THE COST OF POLLUTION DAMAGE AND CONTROL

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Over the past several years, numerous laws have been passed and regulations adopted directed toward protecting or improving the environment. Unfortunately, many of these laws and regulations were promulgated in an emotional atmosphere created by the outpourings of well-meaning, but often ill-advised, consumer advocates and environmental activists. Branley Allen Branson, for example, in an article "Stripping the Appalachians" (*Natural History*, November 1974) writes, in part,

> "Yet, like some darkly creeping miasma, all over the mountains the cogs mesh in the machines, and while we argue trivial points of jurisdiction and time schedules, the Appalachians continue to fall. When the wind blows straight across the barren, moonlike surfaces of Appalachia, and the dust rises and beats endlessly against the spring traveler's skin, I remember the green wall of forest that used to thrive there, the bright streamers of water that laced the rills. And as I walk across the desolate sands, it is the magic of memory that assures me of sanity."

It would take an exceptionally courageous legislator to vote against strict strip mining regulations in the face of such poignant words. All too often, however, courage has been preempted by political expediency. Environmental laws and regulations have been based on the premise that pollution is bad and should be eliminated without any regard being given to the consequences of compliance.

A more reasonable approach to environmental control would be to agree that pollution is bad but recognize that most of man's activities that cause pollution are beneficial and strive to achieve an optimum balance. Pollution is bad because it causes damage. Damage may appear to some to be too harsh a word to use. But as used herein, the word damage is meant to encompass any adverse effect. It is used in the sense that one man cannot walk across the face of this earth without causing damage. He would at least step on and crush a blade of grass. The only way to eliminate man-made damage is to eliminate man. If man, as we know him, is to survive, he will have to achieve a balance between pollution control (quality of life) and resource development (standard of living). But how does one go about achieving this balance?

It is quite likely that man has been faced with this question since he first learned to control and use fire some 800,000 years ago.[1] One can imagine a prehistoric cave dweller berating a fire-builder for smoking up the cave. So the question arose; what is more important — warmth with burning eyes or a cold, smoke-free cave and raw meat? Prehistoric man could only answer questions such as these with subjective or prejudiced reasoning. The individual with sensitive eyes opted for ultra-clean air. The individual with no teeth opted for well-cooked food. People were trying (forgive the cliché) to compare apples and oranges.

Modern man is faced with basically the same question, although perhaps in different form. How do we balance our need for a clean environment with our need for energy development? Unlike prehistoric man modern man can answer this question objectively if only he will.

An acceptable balance between energy and environmental needs can be achieved through economic analysis. Economics is a factor that is common to both energy and environmental considerations and can therefore be used as a standard of comparison. Pollution control and abatement equipment and methods incur capital and operating costs. These costs will necessarily

be passed on to the ultimate consumer (the public). Pass-through of pollution control cost is even provided for by the Federal Energy Administration.[2]

Pollution above certain levels causes damages (property and plant damage, health effects, etc.) to which monetary values can be assigned. The cost of these damages will be borne again by the public.

Only when these values and cost are quantified and compared can logical environmental regulations be established.

Estimating the cost of pollution control is a relatively easy task. It is done every day. For example, Thomas L. Montgomery, Air Quality Chief for the Tennessee Valley Authority, reported in October 1974 to the American Mining Conference convention that TVA's sulfur dioxide emission limitation system would cost about $581,000 for equipment and $232,000 in annual operating cost, while the proposed EPA system would cost $1.25 billion for equipment and $220 million in annual operating cost.[3] The environmental literature teems with such estimates.

Figure 1 which was presented in testimony at a New Mexico Environmental Improvement Board hearing on November 21, 1974, is another example of the cost of pollution control.[4] This figure shows the estimated unit cost of installing submerged fill pipes in tank batteries as a function of level control required expressed in terms of throughput. This figure shows, for example, that if submerged fill pipes are required on tanks with a throughput of more than 100 barrels of oil per day the unit cost of control will be $1.15 per barrel of oil per day. This figure is a quite typical cost-benefit curve showing diminishing returns as level of control is increased. Similar curves can be prepared for any other type of control equipment showing the cost of control as a function of level of control. Level of control can be expressed as emission limitations, ambient air concentrations, etc.

Pollution causes damages such as human discomfort, unpleasant odors, damage to vegetation, reduced visibility, health effects and property damage. Most of these damages can be readily quantified. Here again the literature contains numerous estimates of the cost of pollution. The National Academy of Science, for instance, has estimated the annual *benefit* of meeting Federal automotive emission standards at between $2.5 billion to $10 billion (the Academy estimated the *cost* of complying with the

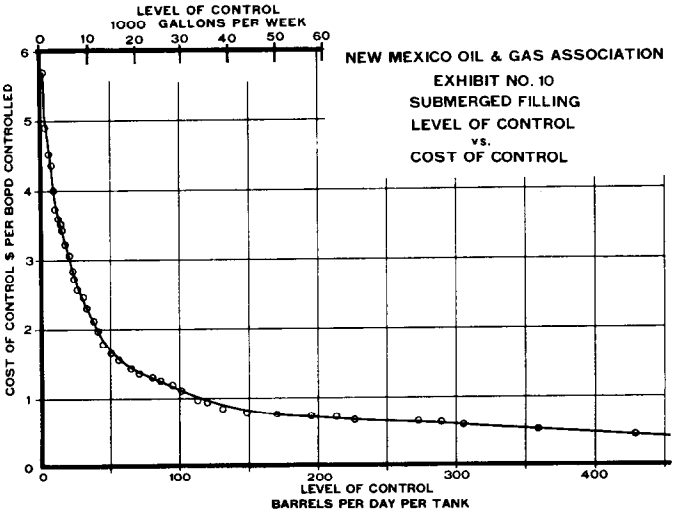

FIG. 1

standards to be between $5 billion and $8 billion).[5]

Assigning a monetary value to some of the damages, such as reduced visibility and odor, would be difficult, but not impossible. If no better methods were available, values could at least be assigned arbitrarily — perhaps by a panel or commission.

Figures 2, 3 and 4 are graphic depictions of how an economic analysis can be conducted to arrive at an optimum control-damage costs balance. These curves, which are highly stylized but not untypical, show cost plotted as a function of ambient concentrations of pollutants. Cost could have just as easily been plotted as a function of ambient standards, or emission limitations. The effects and results would be the same.

Figure 2 shows the cost of control and is similar to Fig. 1 which depicts an actual case. Figure 2

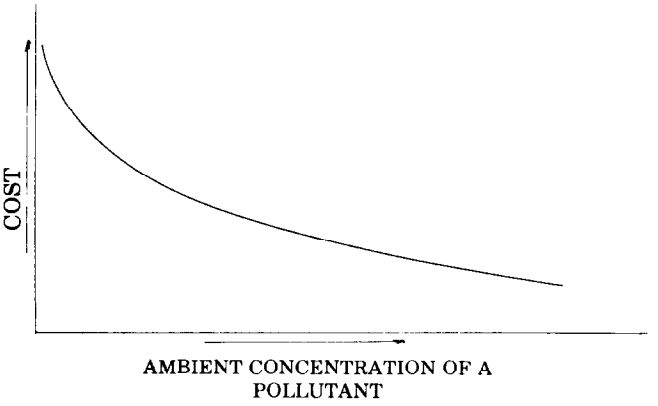

FIG. 2—COST OF POLLUTION CONTROL VERSUS AMBIENT CONCENTRATION OF A POLLUTANT

shows that in order to achieve lower concentrations it will be necessary to install more and more sophisticated and therefore costly controls.

Figure 3 shows the cost of damage plotted as a function of ambient concentrations of pollutants. This curve shows increasing damage costs as ambient concentration increases.

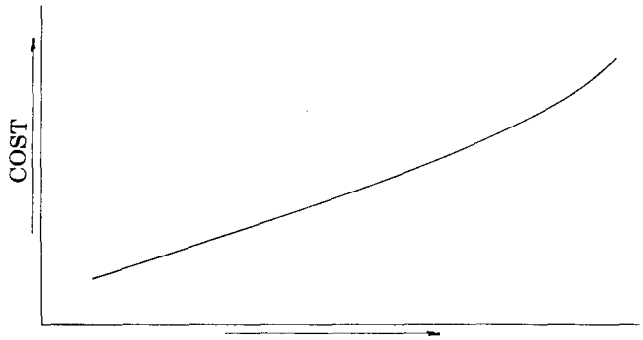

FIG. 3—COST OF POLLUTION DAMAGE VERSUS AMBIENT CONCENTRATION OF A POLLUTANT

Figure 4 is a superimposition of the previous two curves with the addition of a total cost curve. The total cost curve was constructed by adding the cost of damage to the cost of control.

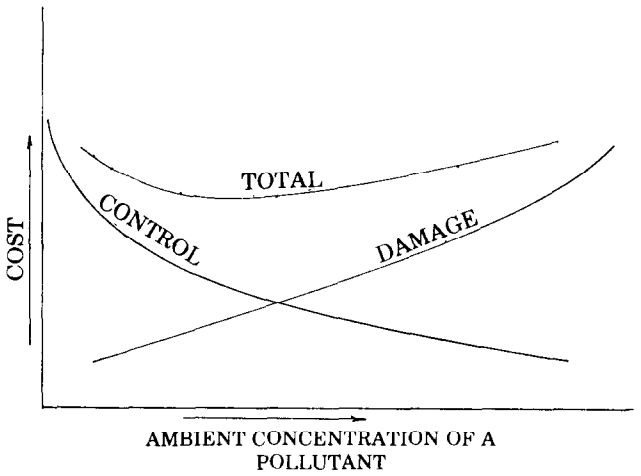

FIG. 4—TOTAL COST VERSUS AMBIENT CONCENTRATION OF A POLLUTANT

An ambient concentration (or emission limitation) can be picked from this type of curve which will result in the lowest total cost — a lowest total cost which will ultimately be borne by the public.

It should be understood that the ideas presented herein are primarily philosophical and not technical. No attempt has been made to provide answers to specific questions (such as what sulfur dioxide standards should be established). What has been presented is a method for determining answers to these specific questions. Much work needs to be done before this method can be successfully implemented — particularly in the area of quantifying the cost of pollution damage. How much, for example, is it worth for Californians to be able to see Catalina Island from the mainland? Difficult to quantify — yes. But just because some of these nebulous values may be difficult to quantify is not a valid reason for abandoning economic analysis as a method for achieving an acceptable balance between environment and resource development.

If we don't adopt such a method, we will regress to the subjective reasoning of prehistoric man. Let us not compare apples and oranges, but instead compare the price of apples and the price of oranges.

REFERENCES

1. Time - Life Books, *The Emergence of Man,* Time, Inc., 1972.
2. Title 10 - Energy, Chapter II, Federal Energy Administration, Part 212 - Mandatory Petroleum Price Regulations, *Federal Register,* vol. 39, No. 235, Dec. 5, 1974.
3. Environment Reporter Staff Correspondent, *Current Developments,* vol. 5, No. 24, pg. 885, Environment Reporter, The Bureau of National Affairs, Inc., Oct. 11, 1974.
4. Kreuz, C.R.: Testimony presented in public hearing before The New Mexico Environmental Improvement Board, Nov. 21, 1974.
5. Eiserer, Leonard A.: Washington Report, *Jour. Air Pollution Control Assoc.,* vol. 24, No. 10, Oct. 1974, p. 914.