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A GESTALT APPROACH TO THE ENVIRONMENT

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ABSTRACT

In the last twenty years, extensive resources have been devoted to the solution of environmental problems, but not necessarily in the most effective way. As we do not have the resources to solve all problems simultaneously, and since solutions to some problems may cause or aggrevate other problems, it becomes necessary to consider a global systems approach to setting priorities. The paper raises a number of questions that must be routinely asked and answered and points out that the systems approach must include economic, social and political factors besides the traditional scientific and technical considerations in order to arrive at appropriate priorities and to produce solutions which can be meaningfully implemented.

The hazard of nuclear war constitutes a unique risk of imminent environmental catastrophe. Recent recognition of the environmental consequences of such a war, of the "nuclear winter," put an onus on those suitably educated to understand the scope of this threat to pass on this understanding to the public, press and politicians. Since the threat of nuclear war will be with us for some time, solutions to other environmental problems must be pursued simultaneously.

An integrated systems approach to environmental problems, when explained to the public, can develop proper political support for environmental solutions.

INTRODUCTION

Over twenty years have passed since Rachel Carson's "Silent Spring" put the environmental movement on the map. A considerable amount of emotional, intellectual and economic resources has been spent since to keep our planet a habitable place, and it's time to take stock of what we have accomplished, where we are, where we're headed, and where we should be headed.

It seems that the resources spent to resolve or ameliorate environmental problems have produced results, but whether the results have been commensurate with the resources spent is another question. For one thing, we seem to have no priorities. Actions are determined by ad hoc groups with pet concerns: Protect this particular scenic river, save the whales, clean up this toxic waste dump. Governments don't move unless they are pushed by one or more of these groups, and then they move in the direction pushed and not according to a plan based on analysis, priorities, long term considerations, etc.

We believe that the convenors of this symposium have provided an important service by publishing a Call for Papers with a Program Format listing 31 topics, some with subtopics, including issues that can be addressed locally, issues that can only be addressed on an international level, and everything in between. It is to be noted that subjects like environmental politics, the economics of pollution, or environmental imperialism were not to be found on the list. Are the industrialized nations exporting to the Third World the very pollutants from which they have protected their own citizens? Are the developing nations ignoring the costly environmental lessons learned by the advanced countries? A Polish-American friend from Los Angeles returned from a visit to the old country with the comment: "Here we call it air pollution, there they call it progress."

How can we integrate the 31 topics of the Program Format into a system that takes account of their relation to each other and of the political, economic and other constraints limiting our environmental options? To put a convenient handle on this question, we decided to borrow a term from psychology and title our effort as a Gestalt approach to the environment.

Having defined our objective, we are immediately beset by questions which must be answered before we can perform our main task. Do all environmental problems carry equal weight? If not, what scale do we apply? What do you do when one person's air pollution is another's progress? How do you compare long range and immediate problems? What about the environmental threat that can preempt all others? This list of questions is not comprehensive, but it's enough to provide a framework for our endeavor.

CAN APPLES BE SUBTRACTED FROM PEARS?

Engineers have a way of making decisions called Engineering Economy. If two or more types or arrangements of power plant can produce the desired amount of electricity, this method will identify the plant which will deliver the electricity at the lowest cost per kilowatt hour over the life of the project and, usually, that is the plant that will be built. In recent years, we have learned that this method has some shortcomings; it does not, for instance, consider environmental factors, public safety or long term availability of fuel. We have now extended our studies beyond engineering economy to deal with the above factors in order to give us the complete picture.

Complete picture? Is there such a thing? Can you compare the safety of a coal-fired power plant with that of a nuclear power plant by subtracting potential meltdown casualties from potential coal mine accident victims? What about the lingering hazards from radioactive wastes? Can apples be subtracted from pears?

Apples are not pears and can't be subtracted from pears, but apples and pears can change places. Different people have different values, religions, etc. If a shrine is to be flooded by a hydroelectric project, I see it as an apple if the shrine belongs to my deity and as a pear if it belongs to your deity. You'll see it just the other way around.

IS THE CURE WORSE THAN THE DISEASE?

Humans are impulsive and impatient and overconfident in their power to shape their environment. When we encounter a problem, we tend to grab for any solution within reach and to apply it without much deliberation. Indoor air pollution is partially the result of energy conservation. Are the natural

resources we save worth the formaldehyde we now inhale as a result of insulating our living space with urea formaldehyde resins? Or is the cure worse than the disease?

We put catalytic converters on vehicles to reduce air pollution. Some of these vehicles operate in areas where air pollution is not a problem but where catalytic converters cause grass fires, a bad cure where there's no disease in the first place. Should we eliminate catalytic converters? Not until something better comes along, but could we be more selective about their application?

Fools rush in where wise men dare not tread, and we must find a middle ground between the two, since we can afford neither the aloofness of the wise nor the impulsiveness of the fools. We must move ahead with our environmental solutions, but we must ask some questions as we go. The first question should always be: "Why has it been done this way up to now?"

Energy conservation has been one of the great environmental virtues of the last decade. To reduce the heating or cooling load of a building, we take in less outside air and recirculate more air. How many of us have asked why we had so many air changes in the first place or why, indeed, these air changes were actually mandated by building codes. If we did ask this question, we might further speculate as to whether the air changes were intended to dilute concentrations of any substances detrimental to human health or comfort. Ultimately, we might recirculate more air, but at the same time provide some type of filter in the recirculation duct to remove formaldehyde, radon, cigarette smoke or kitchen odors.

We might also ask some questions about the inherent properties of the materials we consider incorporating into our solution. Are they flammable? biologically active? radioactive? How much energy conservation has been achieved with asbestos insulation, some of it exposed and friable? We might be able to replace some chemical pesticides by importing a predator of the pest of the week, but what is our predator going to eat next week, after this week's pest has been eradicated?

Figure 1 shows how easy it is to run into non-solutions when tackling environmental problems. If the answers to our questions lead to a box with rounded ends, in this case if they lead us straight down, we have a usable solution. On the upper right, we have a temporary solution, and all those dead ends with rectangular boxes are just that, dead ends. Figure 1 asks only a few of the questions that must be answered when solving environmental problems, and already the odds seem to be stacked against us. The questions that follow will make the questions posed so far look easy.

WHOSE OX IS BEING GORED?

We are all part of the problem, and we all think that our contribution to the problem is less than our neighbor's. Obviously, my tonedeaf neighbor imposes a greater insult upon the environment by practicing his French horn than I do by spraying my yard with pesticides. He's an organic gardener and disagrees. Have you ever shared an office with a cigarette smoker who insisted that he produced less air pollution than your automobile? I've noticed that the most uncompromising environmentalist, the one who opposes any and all energy projects other than conservation, will happily commit vast amounts of fossil fuels to reach the mountain he wants to climb. We can each point at the neighbor to the left and then turn around to point at the neighbor to the right and, finally, we can break the circle and point at Number One and ask: "Why me?" Most of

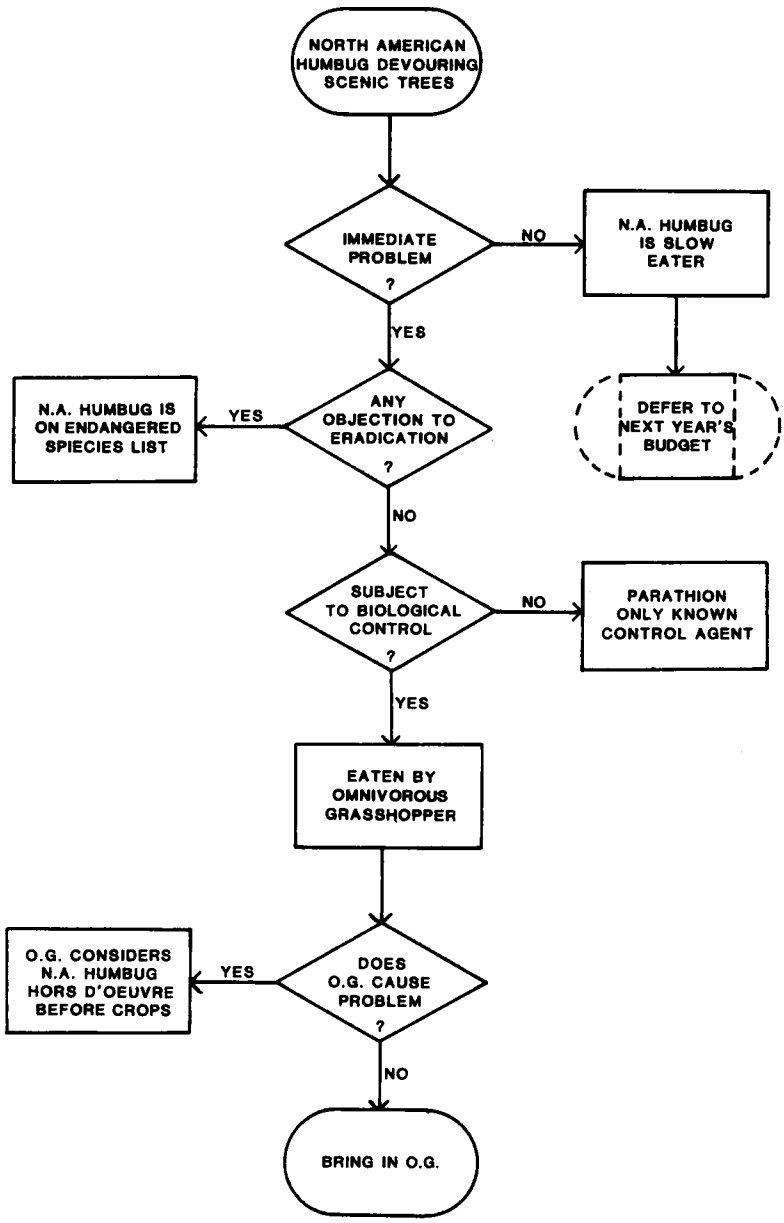

FIG. 1 Obstacles to Solving Environmental Problems

us, especially those from the more industrialized parts of the world, can answer that question thus: "Because you have been living beyond your ecological means, and your credit is running out." Our employers and research grants may have paid our way to beautiful Miami Beach, but our environmental conscience must pay for the jet fuel as well.

WHAT HAPPENED TO THE FREE LUNCH?

Practically every move to protect the environment carries a price tag, and often the price is paid by those least able to pay. Often industrial employers rally their workers against pollution control requirements by threatening to close the plant if the requirements are imposed. Sometimes this is just a ploy, but many times the plant is obsolete and only marginally profitable and, with suitable tax write-offs, closing the plant may not be a bad deal for the owner.

Are we about to face the workers who are about to lose their jobs? Are we prepared to face their families? It's no consolation to these workers and families that new jobs may be created elsewhere in a new plant meeting all environmental standards. Are we going to consign these families to the welfare rolls or are we going to preserve their dignity? Are we prepared to pay the full price of environmental improvements or do we still believe in a free lunch, the lunch paid for by those least able to pay?

If we decide to shoulder our moral responsibility, we may have to make substantial changes in our entire social structure. The topic of the Clean Air Research Institute's its next symposium could be the accommodation of economic and social impacts of environmental action.

WHY DID THE FORMAT OMIT THE MOST URGENT TOPIC?

We glossed over the word "priorities" earlier in our paper, and it's time to return to it. Although oil leaks constitute an immmediate problem, it's always a local problem. Although the thermal effect of the carbon dioxide increase in our atmosphere may be worldwide, it does not constitute a threat of immediate catastrophe. One immediate worldwide catastrophic threat to the environment today overshadows all others, the threat of nuclear war.

Why was this topic missing from the Format? Indeed, until last December, when Science published the reports by R. P. Turco et al. and by P. R. Ehrlich et al., most environmental professionals had given little thought to the environmental consequences of nuclear war. Since our capacity to create the "nuclear winter" has been with us for some decades, why have we failed to face the issue?

The answer to this question comes in several parts. First, humans tend to attack problems that appear tractable and that can be defined, including time necessary for solution, in a grant application. Second, for many years now, we have trusted deterrence to prevent nuclear war. Why work on a nonexisting problem? Unfortunately, when the leaders of one of the superpowers start to talk of prevailing in a nuclear war, it's time to wake up. Third, we come back to our earlier point, that environmental policy is made by ad hoc groups with pet issues. Nuclear war is not a parochial problem. The environmental effects of even a little nuclear war can be expected to overshadow all the other environmental problems we are now addressing.

WHAT CAN BE DONE TO REACH A GESTALT SOLUTION?

We have supplemented engineering economy studies with environmental impact statements, a step in the right direction. The previously raised questions and examples indicate a need for a further step in broadening the range of investigation prior to decisionmaking.

Once we realize that all insults to the environment are not equal, that few, if any, are unrelated to other insults, and that resources to deal with them are limited, we have the basis for a systems approach to environmental problems. No doubt, this paper will inspire someone to set up another computer model or only a modest decision tree. Decision trees and computer models require assumptions, and of course we can make no decisions without assumptions, but unless we recognize the fragility of our assumptions and have an open mind to tuning these assumptions as we ask ourselves whether we're subtracting apples from pears, whether the cure might be worse than the disease, etc., we'll be no better off than before.

There will be a price to be paid, and we must consciously decide that the price will be paid by those in the best position to pay it. Not only is this the morally right approach, but it is the only approach that has a chance of working. If we hand the bill to those who don't have the coin, the bill will not be paid, and our "solution" comes to naught. Fly-by-Nite Electroplating Company may have dumped toxic wastes down the gully in back for thirty years, but all of Fly-by-Nite's earnings during those decades wouldn't begin to pay for the cost of cleaning up the aquifer, much less the company's current assets. On the international level, those countries without access to other sources of energy will denude their forests from lack of choice, so it behooves the "haves" to do with less so that the "have nots" will be able to share, lest the latter be driven to commit damage to the environment.

If an environmental assessment of some kind had been conducted prior to the founding of the city of Los Angeles, it would probably have been built in a location less subject to air inversions and more subject to rainfall. If we had it to do over, our industry would all have been equipped with 1984 state of the art pollution control equipment. If and if and if. At this time, it is impossible to correct the environmental mistakes of the past without considerable social upheavals. We would not suggest the relocation of the entire population of Los Angeles, yet we are prepared to close an industrial facility that fails to meet air emission standards. It's time for us to accept our responsibility for the social problems inherent in environmental solutions. This does not mean that we continue to ignore environmental insults in order to avoid social problems, but rather that we accept the social problems as part of the environmental ones. If any representatives of the United States Environmental Protection Agency are present, hopefully you will bear this in mind when you rule on what is and what is not an essential part of a project, i.e. grant fundable.

Figure 2 shows a suggested decision tree which pointedly includes socioeconomic impacts as a cost that must be addressed in full. We must solve many environmental problems, and our resources are inadequate for complete solutions to all of them. For those problems, however, for which we are not willing or able to pay in full, such as the relocation of Los Angeles, we have to go back for less ambitious solutions.

Previously, we indicated that nuclear war could make all other environmental issues moot. Does this lead to the inevitable conclusion that we should drop whatever else we are doing and work to avert nuclear war? It's not a ques-

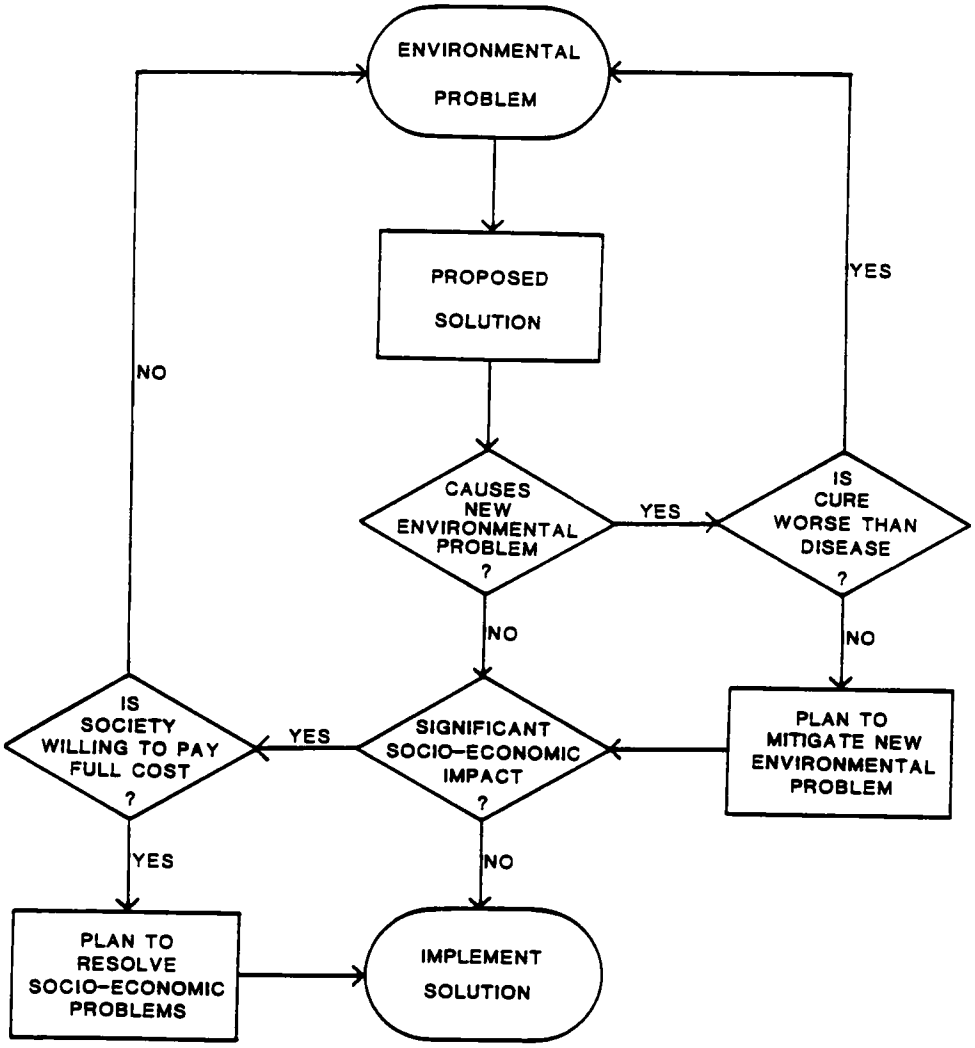

Fig. 2 Decision Tree for Environmental Problem

tion of one or the other. Given our priviledged educational status on environmental matters, those of us assembled here have a special responsibility to inform our political decision makers, as well as the general public and the press, of the real environmental hazards associated with nuclear war, even with that unlikely prospect, "limited nuclear war." Media coverage of the Science reports lasted only 24 hours. It is up to us to get the subject back onto the front page and onto the television screen. None of this relieves us of our more mundane tasks. The nuclear war threat is liable to be with us for a long time, and in the meantime hazardous waste dumps could proliferate, prime agricultural land could be paved over and, certainly, the carbon dioxide concentration of the atmosphere will increase.

No doubt, the future will bring new environmental problems that we havn't even dreamed of until now, and some of today's low priority problems will take on major significance as a result of future events. Any system that we develop to guide our overall environmental effort and emphasis must be sufficiently flexible to accomodate new problems and priorities. Our program must be prepared for today's wonder remedy turning into tomorrow's nightmare. After World War II, DDT and the atom seemed to offer nothing but opportunities; the headaches came later. Although we are probably more cautious about our opportunities now, we should be prepared for unpleasant surprises. Every enterprise should carry a disaster plan with it; hopefully it will never be needed, but if things go wrong, the results can be mitigated.

HOW DOES IT ADD UP?

Waking up in the morning, it's a pleasure to look out the window and see that the birds and the bees are still out there, that the silent spring has not descended upon us, at least not yet. For that matter, the last twenty years have witnessed a persistent effort to counter mankind's insults to the environment. Actually, it has not been a single effort but a number of separate and usually uncoordinated efforts, and credit for these efforts belongs more to ordinary outraged citizens than to us, who should have been the most alarmed because of our professional knowledge.

We have come to the point where the ordinary citizen is dependent upon the professionals for guidance. It is one thing to voice that ecological platitude that everyting is interrelated; it's an eternal job to identify the relationships. Modern science has provided us with a great many tools for this job, and we have to use these tools to place our individual environmental projects into a proper perspective. Not only will this enable us to do a better professional job, it will result in our ability, and responsibility, to educate the non-professional environmentalists who, in turn, will do a more meaningful job when pressuring politicians into environmental action.

Our final recommendation is the same one we have given throughout this paper. Ask questions and insist upon answers. Some answers will come out of your professional investigations, and some will come from your conscience, but other answers will have to come from society as a whole, and it's a lot more difficult to get an adequate answer from this many-headed monster than it is to nail down even your conscience. Unless we get answers, and satisfactory answers at that, to questions of the kind we have raised here, we will find at least one new environmental problem at our door for every one we solve. If we persevere, however, the Gestalt approach can produce the insight necessary to make significant headway toward conquering environmental problems and, if we go public with our insight, we should develop the political support our endeavor deserves.