the first time I had ever visited Green's Bluff near McCormick's Creek State Park. This is about a one-hundred-foot bluff.

It has the largest relict stand of hemlock I've ever seen. There are small, isolated stands of hemlock further south in Indiana; but this is a magnificent stand, a relict left of the glacial times. Below this hemlock is acre after acre of partridge berry, green and red; it is the most magnificent thing I've ever seen. As far as I'm concerned, this area is ruined, ruined because this power line runs right next to it; and what you are going to get is a lot of motorcycle traffic coming right up through this area. Here is an area that represents a part of the one percent of the land area of Indiana that is left in a natural area--just one percent. As a speaker said about a month ago on our campus, we should try to preserve some of the natural strains we have of plants because, if we don't preserve these original gene pools, we are going to really be in trouble. In the case of corn, there are some valleys down in Mexico where the original corn is still being grown. Believe me, these natural areas are important, not just for aesthetics, but for museums and perhaps for this gene pool I speak of. And here's one I feel is virtually destroyed, a magnificent area. That's one reaction I have.

Another reaction I have is that of a tree farmer. The power companies come in and pay the forester no more than they pay the valley farmer. The man who owns the farmland can continue to farm under these power lines, so that even though they've paid him a price for this land (which is usually very little), he can continue--he goes right around those ugly poles and so forth; but the tree farmer is out of business. He's got to continue to pay taxes on his forest land and can do nothing with it. I think they can grow

Christmas trees; but, as you know, the Christmas tree business is a very hazardous business, and I certainly wouldn't want to do it in a narrow swath like that. Some of the power lines agree to wildlife planting, but generally, as I've observed, they do nothing. The land ends up eroded and the wildlife plantings are never maintained, so that you are effectively destroying the landscape.

I have another reaction to this. My third reaction is as a furniture manufacturer. We have approximately 50,000 people working in southern Indiana and Kentucky in woodworking industries--veneer, furniture manufacturing, and so forth. And we have perhaps three million acres of timber land left in southern Indiana but less than four million in the state of Indiana. We import around 95 percent of our wood materials, simply because we don't have a viable program of forestry here in Indiana. I'll admit that multipurpose forestry is the thing today: trees for beauty, trees for water control, trees for oxygen, trees for recreation. This forestry has many applications today, but one of the reasons for growing trees today is for woodworking and for veneer, and here you are destroying a lot of precious woodland. I think it is a very crucial problem, and I am very much concerned about it.

MR. ALDRICH: When I was in Europe this fall I was in Switzerland, and I observed that all over Switzerland, practically every valley, every view you go into you can see power lines. But I did not see one single swath in the whole nation of Switzerland, and it interested me because I've noticed that they've made a point out of placing

their power lines; they use a lot of electricity in Switzerland without creating the swaths that we are talking about.

DeVILLE: Mr. Dunigan, I hope you don't feel too singled out for criticism. We might reinterpret this as a sort of class of problems in which we pose the questions: "Are we always doing the best we can while we try to find out more about how to do it?" "Have we examined all of the implications of our actions?" Which, perhaps, I stuck in to remind you that we are in the information business and hope we can help people examine alternatives in all cases.

MR. DUNIGAN: I can point out that very few people are veterans in this business. The whole idea of improving the environment is a baby, just a few years old in the public's eye. It takes time, and some of us are just waking up to the very things that these gentlemen have talked about; and I'm the last one to defend us. We are looking seriously at better ways to have land use. It makes no sense to have two swaths when the companies can get together and have one; no question about this, this should be done. We believe that the best electric line is the one that's underground and out of sight. We can do this now, technically, with distribution lines or primary lines. For most of the new construction today the utilities in this state really are underground. Almost all new subdivisions look ahead that much and put them underground, so we can do it and we are doing it, and we are gearing up to do this more and more.

The problem at this point is that there has not been a technological

solving of the heat generation problem of putting large capacity lines underground. I would estimate that this is probably five to ten years away. There are three major research--and I stress the term major research--projects under way dealing with very large size transmission lines which will produce answers. One of them is cryogenics, for example. In any event, it will come, but it isn't here. We don't like the towers any more than anybody else. We have retained a leading designer to try to produce designs for a better looking pole or better looking structure in the meantime, until we can get them underground. So that's one thing.

Land use is a different case; we could do more and are going to. To give you some idea, in our company we have a new task force on the environment. I'm the chairman of it and there are six people on it, each of whom is a vice president. It takes a certain amount of time to get the materials, to move the thing, to get under way, to do the things that we really want as much as you do. I think, for example, the day is now approaching when we won't have any more direct lines between that corner and that corner. We will try to follow the contours a little better. We can do a better job, and I'm the last one to say we couldn't. We are now aware, as we never were aware before, of the value of these hardwood forests and places where we and other companies have had problems. I don't think you'll see anything like as much of that, but there are many problems and this is just one. Aesthetics really, in my own opinion, is less important than green, scummy water or heavy, smoky overcasts. These are health problems and I think we ought to sort them out. Now we are working

on these pretty quickly, and we are working at the same time on problems of aesthetics and land use.

I don't want to sound holier-than-thou, because I wish we could move faster. I think if we were to talk about the reason why we are not, money and economics are not the biggest basic reason--it really isn't. But we have a number of people who have spent their lives building things good and tough and strong and hard and driving that price down, which we have done for fifty years. It is difficult to turn them around and to face a whole crop of engineers and accountants and managers in a new direction which says, "Now, your total thought is no longer 100 percent cost and durability. We now have an ecological condition, and you must always think about it." This is one of those things that just plain takes a bit of time. I think you can count on one thing; you can count on our goodwill. We are clearly pointed toward this, and we will continue to go this way with or without encouragement of regulations. I'll guarantee you we will.

MR. CALDWELL: I should like to add a comment that ties this to the discussion earlier about the standard of living and gross national product. We have here in Bloomington a division of the Westinghouse Company that is interested in underground power transmission; and when we speak of environmental improvement in the electrical utility industry, we aren't necessarily talking about something that is going to have an effect in the long run that would either be adverse in the economic sense or reduce productivity. In other words, the changeover from overhead to underground lines is reflected in a new

kind of industrial product, which also provides employment as well as technical research and installation. I think that too often we assume that a reduction in the standard of living or economic well-being is a necessary concomitant of an improvement in environmental conditions. I agree with Mr. Aldrich that this isn't necessarily so. I think you have to look at the specific case. But this particular one may be a good example of where we could get considerable environmental improvement without a loss of the values that we obtain through the industry. This might be, of course, reflected in higher electrical rates. I think we have already a good deal of evidence that the public will indeed pay that cost, that it is prepared to do so. But it would not result in an economic deprivation that would not be counterbalanced by something else that the public could also value.

MR. ADDISON: For thirty years I've been called a radical and probably pretty well acted the part on the same things these gentlemen have talked about. But you were called far out ten years ago when you said DDT is going to get us in trouble. Yet today, you'd be amazed at how many of those men who took the opposite side of the argument then have said, "I told you so." It's amazing. And they were perfectly safe then because the doomsday for DDT was ten years away. We've got to be careful that we don't fall into that same category and shoot these clean-up programs so far ahead that they are not an immediate issue. It's easy to talk about what we are going to do on a ten-year program in '72 and '85; but as I have said many times, we have a revolution on our hands. This revolution isn't

going to disappear anymore than the pollution problem will disappear. This revolution is our youth, your kids and mine. They're getting sick of this; no, they're not getting sick of this, they are very sick of it. I had the fortune, or misfortune, of living a year on a commune. I went there to teach and I learned, learned more than college taught me. I didn't think I could be shocked. I've sat in front of groups of young people, and I'd have young person after young person look me straight in the eye and say, "What's wrong, old man, with Communism?" That's frightening. The only answer I have is that the only thing that's wrong with Communism is what's wrong with democracy and fascism--is its leaders. People in this room are leaders.

I'm going to bring this down to a local problem. In making compost, we were searching for material. Believe it, I have tried for six years in Bloomington to get the waste leaves that are swept up off the street, and I have yet to get permission to have those leaves. I just spent thirty days going down through the political buck-passing that I thought I was used to in the Army, to get the city sewage. I spent two weeks at Indiana University talking with people to beat down the possibility of pathogenic micro-organisms in sewage. Now this is something that has been here for twenty years; we've been looking at it, or some of us have been looking at it.

When people start to look at the opposite side of the argument which we have been putting over, scientific control, scientific analysis, where does it have us today? What got us here? We've

got to deal with facts--and we are looking at the almighty dollar. I realize the problems of the bank; I think I realize some of the problems of the legal profession; I know Cummins Engine is working at their problems; and I could ask the man about grants a lot more questions which I won't. But I think where we have to begin is at home, in our own towns, not project this thing on Uncle Sam, because he's got his share of problems, which he may not have if we start in our own backyards. The question I want to leave you with is, how does an individual fit into this program that you gentlemen are planning or have planned? How does an individual make himself heard where he should be heard?

DeVILLE: That's a difficult question, Mr. Addison. I think you've emphasized for us some of the moral, political, and social problems that we are faced with. But we are faced with a tide of concern about our society's operations. You have pointed out that many of the environmental problems which we have discussed could be handled if the social ethic were such that each individual saw the problem and tackled it to the best of his ability and in a unified way in the whole society. There is no question about this. I think, though, that you have presented us with a paradox. I think that, as Mr. Moorman said, the group action or class action legal suit in environmental matters represents the degree of interest and the cohesiveness between interested parties. And perhaps we can just say that the individual is going to have to try to band with others of like mind to make his voice felt. I'm not entirely happy with that answer. Would any of

the panel members comment on this?

TALBOT: I can't really answer all of the questions you brought up. I'd like to make one point, though. Before I went to Washington, I viewed the individual writing his congressman and that sort of thing with immense skepticism. When the Sierra Club asked for letters or some other organization did, it seemed to me this was a waste of time, and certainly nobody would pay any attention to me writing alone. I have learned that I was wrong. The individual's letter, if it is literate and brief and to the point, can have a most remarkable impact, and I think the case of Secretary Hickel is an awfully good case in point. When he made that comment when he was first being considered for the Secretaryship--that he didn't believe in conservation for the sake of conservation--there were something on the order of 150,000 letters from individuals that came into Congress in less than a week. A number of the conservation organizations said if we could have done that we would have won our battles long ago. These letters came in purely spontaneously, nearly all of them, and they had a fantastic impact right up to the President. And I might add, a very strong impact on Secretary Hickel, which he has been the first to talk about. Therefore, what I am really saying--and I've seen this happen again and again since that time--is that an individual can influence things far more than he thinks he can by writing a brief, thoughtful, careful letter to both federal and state government personnel.

The next question you asked was how do you get the information

on how you can act. I'm just throwing this out as a question to ARAC. Is it possible that one of the questions that you might research might not be for an industry or government, but might be for an individual, showing what an individual can do to try to get certain kinds of assistance?

I'd like to go one step farther on that. There's another area: while we are creating more and more demand for ecologists or environmentally aware people, for example, through this 102 procedure which is demanding an environmental capability on the part of private industry, government in all agencies and so forth, at the same time many of the ecologists we are turning out of the universities can't get jobs. In the spring of 1969, only about eleven percent of the graduates with a Bachelor's Degree in wildlife were able to get a job in the wildlife field, anywhere. Only 65 percent of those with Master's Degrees were able to get a job in wildlife and about 90 percent of those with Ph.D.'s. These figures are roughly comparable to those in forestry, range management, soil, and other natural resource fields. A large part of the problem seems to be this gap between the supply and the demand, and making the demand aware of the supply and the potential supply aware of the potential demands. Perhaps this is another area where your particular capability might be put to work.

MR. CUNNINGHAM: I want to ask whether politicians in our state avail themselves of ARAC's services for information in committee operations. This is something that I find that many people in the

information field, and in library science particularly, ignore completely--the local man who comes off the street to make major decisions about the community with only the facts that two or three people bring to the committee. I know of my own experience going before planning committees and being amazed at the lack of information available to make a decision. One of the things that the services of ARAC in this whole area of environmental control seems to require is for us in the local area to make sure everyone is aware of the information resources and be willing to share that information with the community decision makers. It is very difficult to develop central information coordinating councils for a community. Let's take our own community in Columbus. We have now, I think, four university efforts in the community; and if you look at the certification requirements for all of these, you'll see libraries as a major item.

We have a tremendous "pollution" problem with paper, which we need to attack immediately, and this is one reason, at least in my point of view, that we find ARAC wonderful. They do attack this pollution problem and come out with a small package that we are able to comprehend. It seems to me that we, as information people, have a tremendous responsibility to see that the information is disseminated to the right people, and to make them aware of the services available. I don't know if you've made a survey in your own company, asking how many people are aware of the ARAC services that your company has taken. Take a general survey, everybody, hit them all, and say, "Have you ever heard of the service we are taking called ARAC?"

I think you will find the stacks on your desk from that indicate, "What have I been doing? I thought I had communicated!" And I believe that, if we could do something like this and see that this information gets to everyone who is effective, we can do a much better job and meet our responsibility as information people in the community of which we are a part.

DiSALVO: I have a couple of comments to the point you raised, Larry. You get into a very funny situation. This discussion of transmission lines brought something to mind. We have what we think is an excellent opportunity for receiving the latest technology in how to transmit power, the best ways to do it, and so forth. Amazingly enough, we do not have a single power company in the whole country that subscribes to this service. I think the reason for this is that the power companies have to depend on the suppliers of the equipment, the guys that make the towers, the guys that make the cable, and so forth, for incorporating this technology. And really, if you get right down to the villains, for example, in transportation, it's the trucking companies that are doing the polluting, not Cummins. Yet, none of these people are ever going to take any of our services; they are going to depend on your firm to come out with the smoke-free engine. This is part of the problem and I think we've got information in these areas, but the guy that takes all the heat really can't do anything with it. Poor Mr. Dunigan can only use the cables and pollution control equipment that the manufacturers can supply him with. Your other question was how many local or state or national

politicians subscribe to the services of our center--and obviously the answer to that is zero. Again, part of that may be our fault. The nature of our services is not particularly conducive to a busy man sitting down and going through even the relatively small package of information that we can supply. I must admit with this present effort we are trying to arrive at a new format. I don't know whether we need to use drawings or cartoons or pictures of girls or what, but we are going to try to design this new system such that it will appeal to the individual, to the local planner and so forth. Now, with that I would like to relay a question to Mr. Talbot. It seems to me that you need very good, concise, up-to-date information in your job. Where do you get your information?

TALBOT: I try to use as many information sources as I can at two different levels. One is the remarkable variety of journals and summaries and information services that come into the Council library. (ARAC does not, incidentally.) Second, when a specific point comes up I try to call on the professional organizations, scientific organizations, National Academy of Sciences, or whomever to attempt to go to the organization which has access, or should have access, to as many other information sources as possible. I suppose what I am saying is that I go to both firsthand and secondhand sources. The discouraging thing I find is that there is an incredible proliferation of sources of information for different things, and there is an incredible overlap or duplication. There is a real need for a specific kind of a service to answer given questions. I have yet to

find (and I'm emphasizing I didn't know ARAC until this visit) any one single source of information that can provide me everything I need on any one subject that has come up yet.

DeVILLE: That's a point well taken. Mr. Cunningham, you had another comment.

CUNNINGHAM: Yes, one of the things it seems to me that makes this problem even more complex is one of the things that I find in a community the size of Columbus. I live in a new subdivision, and we go around and talk to neighbors and say, "You know, there's this problem, you ought to do something about it." And he looks at you and laughs and says, "Well, I don't plan to be here five years, so I'm not going to worry about it." This has been the typical attitude I've found among many of the people that I work with: we'll let somebody else worry about it; we're not planning on staying here very long; we're going to wait till we get on the other side of the tracks, or wherever he wants to go. The old farmer's attitude still carries over here in this country from the frontier days: "When I exhaust this plot of ground, I'll just move further." I think this still is a typical attitude in the community. Sure, I'll just plow it up and exhause it and then tomorrow I'll move across the road and start all over again--and he doesn't realize that across the road is already filled up.

Somehow we need to alert and to awaken the community with accurate information. I think it is a real tragedy that we do have

this paper blizzard of very inaccurate, poorly communicated, and condensed information. Think about the politician. I don't really give him much credit for his work. I think he is a figurehead at this point. I'm concerned about his assistants, who are writing his speeches and giving him information. If I had been aware of ARAC two or three years ago, I'm sure that I could have done a much better job for one of the mayors in Indiana. He was desperate for information, and we had no place to go to get it quickly. His timetable wasn't such that he was able to look around for six months to see if he could locate it. We have a heck of a responsibility to encourage groups like this to do the work.

The other point is that the information people in companies are empire builders. I don't know whether you ever noticed it in your own company, but if a service like this is available, the first thing the guy says is, "Well, I don't want to go outside the company; I want to bring it inside. I'll use the computers and I'll do this myself." But the service is already available and the access to a broad range of information is much more available through the national and regional system than in our own company. I find this to be a real reflection on the information people. I hear this at conferences constantly: "I've got my own system, I've got eighteen people doing it and six clericals over here and eighty-five over here"--and you come back and you say, "Well, I've got four clericals and two professionals, and I think I'm doing a pretty good job. I'm getting information from a central data base." But we have a real problem. The information people themselves have a real problem, getting

themselves organized on a regional basis.

DiSALVO: Larry, to some extent, I think one of the problems is that it's still a relatively new endeavor. We spend a lot of our time trying to teach people that information is a resource like capital, and real estate, and some of these other things that industrialists worry about. But if you think back, there was a time when all the companies did their own accounting, and all the companies did these other peripheral things, and gradually through the years, it has been recognized that it is better to go to somebody in that business. I appreciate what you are saying; we run into that all the time, and I think we just have to wait for some attitudes to change. I just hope that we don't have to wait too long.

LAVENGOOD: You probably never heard of us because we do not sell to the consumer. We're in the area of industrial packaging, both for G.E. and Westinghouse, to package tubes so they don't break in transit, and we supply the supermarkets with the packaging for their meats, their produce, their eggs, and other items. I want to hit on the positive approach here, which can be done sooner rather than later. We are talking about all these problems that have to be solved, but I think there are encouraging areas, and I want to bring some of these to you today.

One of the areas is the fact that there are a lot of choices that can be made today, tomorrow, or next week. There are many biodegradable items on the market, and somebody along the line of distribution to you, the ultimate consumer, had the choice as to whether or not it was

to be a biodegradable item. I've been spending the last two or three months of my time in the Midwest, from Pennsylvania out to Kansas and Nebraska, talking with and working with the presidents and vice presidents of the major supermarket chains in this country. I find that when I talk to them about the whole area of ecology and environment, they are very much concerned. But, you see, until you or I talk to them, they are not involved; they've got their own financial and other problems. If you talk to the buyer who is going to buy your product, he couldn't care less; he's got the products he's been buying, and he's going to continue buying these products. But go in and talk to the president of a large chain, and you may get immediate results.

We recently talked to the president of King Super, one of the Dillon divisions in Denver, Colorado. We talked about the fact that there are many areas where he could give his people environmentally relevant choices; biodegradable packages, recyclable bottles, and so on. Denver is very vulnerable because, as some of you who have been there know, they are very proud of their atmosphere--and they know what's happening further west. You talk to these people, and they do it. Last week, as an encouraging point for this environmental conference, this chain came out with full-page ads costing about $2,000. The ad was in two colors, with a logo on top of the ad showing a mountain, some beautiful clouds, and a burst of sunlight. It read, "Wherever possible in our supermarket chain we are going to use biodegradable products, and we are going to use recyclable bottles. We want you, our community, to know what we are doing; and we ask you in the community, in your own life and for your own benefit, to do the

DeVILLE: Thank you, Mr. Lavengood. You have made an incisive case for immediate action in areas we know can be productive. One of the problems with the information business is that information, in itself, is not going to solve environmental problems; we have got to want to use it, and look for it. I should also like to react to the question Mr. Cunningham raised. He asked how many politicians use the services of ARAC. That's an embarrassing question, and I'm not sure who should be embarrassed--the politicians or ARAC. I suspect that ARAC and ESAC should be most embarrassed. If we think that our information is useful and if we think that--as an organization in a foundation at a major state university--we should be involved in community service and service to the state, then we should try to find some organizational niches and mechanisms by means of which we could make this information available to state senators, to industry, to planning organizations like Mr. Phillip Willkie's Southern Indiana Incorporated, and to conservation groups. We haven't done that yet, but I hope we can do it. We are going to have to look at the resources we use in terms of such organizational niches in state government and elsewhere. Of course, there is another point. I think we would have to admit that the university would look at us with ill-favor if we ran a deficit organization in such services. We have to find support for them, and this often takes a lot of planning. One of the things I hope to be able to do is to apply to foundations, or other sources, for subsidy to furnish information services to the private individual, as Mr. Talbot has suggested, to conservation organizations like the Audubon Society, and other groups. We have to think hard, not only about the sources

of our information but about how we can supply it and about how we can assess the needs and meet them. We would appreciate continuing comments and criticisms from all of you here as to the directions we try to take in the future. I'd like you to keep your eyes on us.

Mr. Aldrich, I wanted to make one comment to you. I think you have to admit that you learned something here; that is, the suggestion on abortion support!

ALDRICH: I'd like to make one comment on that composting operation; that's exactly what we are trying to do. We are trying to listen to people who come in with ideas; and when they do come in with ideas, it's the responsibility of that person to come in with a responsible idea, an idea that is technically sound, which we are trying to establish expertise to develop. If the idea is going to be in the profit area, and this one sounds like it can be, this makes good economic sense, and it makes good environmental sense. I would think that, certainly at our bank, it would receive a hearing. Of course, the evaluation of the program will be on two bases, where it used to be only on one; is it an environmentally sound project, and is it an economically sound project. I look forward to the time when industry, not leaning on the government, will develop these concepts to bring them to the stage where they do demonstrate profitability and environmental soundness. And I have learned a lot today.

DeVILLE: We are past the scheduled closing time of this program. If I had known several months ago how well this discussion would proceed, I would have tried to get you all together as long as I could keep you.

I would like to ask Dr. Talbot, if I may, to spend another five or ten minutes talking about the implications of the new federal agencies devoted to environment administration.

TALBOT: Recently, two new federal agencies have been established with the general objective of making the approach to the environment more effective, more efficient, and with fewer built-in contradictions. The one that is closest to what we are talking about is known as EPA, the Environmental Protection Agency. This agency was developed to bring together under one administration a series of pollution regulations and control functions which formerly were scattered in a number of different parts of government. There are two basic ideas behind it. One is that, the way the government has grown, we have ended up with individual agencies promoting pollution on the one hand and then trying to regulate it on the other. The Department of Agriculture, for example, promotes pesticides with one hand, and then tries to register and regulate them with the other hand; and you get the same thing in radiation and in a number of other areas. This would appear to be a conflict of interest--and clearly it is. The idea of this new agency is to take the control functions out of the areas where they are being promoted. The other idea was that, as these things have developed, we have people concerned with one media: that is with land, or water, or air. So, people may be concerned with DDT, but only with DDT in the water. Yet the DDT started on land, then perhaps went up into the air, and eventually got to the water. So, recognizing that you have to deal with the whole biosphere and not

with one piece of it, the attempt was to bring these things together.

EPA is an independent agency, independent of any of the existing cabinet departments. It is due to come into effect on the second of December of this year, and it has brought together functions from five major existing cabinet departments. It has the Federal Water Quality Administration from the Department of Interior; the National Air Pollution Control Administration from the Department of Health, Education, and Welfare; the Bureau of Solid Waste Management from Health, Education, and Welfare; the Federal Radiation Council from the Atomic Energy Commission (which, I might add, is not as great a thing as it sounds, because it means three people); pesticides regulation from the Department of Agriculture; and Pesticides Research and Standards from HEW. The major thrust of this new agency is to control pollution, to establish and enforce standards for this control, and to monitor and analyze pollutants in the environment. The Environmental Protection Agency will be a major market for environmental information and, also, a major producer of information in this field.

The other new agency that has been established is called NOAA, the National Oceanographic and Atmospheric Agency. This is not a pollution control agency; its main thrust is research and development in the atmosphere and oceans. It has brought together the environmental services of the Weather Bureau and a series of activities of several other agencies that deal basically with the ocean: part of the Bureau of Commercial Fisheries, part of the Bureau of Sport Fisheries and Wildlife, the marine mining program of the Department of Interior, and the sea grant program from the National Science Foundation. This

new agency is within the Department of Commerce. Because the basic concern is research and development, it will be a producer and a user of information, and of great interest to you all.

BAUER: I think it would be appropriate to announce that our study committee on pollution has recommended a package of about eight bills to the next legislature, one of which, like EPA, would combine the five different regulatory agencies that we have in our state into one, the Environmental Management Commission. There is a lot of study going on concerning this Environmental Management Commission. We are happy to know that when we impose regulations and requirements on industry and agriculture, we also can now say that there is a place at Indiana University where you can get some information.

DeVILLE: I would like to thank the panelists and the participants for meeting with us today. I think we will have to say that we did not solve the problems of the environment. This is an exploratory meeting. I hope that out of it have come some ideas that will help us to develop information services that will be of utility to groups and industries involved in environmental concerns. We hope that you will write to us and that you will submit some search problems to us to help us assess your needs.

MISSIONS OF THE ENVIRONMENTAL SYSTEMS APPLICATIONS CENTER

William B. DeVille

The Environmental Systems Applications Center (ESAC) at Indiana University wasorganized in June, 1970 as an operating division of the Aerospace Research Applications Center (ARAC), which is a not-for-profit service arm of the Indiana University Foundation.

ESAC is now preparing a broad-range information system designed to help industry, municipal government, and state government to meet the urgent demands of environmental management and protection. Some of the major capabilities of the system, including important components of the environmental science and technology and environmental law services, have already been put to use.

This report presents some perspectives concerning the information needs of persons faced with the task of environmental administration in industry and government, and concerning the design of an information system to help meet those needs.

Two guiding premises have been adopted in designing the ESAC system: (1) the information required for the resolution of any particular environmental problem tends to cut across a galaxy of otherwise "atomic" fields such as science and technology, law and public administration, public policy, and economics and business; (2) an information system designed to be of practical utility to decision makers faced with environmental problems should have the capacity to search all relevant information fields and synthesize the related

information in a useful format.

Why an environmental information center at Indiana University?

The decision to create the Environmental Systems Applications Center represents both a commitment of many persons in the university community to the urgent goal of environmental preservation, and a reading of how that commitment might be expressed through the resources at Indiana University. I do not believe this last point can be overemphasized. Both the decision to attack information problems, and the specific format of the information system were dictated in part by the available resources at Indiana University. Other options might prove to be more feasible and desirable at other institutions.

Indiana University is a large midwestern university with an enrollment of approximately thirty thousand on the main campus at Bloomington. Regional campuses are distributed at various points about the state, and the medical school campus is located in Indianapolis, about fifty miles from the main campus. The other major state university in Indiana is Purdue. Two other state universities, Ball State University and Indiana State University, have been developing rapidly in recent years. In addition to the state university and college system there are a number of private colleges and universities in the state.

The agricultural and engineering programs in the state university system are located at Purdue rather than at Indiana University. Indiana University has no on-campus engineering program. Partly by charter, and partly by tacit agreement, the development of the science

programs at the two universities have proceeded along different lines; so far as the terms have any meaning--and this is often only a rough generalization--"applied" science programs have tended to develop at Purdue, and "pure" science programs have tended to develop at Indiana. On the face of things, some kinds of action-oriented attacks on environmental problems, such as in areas of sanitary engineering and agricultural engineering, might more probably be expected to develop at Purdue.

Indiana University does have, however, many areas of strength which can be involved in academic, research, or action-oriented environmental programs. The university administration has given strong encouragement to the development of teaching and research programs concerned with environmental problems; an all-university program called "Focus: The Environment" will have a prominent place on the university calendar for the spring semester of 1971.

One of the strongest environmental policy programs of its kind is the Program of Advanced Studies in Science, Technology and Society, headed by Professor Lynton K. Caldwell of the Department of Political Science at Indiana University. For the past five years I was associated with Professor Caldwell in this program, and expect that it will be a major resource for environmental policy information programs of ESAC. One of the key perspectives in this program is the synthetic or systems approach to policy formulation and administrative problem solving.

Other strong environmental programs on the campus include the Water Resources Center, a new Environmental Studies Program, an environmental law program in the Law School, headed by Professor

Dan Tarlock, strong biological science programs, and a nucleus of interested faculty in the Department of Economics and the School of Business.

The key information handling capacity at Indiana is the Aerospace Research Applications Center (ARAC), which is a non-profit arm of the Indiana University Foundation. ARAC was formed in 1962 as an instrument of the National Aeronautics and Space Administration's Technology Utilization program. ARAC's mission is the dissemination of scientific and technical information to the industrial and scientific communities. This mission has required ARAC to develop a staff of engineers, analysts, and computer specialists and to acquire access to a number of governmental and private scientific and technical data bases. I had a number of contacts with ARAC personnel over the years in connection with the science policy program. During the past year, Dr. Joseph DiSalvo, Director of ARAC, and I became increasingly more interested in the possibility of using the information-handling resources of ARAC as a tool in attacking environmental problems. After some months of discussion and studies of the possibilities of data bases pertinent to the project, as well as studies of supplemental resources on the campus, I joined the staff of ARAC to devote full time to the environmental information project. Perhaps the clinching factor in this decision was a study which demonstrated the feasibility of using a new computerized legal information system as an integral part of the new environmental information system.

The nature of environmental problems

It has become increasingly obvious that practical approaches to environmental problems cannot be simplistic approaches. We have difficulty even in defining what we mean by the "quality of the environment." The pronouncements of impending doom for life on earth, given out by many of our leading ecologists, are difficult to assess, either as to their probability or as to what is required to avert disaster. Current interest in the environment is high, and environmental policy has become an important issue on the political scene. A variety of opinions have been expressed as to the cause or causes of environmental deterioration, many of them in a simplistic form: deterioration of the environment is due to the growth of science and technology; it is due to the expansion of population; it is due to a greedy capitalistic exploitation of our resources; it is due to a fundamental lack of social ethics--and so on. My personal feeling is that all of the causes cited may be relevant in one case or another. But I do not believe that any really operable programs have been suggested by single-faceted generalizations about the nature or causes or environmental problems.

Environmental problems, whether they involve air or water pollution, land use planning, wildlife conservation, or resource planning, are complex problems. They are complex because they cannot be bounded within the parameters which often seem to define them, such as the sulfur dioxide content of the atmosphere, or the bacterial counts of sewage effluents. Rather, environmental problems are really

problems of the man-environment relationship. If this perspective is adopted, it becomes apparent that environmental problems often cut across the fabric of many activities and institutions in the whole society. Such a premise implies that we cannot control the environment without, concomitantly, controlling man's institutions and activities. Such control may be voluntary and independent, or it may involve legislation and governmental administration. In any case, it is apparent that many environmental problems cannot be resolved by merely technological means; other means, involving politics, policy, law, administration, and economic considerations must often be considered and applied as well.

Some of the interest in the environment is undoubtedly faddish, and will pass away. But the environment as a genuine policy issue for government and the society as a whole is not just a fad; it cannot be. We may be assured that some of the problems are real and pressing. New legislation, new regulations, and stricter enforcement are forthcoming from government at all levels: federal, state, and local. Industrial and business economics must increasingly take account of the costs of environmental pollution and of pollution abatement. These last two statements are not specualtion; they are verified by articles and news stories in your daily paper during the past year.

Environmental information requirements

Practical approaches to environmental problem solving must include other information fields than science and technology. This is the

import of the above section for the design of the ESAC system. It is true that many specific problems may be resolved by the application of scientific and technical information; for this reason alone, the decision maker must have information of this kind available to him. Further, it is likely that such information would be of major importance even in cases such that other factors must be included. But the introduction of environmental policy to a national, state or local goal must necessarily involve other fields. Reinterpretations of law and new legislation concerning individual, corporate, and governmental rights and responsibilities concerning the environment are rapidly developing. The implications of these developments for individual and corporate activities must be constantly re-examined. For industry, both new opportunities (as in sale of pollution control equipment) and new costs (as in requirements to purchase such equipment) are involved. In many instances, assessments of process costs, resource availability and cost, marketing feasibility, etc., will have to depart drastically from traditional models.

ESAC environmental information capabilities

The unique character of the ESAC system lies in its ability to synthesize information relevant to a particular problem from these areas:

Science
Technology
Law
Economics
Public Policy

The synthesis of such an enormous mass of diverse information is only recently possible. The capability to handle the sheer volume of material depends on two factors: the use of automated information

technology, which makes possible the search of huge amounts of data rapidly and economically; and the recent emergence of appropriate data bases.

The use of ARAC's information handling techniques and data bases, with a number of additions and elaborations, forms the basis for ESAC's operations. ARAC has furnished information to industry and state government for the past eight years, and has developed workable information formats and modes of operation. Data bases from a number of governmental and private sources, most of them in computer searchable format, are routinely searched. Staff operations have been designed to analyze search inquiries, relate them to appropriate data bases, design, perform and edit computer searches, and furnish the user with the resulting information. This last stage often involves consultation with the user by staff scientific or engineering personnel.

ESAC uses a number of data bases not required by the largely technical requirements of ARAC. These include areas of the biological sciences, water and air pollution data bases, areas of environmental health, economics, and law and administrative regulations at the federal and state government levels. ESAC has access to full-text searches of the U. S. Federal Code, the statutes of all of the fifty states, and the ordinances of several large municipalities in computer searchable form. Economic information, covering such problem areas as the costs of pollution abatement, is available from several sources. Other important information areas for which searches can be routinely done include administrative regulations at the federal, state and municipal

levels, and public policy trends at the federal and state levels.

A partial list of information resources:

Pollution Abstracts - spans the full spectrum of pollution and pollution related problems

Water Resources Abstracts - provides coverage of water and water resources-related problems, including some legal and economic as well as scientific and technical information

Chemical Abstracts CONDENSATES - comprehensive coverage of the world's chemical literature in machine readable form

Biological Abstracts - analogous to Chemical Abstracts in its importance, with its primary orientation being biological rather than chemical

Engineering Index COMPENDEX - the comprehensive information source in engineering (all fields); extensive coverage of such fields as solid waste management

Nuclear Science Abstracts - prepared by the U. S. Atomic Energy Commission; concerned with radioactivity, nuclear energy, and related problems

STAR (Scientific and Technical Aerospace Reports)

IAA (Reports of the American Institute of Aeronautics and Astronautics) - these two data bases give access to the wide range of NASA information resources

USGRDR (United States Government Research and Development Reports) prepared by the National Technical Information

Service (NTIS); covers unclassified research of the Department of Defense and other sources; contains a significant amount of environmental information

Food Abstracts - this new British data base is concerned with all aspects of food, from production to digestion

INDIRS (The Indiana Information Retrieval System) - developed for the Indiana State Department of Commerce; concerned with data about population, its structure, labor forces and, in general, all data related to industry and commerce

Air Pollution Abstracts - concerned with all aspects of air quality

ESAC has access to information from many other sources, such as the STORET (water quality) and SAROAD (air quality) data banks of the Environmental Protection Agency, and a similar system for solid waste information. Broad environmental policy inforation, economic data, and information concerning such areas as transportation, population, environmental health, etc. can be furnished from a number of sources.

Operation of the ESAC system

A fee is charged for information searches to cover staff time, computer time, and data base costs. The fees are relatively nominal for the volume of data base material searched. Fees vary according to the complexity of the search, but an average search charge is $150. Two kinds of service are supplied: a retrospective search, which goes back through past files of the data bases to identify a major

slice of knowledge about a problem area; and a current awareness service which provides the user with biweekly or monthly searches of current literature.

When a problem is received, it must be broken down into search strategies for the relevant data bases. Finally, after searches have been run, the respective outputs of each data base must be examined and edited, and then integrated into the final product. Unfortunately, neither the analysis nor the synthesis stage is subject to mechanical manipulation. Both stages require comprehension of the nature of the problem, the possibilities of manipulation of the data bases, and--above all--as much feedback from the user as is possible. People are indispensable.

A major virtue of ESAC's location on the campus of Indiana University is the pool of talent, both in faculty and in graduate students, which can be drawn upon for a particular search project. We plan to operate with a relatively small permanent staff, and develop a core of faculty and graduate students who can be called upon for particular projects. We have already developed such consulting contacts in the School of Law, the Business School, the science departments, and the science policy program in the Department of Political Science. Fortunately, ARAC already has on its staff specialists in a number of fields of engineering, so that the lack of an engineering program on the campus is less serious than it would have been otherwise.

The output of most of the data bases already discussed is in the form of citations and/or abstracts of literature. The utility of

this form of output varies widely with the nature of the problem and the user's staff and library resources. This is one of the problem areas which is now under investigation. We can furnish the user with copies of cited documents for nominal charges; but it already appears that, in some cases, it will be necessary not only to supply the user with the full text of documents, but perhaps also with assistance in the evaluation of the contents of the information service. It is not our intention at this time to involve ESAC heavily in full consultation services, since this would require a much larger continuing staff, and would in any case dilute the operation of the thing we can do best: find relevant information.

The data bases accessable to ESAC give us nation-wide capabilities for information services. However, it must be emphasized that the system is designed to function most effectively when frequent interaction with the user is possible. The system is not merely a passive stack of documented information, but an active tool for clients in industry and government. In this context, the staff and system capabilities of ESAC can operate as an interface between the user who is faced with a particular problem, and the knowledge and resources of all relevant specialties and disciplines.

Relevance to industry

The focus of public interest and public policy on environmental problems has important consequences for business and industry. The history of American industrial development has shown that industry is becoming increasingly efficient in product planning, design, production,

and marketing. What has been called into question in the context of public policy discussions of our environmental situation is, quite simply, a complex of traditional practices and attitudes toward resource management and production cost allocations. It is evident that the use of land, water, air and other natural resources will be regulated to a greater degree in the future where such uses impinge upon broad social needs. Such broad social needs include open spaces, wildlife conservation, acceptable quality of air and water, recreational land use, resource husbandry and recycling, and so on. Stringent controls on the use of land, water, and the atmosphere as "reservoirs" for disposal of industrial wastes and effluents are already beginning to appear. It is apparent that our productive capacity is so great that the capacity of our environment to absorb these byproducts of industry without change has been over-reached. Finally, much public policy interest has been focused on a new kind of "technology assessment" in which the impact on the environment of industrial production processes and products alike is coming under voluntary or governmental regulation. Many examples may be cited, including regulation of thermal pollution by nuclear or other power plants, automotive exhaust emission controls, and controls of pesticide types and uses.

Industrial planning has always been complicated. Now, to such variables as production costs, marketing, competition, etc., the businessman must add the legal, regulatory and economic consequences of what appears to be a genuine and continuing national commitment to environmental quality. It is easy to imagine the impact of these new

variables on specific plans for factory location, water and sewage use, production costs, marketing possibilities, etc. Further, the businessman must carefully survey the consequences for his operations of probable future laws and regulations.

The ESAC system is designed to help business and industry take advantage of existing technical, legal, economic and policy information. It is in large part due to the complexities of industrial planning needs that we have designed ESAC to draw upon many information fields for answers to specific problems. We believe that our possibilities for service to the industrial community are great; and we feel that this is one of the most important contributions that a university-related service organization could make at this time.

Relevance to government

Public policy for the maintenance and protection of a viable environment has taken a prominent place in every level of government, from national to local. There is ample evidence, scientific and otherwise, that failure by government to accept the environmental challenge may seriously endanger the viability and quality of our society.

Environmental problems are, by their very nature, complex problems intertwined with virtually every thread of the society. Scientific evidence can often furnish a solid basis for concern about problems in areas of resource use, pollution, or environmental health and safety. Science can, in other words, often furnish us with concrete evidence of the limitations of what is, in fact, a

limited, closed-system environment. But the actions which must be taken by policy makers, legislators, and administrators in government can be guided only to a limited extent by hard scientific fact. What government must concern itself with is the attainment and preservation of social values, of which a quality environment is only one, however important.

Even, therefore, if we take it as a minimum condition of sound governmental practice that our environment be protected and preserved, the range of possibilities to be considered in any particular instance of policy formulation, legislation, or regulation must be enormous. The consequences of any policy or action, for example, for the viability of the economy, must be examined with the greatest care.

The ESAC system, by its capability of synthesizing a wide range of available information which may be pertinent to a particular case, may well be of considerable use to state and local government. The ESAC system will enable legislators or administrators to examine the scientific, technical, legal, regulatory, and economic aspects of a particular problem, as far as existing information is pertinent to that problem. For state and municipal governments, ESAC can survey analogous legislation and thus provide models for the consideration of legislators. For administrators faced with the necessity of applying regulatory standards, ESAC can bring to bear the entire range of pertinent information which may help the administrator to choose optimum standards.

Relevance to the university

The interdisciplinary, problem-oriented character of ESAC departs

to a considerable degree from the traditional academic mold. In so doing, however, the environmental activities of ESAC may help provide some measure of the "relevance" on campus which a number of students and faculty have sought.

The interdisciplinary nature of ESAC makes the employment of graduate students from a number of academic disciplines necessary. The range of disciplines needed includes the sciences (physical and life); engineering; law; business; economics and finance; political science and public administration; and information and computer specialists. Students have expressed great interest in the idea of working together with a wide range of specialists in other fields toward a common aim: provision of useful environmental information services to industry and government. The financial support of such students is in itself a worth-while contribution to the university community.

A number of faculty members have expressed interest in various facets of ESAC. The presence of the information facilities of the system can be a valuable resource to academic researchers. This presents possibilities of an interplay between the academic disciplines and ESAC which can be of mutual benefit.

Finally, ESAC--as a service arm of the Indiana University Foundation--is engaged in exploring avenues of effective involvement of the Foundation and the university community in services to industry and government. It is hoped--and the prospects appear promising--that such a cooperative venture bringing together the interests and resources of industry, government, and the university may provide pragmatic,

effective answers to many of the environmental problems which threaten the quality of our society.

ESAC Advisory Board

To assist us in the planning of ESAC activities, and to provide overview and criticism, the following persons are now participating as an Advisory Board:

Mr. Benny Arnwine
Director, Technical Information Group
Mobil Oil Corporation

Mr. Robert Burdett
National Association of Manufacturers

Dr. Lynton K. Caldwell
Professor of Political Science, Indiana University

Dr. Ralph Clelland
Professor Emeritus of Botany, Indiana University

Mr. John Dunigan
Vice President
Public Service Indiana

Mr. John Kravis
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Indiana Legislative Council

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Vice Chairman of the Board
Cummins Engine Company

Dr. Dan Tarlock
Professor of Law, Indiana University

Dr. Arthur Weimer
Professor of Reas Estate Administration
Special Assistant to the President
Indiana University

Mr. Philip Willkie
President, Rushvill State Bank
President, Southern Indiana, Inc.

The assistance and advice of the members of the Advisory Board is of immeasurable assistance in setting priorities for ESAC programs.

P70-02969
Stewart, B.A. USDA, Southwestern Great Plains Research Center, Bushlands, Tex.
Volatilization and nitrification of nitrogen from urine under simulated cattle feedlot conditions.
Environmental Science & Technology. Wash., D.C., 4(7) :579-582, July 1970.
Abs., 1 fig., 6 tables, 7 refs., AA.
ANIMAL WASTES : SOIL ANALYSIS : NITRATES : NITROGEN : feedlots : cattle urine.

Animals fed for slaughter are being concentrated in large feedlots, and, in some cases, contamination of ground and surface water supplies has resulted. In laboratory model studies, the amounts of ammonia volatilization and nitrate accumulation under simulated feedlot conditions depended on the moisture content of the soil. When urine was added every 2 days to an initially wet soil at the rate of 5 ml. per 21 cm2, less than 25% of the added N was lost as ammonia and about 65% was converted to nitrate. When urine was added every 4 days to initially dry soil, essentially all the water evaporated between urine additions, and 90% [illegible] added N was lost as ammonia. These findings suggest that [illegible]ing rate and [illegible]ment factors [illegible] he con-

EXAMPLE OF A SEARCH BIBLIOGRAPHY

THE TOPIC FOR WHICH INFORMATION WAS SOUGHT WAS POLLUTION FROM AGRICULTURAL WASTES. BOTH COMPUTER AND HAND SEARCHES OF APPROPRIATE DATA BASES WERE PERFORMED, AND ABSTRACTS OF THE RELEVANT LITERATURE CITATIONS WERE FURNISHED THE USER. THE SAMPLE OF ABSTRACTS FURNISHED HERE IS ONLY A SMALL PORTION OF THE TOTAL SET COMPILED, AND IS INTENDED TO DEMONSTRATE ONE OF THE FORMATS IN WHICH INFORMATION IS AVAILABLE FROM THE ENVIRONMENTAL SYSTEMS APPLICATIONS CENTER.

TRICKLING FILTERS AS A DAIRY-MANURE STABILIZATION COMPONENT,
Massachusetts Univ, Amherst
D. O. Bridgham, and J. T. Clayton.
Manage Farm Animal Wastes, Amer Soc Agr Eng, St Joseph, Mich, pp 66-68, 1966 3 p, 6 fig, 3 tab, 9 ref. OWRR Project A-009-MASS.

Descriptors: *Trickling filters, Filters, *Waste treatment, Sewage effluents, *Farm wastes, Effluents, Settling Basins, *Cattle, *Dairy industry, Wastes, Biochemical oxygen demand, Pollution abatement.

Trickling filters are an effective means of reducing the polluting qualities of dairy manure and a possible means of treating effluent for discharge or recirculation. Loading rate and waste temperature have a great effect on the quality of the effluent Nine points were plotted for this experiment and labeled according to average BOD of the effluent under respective conditions. Assuming a linear relationship between points, a topograph was drawn for various qualities of effluent With bubbling aeration, a 1000-lb cow would require 334 cu ft of storage and treatment volume for 6 months of operation between sludge removals. An aeration tank, 134 cu ft in volume, was operated at 95 deg F. The estimated size for 70 deg F operation was 200 cu ft. Experiments support Webster's value for sizing primary sedimentation tanks of 200 cu ft per cow for biannual sludge removal. Test results show the volume of trickling filter required per cow to meet specific temperatures and effluent qualities Experiments suggest a sedimentation tank volume of about 114 cu ft per cow instead of the 248 cu ft actually used. Therefore, a trickling filter system would require from 346 to 391 cu ft of tanks per cow to produce an effluent BOD of 200 ppm
W69-01156

BACTERIOLOGICAL WATER QUALITY ANALYSES OF METHODS FOR DETECTING FECAL POLLUTION,
South Dakota State Univ., Brookings.
Paul R. Middaugh.
Available from the Clearinghouse as PB-191 536, $3.00 in paper copy, $0 65 in microfiche Completion Report April, 1970. 14 p. OWRR Project A-019-S DAK (1).

Descriptors. Water pollution sources, *Farm wastes, Bacteria E coli, Coliforms, Pathogenic bacteria, *Sewage bacteria, E coli, Enteric bacteria, Streptococcus bovis, Streptococcus faecalis, *Pollutant identification.

The initial or laboratory research phase of objectives were achieved. These were to improve the specificity, speed and reliability to bacteriological methods for determinging kinds and number of fecal bacteria in water resources. The major objective of distinguishing between human and animal sources of pollution was partially achieved by improved isolation of the rumen organism Streptococcus bovis. The objective of determining the survival of selected fecal coliform and fecal streptococcus in river water with and without filtration was completed in the M.S. Thesis study by Joseph Zerfas. He compared river water in laboratory flasks with environmental river exposure chambers to determine survival effect of temperature from 10 to 30C, decreased both colform and streptococci equally with increased temperature Added organic nitrogen fertilization of river from normal level 2 5 ppm N to 10 to 30 ppm N stimulated growth and lengthened survival time. Both kinds of organisms increased in survival in water with reduced dissolved oxygen compared to aerated water. In untreated river water fecal coliform bacteria lived longer than fecal streptococci, 7% and 0.1% survival respectively after 7 days. Water membrane filtered to remove protozoa gave 20% coliform and 100% streptococcus survival after 7 days In M S. Thesis study by L. Koupal, methods for detecting the rumen organism Streptococcus bovis resulted in a rapid, sensitive selective method using membrane filter for quantitative recovery from river water and selective medium incubated in 25% CO2+75% N2 gas grows S. bovis which is then detected by starch agar overlay. Only ruminants have S. bovis in numbers in feces so S. bovis in river survival studies was proven to be a useful tracer for ruminant pollution of surface waters. More rapid and sensitive methods for both indicator and pathogenic bacteria were being investigated when the project was terminated.
W70-06312

AMMONIA REMOVAL FROM AGRICULTURAL RUNOFF AND SECONDARY EFFLUENTS BY SELECTED ION EXCHANGE.
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
Mar 69, 58p TWRC-5, TWRC-AWTRL-5
Grant WPRD 26-01
See also Rept. no. 6, PB-187 760.

Descriptors. (*Ammonia, *Water pollution), (*Ion exchange, Ammonia), Pilot plants, Calcium oxides, Silicates.
Identifiers. *Water treatment, *Zeolites, *Clinoptilolite, *Agricultural wastes, Strippers

A selective ion exchange process was developed for the removal of ammonia nitrogen from wastewater. The process employs a natural zeolite, clinoptilolite, which is selective for ammonium ions in the presence of sodium, magnesium, and calcium ions Regeneration of the exhausted clinoptilolite is accomplished with solutions or slurries containing lime. Lime provides hydroxyl ions which react with the ammonium ions to yield an alkaline aqueous ammonia solution. This ammonia solution is processed through an air stripping tower to remove the ammonia which is exhausted harmlessly to the atmosphere. The spent regenerant is then fortified with more lime and recycled to the zeolite bed to remove more ammonia. Since the regenerant is not discarded, the process generates no liquid wastes. The ion exchange equilibria of four zeolites was investigated and clinoptilolite was selected for further study on the basis of its ammonium ion selectively and low cost Operation of the mobile plant with secondary effluent resulted in ammonia removals of 97 and 93 percent at 70,000 and 100,000 gallons per day respectively; thus demonstrating that selective ion exchange provides a highly effective means for removing ammonia from wastewater. (Author)
PB-187 759 HC$3.00 MF$0.65

TECHNICAL AND LEGAL CONTROLS FOR THE DISPOSAL OF ANIMAL WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering
Raymond C. Loehr.
Proceedings of the Industrial Waste Conference, 23rd, 1968, p 507-519. 2 fig, 5 tab, 21 ref.
Descriptors: *Animal wastes, *Runoff, *Management, *Farm management, *Aerobic treatment, *Water pollution, *Water pollution control, *Water pollution treatment, *Solid wastes, *Legal aspects, Runoff forecasting, Cattle, Hogs, Poultry, Farm wastes.
Identifiers: *Manure, *Agricultural runoff, Anaerobic lagoons.

Several alternatives exist for disposal of animal wastes. (1) land disposal of liquids and solids, (2) solids combustion with land disposal of liquid, and (3) discharge of solids and liquids to receiving waters. All these alternatives are potential sources of water pollution. The quality of treated and untreated animal waste waters, both from a legal point of view and a farmers point of view, are discussed. Animal wastes are normally semi-solid, thus high in BOD, COD, suspended solids, Na, NH3. If rainfall runoff is allowed to mix with the animal wastes, a larger volume of waste will need to be treated Many states now consider large livestock operations to be industrial processes and require treatment of wastes in such a manner that receiving waters are not harmed by discharge of animal waste waters Waste water runoff holding ponds are commonly used with intermittent discharge to receiving waters or land disposal. Several processes are used for treatment of animal wastes, the more common being anaerobic lagoons, aerobic lagoons, aerated lagoons, oxidation ditches, or a combination of anaerobic-aerobic treatment In more arid areas, runoff holding ponds are sometimes satisfactory. Handling and treating animal wastes as a liquid usually involves less labor, less expense, and thus is more commonly found in large livestock operations where concrete pens are found and confinement is practiced. Since liquid wastes require more treatment, handling the animal wastes directly as a semi-solid with land disposal might be a more economic method. (Makela-Texas)
W70-07486

OPERATING CHARACTERISTICS OF TWO AEROBIC-ANAEROBIC DAIRY MANURE TREATMENT SYSTEMS,
New Holland Machine Co, New Holland, Pa and Massachusetts Univ, Amherst.
N. W. Webster, and J. T. Clayton.
OWRR Project A-009-Mass, Mange Farm Animal Wastes, Amer Soc Agr Eng, St. Joseph, Mich, pp 61-65, 1966. 5 p, 14 fig, 2 tab, 20 ref.

Descriptors: Waste disposal, *Waste treatment, *Farm wastes, *Cattle, *Aerobic bacteria, *Anaerobic bacteria, Operations, Settling basins, Dairy industry, Biochemical oxygen demand.

Two aerobic waste-treatment systems were designed and tested for use in treating dairy manure. The systems were combinations of aeration and settlement for the purpose of reducing the pollution capabilities of the waste and to make possible the use of treated effluent for transporting fresh waste. The designed systems were first tested on a bench-scale system, and results showed that the loadings were too heavy. The loadings were reduced to 0.044 lb of volatile solids per system and rerun. The second test was satisfactory and loadings and containers were scaled up 100 times to 4.4 lb of volatile solids per system with tank sizes of 1000, 750, 500, and 300 gal. This pilot model was run for 5 months before it was terminated. System A, the anaerobic primary settlement and secondary aeration system was functioning and could have been continued. System B, primary aeration with secondary settlement, did not operate satisfactorily for the full 5-month test period. The system suited for agricultural uses was System A, with the addition of a small sediment tank with provisions for returning the settled solids to the primary settlement tank. This added feature would prevent an anaerobic condition from developing in the final sedimentation tank.
W69-00413

MANAGEMENT OF CATTLE FEEDLOT WASTES,
Iowa State Water Resources Research Inst., Ames.
Richard R. Dague, and Kenneth J. Kline.
Available from the Clearinghouse as PB-190 830, $3.00 in paper copy, $0.65 in microfiche. Iowa State Water Resources Research Institute Report No 69-4, Iowa University, Project Completion Report, June 30, 1969. 195 p, 99 fig, 20 tab, 19 ref, 4 append.

Descriptors: *Farm wastes, *Confinement pens, *Waste treatment, *Waste disposal, Lagoons, Water pollution control, Water pollution sources.
Identifiers: Feedlot wastes, Waste management.

The effects of hydrologic factors on the control of runoff from open feedlots were studied. Management and treatment techniques are discussed and evaluated. Rainfall, runoff, and streamflow are the primary factors to consider in managing cattle feedlot runoff. The nature, volume, and rate of delivery of runoff are directly related to rainfall. Storage requirements depend upon the volume of runoff, whereas the retention pond discharge rate should be proportional to streamflow. Terraces and retention ponds will reduce the pollution from cattle feedlot runoff. Application to land appears to be the most practical method of disposal for both the solids and the liquid. When applied to agricultural land, the waste has some economic value. Retention ponds may not remove sufficient amounts of suspended solids, BOD, COD, and nutrients to provide safe effluents for disposal to streams. (Knapp-USGS)
W70-05465

P70-02018
Allee, David J. — Cornell Univ., Dept. of Agricultural Economics, Ithaca, NY
Clavel, Pierce — Cornell Univ., N.Y. State College of Agriculture, Ithaca, NY
Who should regulate poultry conflict problems?
Animal Waste Management. Cornell University Conference on Agricultural Waste Management. Proceedings. (Held in Syracuse, N.Y., Jan. 13-15, 1969.) Sponsored by New York State College of Agriculture at Cornell University, Ithaca, New York. 407-414, 1969.
Abs., 6 refs., *from AA.
ANIMAL WASTE : WASTE DISPOSAL : ODOR CONTROL : ENVIRONMENTAL QUALITY : rural regulatory control : poultry.

Economic and social theory applicable to conflict situations, such as those that arise downstream or downwind from some poultry houses, has some ability to indicate directions for administered solutions to these problems. Based upon such theory, related research and a case study of a number of ways in which rural communities have dealt with situations of stress between components of the community, the outlook for regulatory devices is appraised.

P70-02013
Norton, T. E. — Nelson, Haley, Patterson & Quirx, Inc., Engineering Consultants, Greely, CO
Hansen, R. W. — Colo. State Univ., Agricultural Engineering Dept., Ft. Collins, CO
Cattle feedlot water quality hydrology.
Animal Waste Management. Cornell University Conference on Agicultural Waste Management. Proceedings. (Held in Syracuse, N.Y., Jan. 13-15, 1969.) Sponsored by New York State College of Agriculture at Cornell University, Ithaca, New York. 203-216, 1969.
No abs., 14 figs., 2 tables, 12 refs., *from Introd.
ANIMAL WASTES : WASTEWATER : RUNOFF : HYDROLOGY : WATER QUALITY : field study : cattle feedlots.

This paper is concerned with the runoff wastewater from cattle feedlots. The organic pollutant considered in this study was the ultimate combined BOD and the inorganic was the dissolved solids content and alkalinity. Additional determinations of conductivity, pH, and volatile solids were also made. The overall objective of the study was to determine if the hydrology characteristics could be correlated with the quality characteristics through a modification of the flat plate model of overland flow. The results of the correlation could then be used to predict the quantity and quality of the runoff from existing feedlots.

P70-02012
Eby, Harry J. (both) U.S.D.A., Agricultural Research Service, Beltsville, MD
Willson, G.B.
Poultry house dust, odor and their mechanical removal.
Animal Waste Management. Cornell University Conference on Agricultural Waste Management. Proceedings. (Held in Syracuse, N.Y., Jan. 13-15, 1969). Sponsored by New York State College of Agriculture at Cornell University, Ithaca, New York. 303-309, 1969.
No abs., 5 figs., 1 table, 6 refs., *from Introd.
ANIMAL WASTES : DUST : ODORS : FILTERS : poultry houses : filter media evaluation.

The production of poultry, in addition to producing quantities of manure that must be managed in a manner to avoid pollution, gives rise to dust and odors which are also a source of pollution. In an effort to more effectively, yet economically, reduce output of dust from poultry houses, a project was established to evaluate the use of various filter media on poultry house exhaust fans.

P70-02804
Anon.
The economics of clean water: Animal wastes profile.
The Economics of Clean Water. Vol. II. Third Report to the Congress on National Requirements and Cost of Water Pollution Control. U.S. Dept. of the Interior, Federal Water Pollution Control Administration, Washington, D.C. 97 pages. March 1970. Price: $1.00.

Sum., 18 figs., 10 tables, 4 refs., from Introd.

ECONOMICS : ANIMAL WASTES : AGRICULTURE : WASTE TREATMENT : WATER QUALITY CONTROL.

This report concludes that water pollution as a result of improper or inadequate disposal of animal wastes can be a major but manageable problem. It also points out that further study may show that in many cases the net costs of control may not only be manageable but very minimal, if at all existent, when offsetting economies of the changed operations are considered.

P70-01906
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Attenuation of selected nitrogen forms by sorption from solution onto natural soils.
Michigan. State University, East Lansing. College of Engineering. Division of Engineering Research. Completion Report, 140 pages, April 1969.

Abs., 5 figs., 2 tables, 3 appendices, 87 refs., (1 in Ger.), *AA.
Contract(s): USDI DI-14 01-001-1390.
(Ref. Order No. PB-188 961).

AGRICULTURAL WASTES : NITRATES : SOIL : WATER SUPPLIES.

The interaction of nitrates from agricultural waste disposal and other sources with soil materials was studied by equilibrating 200 solutions of nitrates with coarse-size Na and K montmorillonite particles. The literature on the physiological and chemical effects of nitrates is extensively reviewed and a bibliography is included. In the adsorption experiments, the equilibrium pH increased with increasing clay content. Increasing the nitrate concentration up to 32 mg/l caused an increase in the equilibrium pH when the average pH was greater than 8.9 and a decrease when the average pH was between 4.5 and 10.2. Increasing the nitrate concentration reversed the initial increasing trend of the negative adsorption isotherms.

P70-02897
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ANIMAL WASTES : FERTILIZERS : SOIL : WASTE DISPOSAL : EROSION : SEDIMENTATION.

Agriculture faces the challenge of using soil, with its remarkable abilities for self-rejuvenation, as an animal waste disposal medium in a way that minimizes the pollution of this and related resources.