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DO PUBLIC AND PRIVATE INTERESTS IN POLLUTION CONTROL ALWAYS CONFLICT?*

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ABSTRACT

Traditional economic theory finds the pollution control interests of environmentalists and regulators to be in conflict with the profit-motivated decisions by businessmen. However, the usual assumptions about the relative shapes and positions of the marginal social benefit curve and marginal social cost curve for a cleaner environment may not always be realistic. This article examines the conditions under which the interests of environmentalists and regulators would coincide, rather than conflict, with those of businessmen. In these cases, reducing pollution control from suboptimal levels improves both public welfare and private profit.

Regulators and environmentalists often oppose private industry regarding the appropriate level of pollution control. Traditional economic theory explains this conflict in terms of the regulators' concern over the social cost of production (including externalities) compared with businessmen's interest in private production costs and profits. Regulators tend to view businessmen's concern over profits as damaging to public welfare, whereas businessmen view the regulators' concern about externalities as damaging to their profits. In this paper, we show that in some instances the two interests are compatible. That is, there are situations where reducing pollution control from suboptimal levels can increase both public welfare and private profit.

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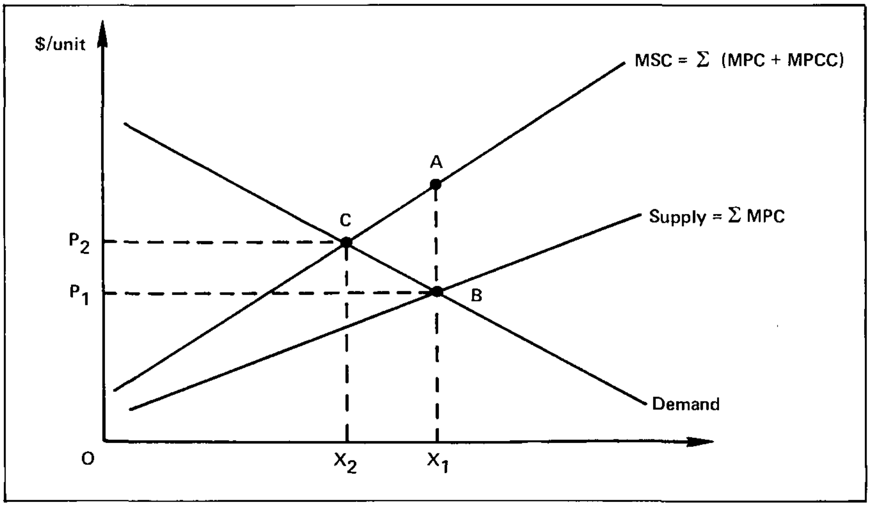

Figure 1. Market equilibrium and optimal production with pollution.

THE TRADITIONAL ECONOMIC APPROACH

An economic analysis of pollution control typically begins with traditional market demand and supply curves, as shown in Figure 1. It is assumed that Industry X is sufficiently competitive so that the market supply curve is the sum of the firms' marginal private cost curves (= Σ MPC). With no pollution control, businesses would maximize profits by producing X_1 units of commodity X at market price P_1. If the production of X also generates pollution, the cost of removing the externality is shown by the difference between the private supply curve and the marginal social cost curve, MSC (where MSC = Σ (MPC + MPCC), with MPCC = marginal pollution control cost). Internalizing pollution control costs reduces production to the socially optimal level X_2 and reduces to the optimal level the pollution (externality) attendant with the production of X_2 at price P_2. Although firms would prefer to produce X_1 and sell at price P_1, the decrease in output from X_1 to X_2 reduces pollution and improves social welfare by area ABC in Figure 1. Thus, the regulator and the firm are in a conflict situation.

If environmental quality depends on the production level,[1] traditional analysis as shown in Figure 2 assumes diminishing marginal benefits from a cleaner environment and increasing marginal costs to achieve improved

[1] This assumption is reasonable to the extent that environmental quality is inversely related to the amount of pollution and, given any level of control, pollution is a function of production.

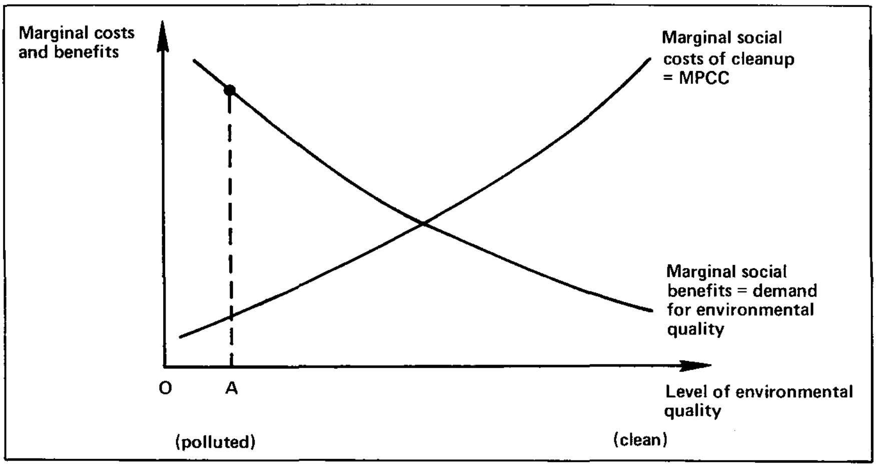

Figure 2. Analysis of environmental quality.

environmental quality. Starting at "highly polluted" point A, any additional pollution control up to the intersection of the two curves generates net social gains, because MSB > MSC or MSB > MPCC. However, as shown in the next section of this paper, this conclusion largely depends on the shape and position of the two curves.

A POSSIBLE ALTERNATIVE APPROACH

When examining the effects of certain pollutants on environmental quality and considering the factors that bear on setting pollution control standards, we hypothesize that the traditional shape of the social benefit curve may not always be relevant. In certain instances less pollution control may be preferable to more control (relative to a suboptimal level) for both society and private industry. For our example, we use water quality improvements derived from controlling very environmentally damaging pollutants, such as toxic metals and toxic organic materials.

Consider a highly polluted river, where initial environmental regulations remove 20 per cent of these very toxic pollutants entering the river. Because the toxic pollutants are so damaging even at this level of control, fish and plants cannot survive in the river and the toxicity prevents any recreational use. In addition, the water remains too corrosive for industrial use and treating it for use as a municipal water supply is economically unattractive. Although the river is still so polluted that everyone avoids physical contact with it, the 20 per cent cleanup may have created some relatively small health benefits if fewer pollutants are carried into the air as evaporation occurs.

Suppose the river is cleaned up another 20 per cent, but that the water remains economically unattractive for industrial and municipal uses and still is

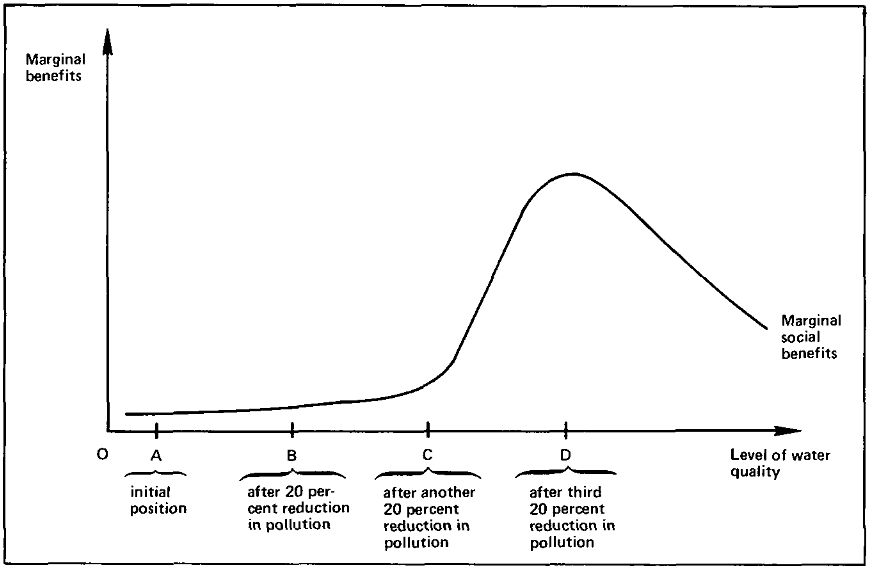

Figure 3. Pollution reduction benefits.

not clean enough to support fish, plants, or recreational use. Again, there may be some limited health benefits.

Now imagine that an additional 20 per cent cleanup causes a dramatic increase in benefits. Industries now use the water for cooling and washing, some fish and plants survive, and limited recreational use becomes possible. Under this entire scenario, the marginal benefits curve may have the shape shown in Figure 3, rather than the shape in Figure 2. In other words, the removal of even substantial amounts of highly toxic materials may not provide much noticeable benefit, because even relatively small amounts of these types of pollutants can preclude many potential uses of the water.

As shown in Figure 4, if this shape is combined with the usual rising marginal cost of control curve, then relatively small amounts of pollution control are not cost-beneficial. For control levels less than C, society clearly suffers a net loss. If water quality is at A, for example, society is worse off than at lower water quality levels since MSC > MSB at A, and would be even worse off with the quality defined by point C, because the excess of total costs over total benefits (area N) is greater at C than at A. Thus, if only small changes in water quality are policy options at point A, an improvement in social welfare in this example would dictate *decrease* in control.[2]

[2] These conditions could well exist when controlling toxic pollutants. It can take relatively large increments of pollution control at fairly high costs to generate relatively small improvements in water quality.

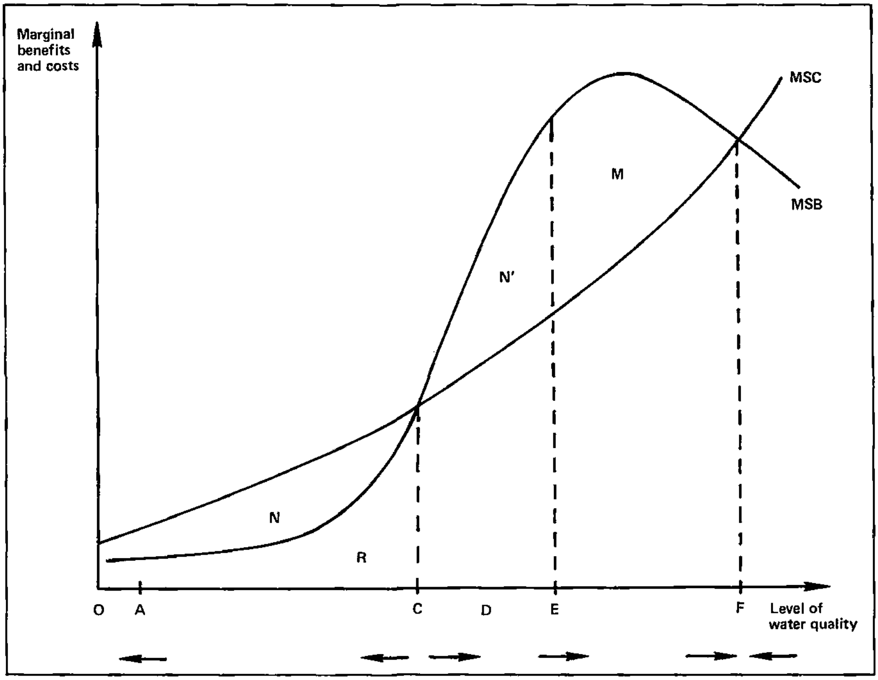

Figure 4. Welfare implications for alternative pollution control levels.

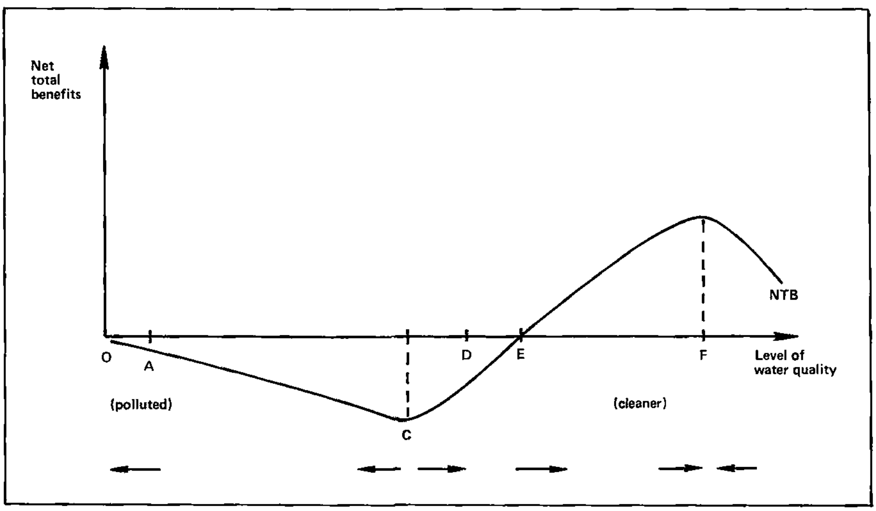

Figure 5. Society's net total benefits from pollution control.

This conclusion is made clearer by considering the net *total* benefits curve, depicted in Figure 5, associated with the marginal curves in Figure 4. As shown in Figure 5, the net loss to society becomes greater with more control until water quality level C is achieved.

At water quality level C, the marginal social benefits equal the marginal control costs. However, water quality E (where N′ = N in Figure 4) must be reached before society begins to realize net gains. Intermediate levels, such as D, are inefficient. However, society has more to gain from incremental increases in water quality at D compared with C, although society may still be better off with much less or *no* control. It is only when water quality exceeds E that society gains from additional pollution control.

Optimal water quality is found at F in Figures 4 and 5. The arrows indicate direction of movement to improve social welfare. Any innovations in control technology would tend to shift the MPCC curve downward, reducing the critical minimum control level necessary for achieving net welfare gains. The point remains, however, that in some cases, partial pollution control and the subsequent improvements in water quality (i.e., any level less than E) does not always make economic sense, even though "full control" (i.e., control to level F, or at least greater than E) yields net benefits to society.

In practice, initial – or perhaps interim – control standards are determined after the regulators balance available information regarding pollution's harmful effects, the firms' ability to afford the standards, and other practical considerations. Firms argue that pollution controls raise their costs, causing a restriction in output, reduced rates of return, lower productivity, and higher product prices. If initial control achieves a water quality less than C (in Figures 4 and 5), then industry's argument for relaxed controls is also consistent with improved social well-being, even though it means lower environmental quality. Therefore, if the ultimate goal is to reach the optimal level of water quality, then initial controls should be sufficient to achieve at least the quality level defined by point C, with the expectation that incremental adjustments can be made later.[3]

THE LIMITING CASE

Figure 7 shows an extreme case where no improvement in water quality is socially efficient. In this situation, to achieve the water quality level defined by point C might require the removal of 90 per cent of the pollutants being

[3] Evidence indicates that the relation between water quality and number of potential water uses may be essentially a step function, such as shown in Figure 6A. That is, water quality thresholds exist for various uses. Then, the marginal benefits function might look like MSB as shown in Figure 6B. In this situation, rising control costs seem to imply that control and improved water quality are justified, if at all, only at very high control levels. Equivalently, the dotted areas must be larger than the striped areas in Figure 6B, to justify control (see page 119).

discharged. The costs of achieving this level of control may be quite high. To reach the water quality level defined by point F, which is optimal according to the MSB = MSC criterion, firms may have to control 98 per cent of all the pollutants. However, at point F, total costs are greater than total benefits by the amount equal to area N minus area R.

This situation has important regulatory implications. If regulations are achieving a level of water quality greater than that defined by C but less than F, regulators can show that the marginal benefits of further improvements in water quality are greater than the marginal costs. However, the broader issue is that society could be better off if water quality had remained unchanged. That is, water quality should be that which prevails with *no* pollution control. This case, where optimal pollution control is always zero, can be compared with the

Footnote 3 (Cont'd.)

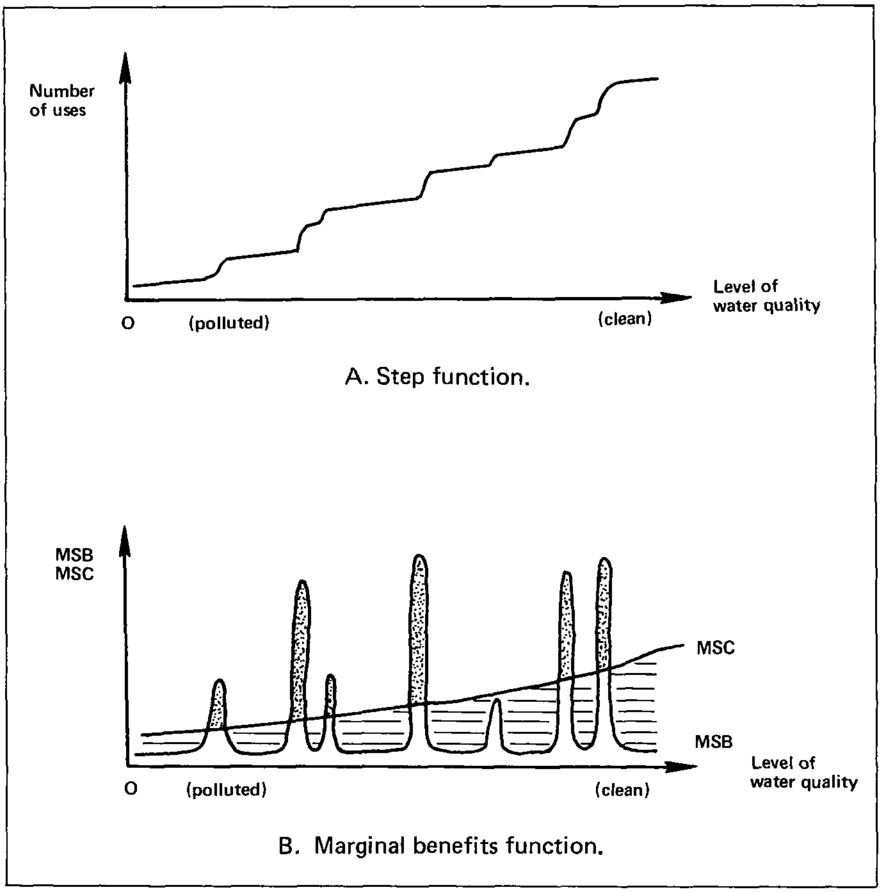

Figure 6. Relation between water quality and number of potential water uses.

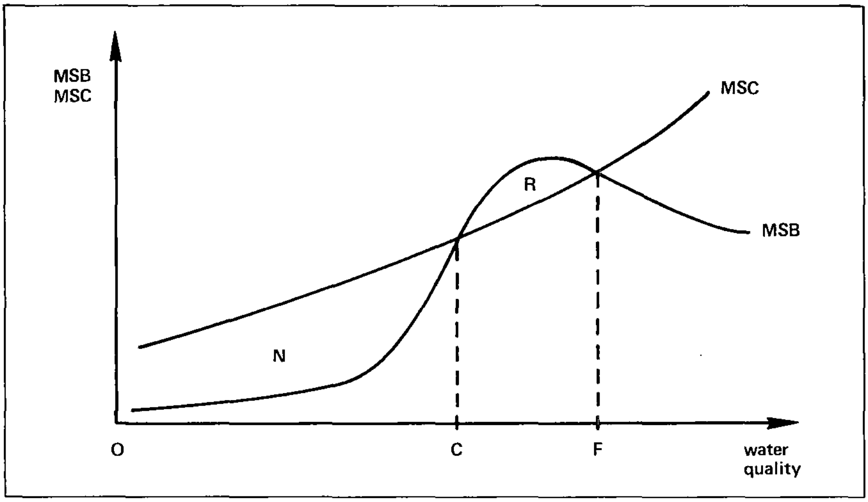

Figure 7. Additional welfare implications of alternative water quality levels.

situation in the preceding section, where pollution control is justifiable only if the initial control level yields water quality of at least C.

APPLICABILITY OF THE ALTERNATIVE APPROACH

Why hasn't this argument appeared in the literature? One basic reason is that the analysis may rely upon a hidden assumption: any benefits of improved water quality accrue only to the immediate area. This condition is valid in three instances, shown in Figure 8. *First,* cities polluting the river and affected by the pollution are so close together that city X's contribution to the pollution cannot be distinguished from city Y's contribution, and as the river flows through uninhabited land, it cleanses itself before reaching the ocean (or the next usable area). Because the river is now clean, it has no adverse effect on ocean life, recreational uses, etc. In the same way, pollution cleanup is irrelevant for potential downstream users, because the river cleanses itself before reaching them even without pollution control. *Second,* while both cities are again close together, the river empties immediately into the ocean. However, the ocean must be viewed as a sink, capable of absorbing pollutants without adverse effects. *Third,* the relevant political jurisdiction for controlling pollution is geographically limited, so that potential downstream benefits are not considered in the decision.

While other cases combining these can be constructed, basic difficulties pertaining to restrictions placed on the downstream part of the river or on the ocean will always be present. The river's lower reaches must be essentially uninhabited and inherently unsuitable for fish and recreation in the absence of

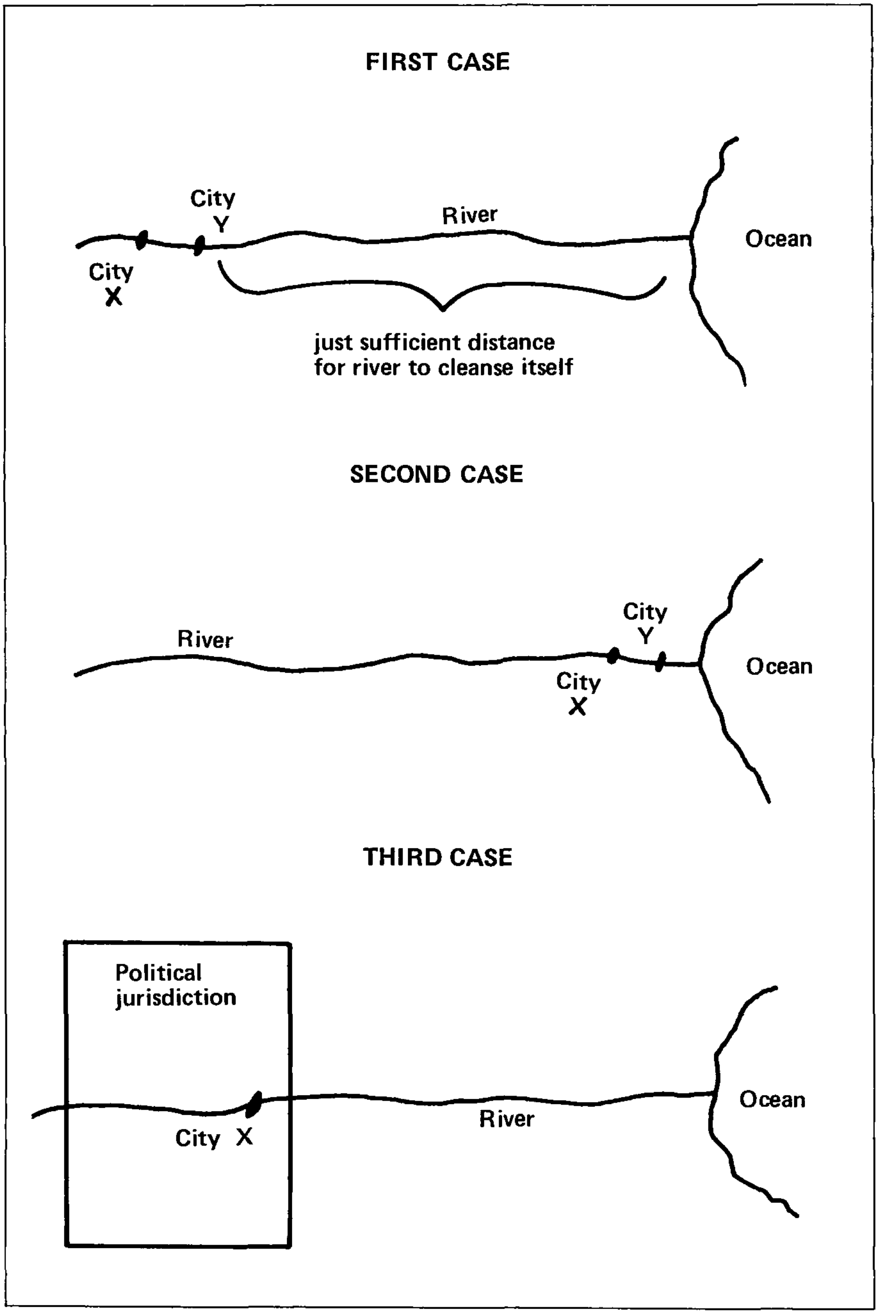

Figure 8. Areas affected by pollution.

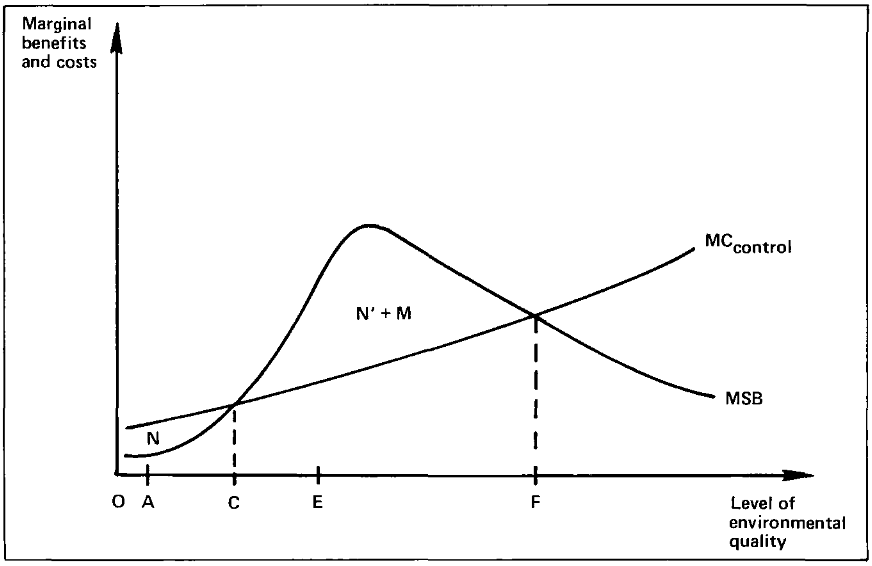

Figure 9. Moderate pollution benefits curve.

the pollution. (This condition calls into question part of the presumed benefits flowing from substantial cleanup.) Otherwise, even the first 20 per cent cleanup (for the first case) leads to part of the river cleansing itself *before* reaching the ocean, making it attractive for downstream fishing, recreation, industrial, and municipal uses, so that the MSB curve in Figure 3 would rise sooner. In the third case, a decision-making body is responsible for a geographic region extending only slightly downstream from the major polluters. Their analysis of benefits and costs for that jurisdiction might show that small amounts of pollution control are not cost-effective.

Each of these situations is a special case. For the first case, some pollutants simply cannot be "cleansed" or "neutralized" by either river or ocean water; if these are among the pollutants in our hypothetical river, there will be some damage to the ultimate sink. Similarly, the argument for the ocean serving as a perfect sink for the pollution can be disputed. Substantial evidence indicates that the ocean's carrying capacity for many pollutants has been exceeded in numerous areas, damaging fishing and recreation. In the third case, a more global approach that considers the entire river might show net benefits from even small amounts of cleanup.

These considerations tend to argue against the extreme shape for the MSB curve in Figure 3, and weaken the hypothesis, shown in Figures 4 and 5, that a rather substantial level of cleanup is required before there are net gains to society. Figure 9 shows a more realistic situation that recognizes that there *are* threshold quality levels which must be achieved for water to be useful for certain purposes *and* that the pollution must be either cleaned naturally or damage a "sink."

In this situation, very small improvements in environmental quality beyond level A would not be cost-beneficial. However, only modest improvements would move the quality level beyond C, where the incentive is to increase water quality. Beyond E, net social benefits would increase until level F is achieved.

The actual shapes and positions of the MPCC control and MSB curves are empirical questions. Evidence does support a rising MPCC curve. However, less is known about the relative shape and position of the MSB curve for small amounts of pollution control because of difficulties in measuring benefits. As more evidence becomes available, this issue can be resolved.[4] At this time, however, we believe that there is some evidence to support the hypothesis that under some circumstances partial pollution control can be economically less efficient than no control.

[4] Executive Order No. 12291 (issued February 17, 1981) requires that regulatory objectives maximize net benefits to society (which would correspond to point F in Figures 4, 5, and 9) and that potential benefits to society outweigh society's costs from a proposed regulation. This requirement makes it likely that more benefit information will be generated in the future.

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