



# NATURAL RESOURCES JOURNAL

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Volume 12

Issue 2 *The Human Environment: Toward an International Solution*

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Spring 1972

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### Recommended Citation

Harold P. Green, *The Resolution of Uncertainty*, 12 Nat. Resources J. 182 (1972).

Available at: <https://digitalrepository.unm.edu/nrj/vol12/iss2/6>

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# THE RESOLUTION OF UNCERTAINTY

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Environmental abuse is a consequence of human activity, particularly the use of technology. Every human activity—even basic biological functions—takes place within man's environment and involves the use of the environment. It is meaningless, therefore, to speak of preservation of the environment, since all human activity to some degree changes the environment in proportion to the scope of the activity. The more dynamic our society, the greater will be the impact of human activities on the environment. Environmental change can be minimized only in a static society. The real question, therefore, is what environmental change will be accepted as a consequence of man's aspirations for a better life.

All human activities also take place within the framework of our political, social, economic, and legal systems. These systems are inter-related; a basic thread running through all of them is that people are free to act as they please, subject only to restrictions imposed by law. In the economic sphere, our system contemplates that government and law will be neutral in the first instance; that in the absence of some regulatory law, people will make decisions on producing, using, and selling products and services in terms of their own self interest as determined through their own personal value judgments. Products and services come into existence because a market exists for them at the prices at which they are offered. In a real sense the market is made as people vote with their dollars for the products and services they want. As is well understood, economic activities sometimes result in environmental abuse because the costs of such abuse are not internalized so as to be reflected in the prices for products and services, the production or use of which causes the environmental injury. When abuse of the environment is found to be unacceptable, the remedy lies in the making of laws which regulate the activities causing the abuse or which impose liability for the abuse, thereby forcing an internalization of environmental costs.

The present automobile internal combustion engine is a good example of this. Development of the automobile was a tremendous boon to our society and was enthusiastically accepted in the market place. No attention was paid to the fact that its exhaust fumes might be injurious to the environment. It was assumed that the environment had a virtually infinite capacity to absorb these fumes. Only in recent years have we recognized that this is an intolerable pollution

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of the environment and adopted laws requiring automobile manufacturers to incorporate in their products devices to minimize this source of pollution and to consider alternatives to the present internal combustion engine. These corrective measures will, however, undoubtedly increase the costs of automobiles and in turn decrease the attractiveness (*i.e.*, the benefits) of the vehicle to consumers with possible major consequences to the economy of the country.

The recognition that automotive exhaust fumes have an intolerable effect on the environment and must be minimized has come at a very late date. Incalculable harm to the environment and to life has already resulted and will continue at least until the present generation of motor vehicles passes out of existence. There are, moreover, immense practical difficulties in eliminating such a well-established source of pollution because of the dislocations which corrective measures involve affecting not only the automobile manufacturers, but also their employees and the general public which will be adversely affected by increased costs. The case of the automobile is by no means unique. The same situation applies with respect to other sources of today's pollution such as sulfur dioxide from industrial plants and the use of pesticides and herbicides.

This suggests the necessity not only for eliminating known, existing sources of pollution, but also the necessity, if we are serious about having environmental quality, for prevention of future pollution before technological sources of such pollution become well established, with strong vested interests in the production and use of products and services associated with the pollution, and before substantial environmental abuse has become a *fait accompli*. It is important also that pollution attributable to future technology be arrested before it develops because of the simple fact that successively new sources of pollution are likely to be much more destructive, much more quickly, than their predecessors.

The problem of stopping pollution before it begins is a difficult one, especially when the pollution consists of materials discharged into the environment in small quantities. Frequently, adverse effects on the environment cannot be predicted or verified on the basis of laboratory research and experimentation because the effects are creeping and cumulative over a long period of time. In such cases, the pollution does not become observable until the polluting activity has been conducted on a sufficiently broad scale over a long enough time span to permit ascertainment of injury through use of statistical techniques. It is doubtful, for example, that the injury caused by automobile exhaust fumes could have been ascertained until automobiles were used in such quantities and concentrations, and under

such circumstances, as to produce the smog effect. Similarly, it is doubtful that the environmental impact of DDT could have been recognized until DDT had been in actual use for a considerable period of time. This is particularly true where the adverse consequences may result from a synergistic combination of the material with some other material in the environment.

The determination that environmental consequences constitute unacceptable pollution and that they must be eliminated is not a scientific determination. True, scientific data is an important element, but these determinations in a democracy are essentially political judgments reflecting public sentiment that additional costs should be imposed and benefits foregone in order to have a higher degree of environmental quality. The making of such political judgments in a timely manner so as to prevent pollution from developing and becoming entrenched involves substantial difficulties. Even in the early stages of development of a technology, its benefits are obvious and relatively immediate. The benefits will always be effectively and vigorously articulated by the cohesive and well-financed sponsors of the technology. Moreover, the public is always eager to enjoy the benefits of new technology. On the other hand, the potential adverse environmental consequences are usually, if perceived at all, relatively remote and speculative; and there rarely are individuals who have sufficient interest or resources to articulate the risks to the environment in an effective, or even minimally adequate, manner. It is to be expected, therefore, that in any assessment of the benefits and environmental costs of a new technology the conclusion will be that the relatively immediate benefits outweigh the speculative potential costs, thereby flashing a green light for development and use of the technology. In effect, such conclusions reflect the optimistic presumption that experience will ultimately resolve the uncertainty through demonstration that the effects are not injurious, or are at least tolerable. The companion assumption is that if the effects prove to be intolerably injurious, it will be time enough to impose social controls when the fact of injury has been authoritatively established. It is doubtful, therefore, that even a law requiring precicensing, based on research and testing of all new technologies, would be effective in forestalling pollution.

The basic need is to develop political institutions which will tend to give potential adverse environmental effects time, dignity, and attention more equal to that given to benefits. In other words, the existence of unresolved uncertainty should in itself be regarded as a substantial environmental cost of the technology. This approach can, however, be carried to an untenable extreme. If laws were enacted in

effect banning introduction of new technologies in the face of unresolved uncertainty, the consequence would be that no new technologies could be introduced and the uncertainties would never be resolved. This would place an intolerable brake on progress. On the other hand, if the fact and the implications of uncertainty were adequately articulated in the political arena, the public, and legislators responsible to the public, would have the opportunity to make judgments in each case as to whether development and introduction of the technology should be restricted. These judgments would, of course, be based, in terms of the public's values, hopes, concerns, and fears, on what technological benefits the public wants and what environmental risks, including risks incident to uncertainty, the public is willing to accept in order to have these benefits.

At the present time, availability of information as to the environmental consequences of technology is limited by the internal processes of the scientific community. The existence of uncertainty is rarely explicitly articulated in public forums. For example, until Rachel Carson's *Silent Spring*, DDT had been in widespread use without any public recognition that there was uncertainty as to its environmental effects. The fact of uncertainty emerges into public view only when scientific research produces an inkling of adverse consequences which finds its way into the press. Thereafter, as scientists pursue this initial lead through their cautious and objective processes of research and publication, the uncertainty is slowly resolved, but not without friction and dispute as the vested interests in the technology seek to rebut the scientific critics. The identification of pollution as a predicate for political decision as to what should be done about it is, therefore, tied to the principles of scientific objectivity, and remedial action is usually not forthcoming until a scientific consensus has emerged.

The effect of this is that environmental issues do not become ripe for political debate until the scientists have resolved uncertainty to the point that environmental risks have been identified. There are, of course, exceptions to this, as in the case of political debate on the supersonic transport plane in which the existence of uncertainty as to environmental effects, despite the establishment scientists' optimism that the uncertainty would be favorably resolved, led to defeat of the proposal in the Congress. This was, however, an atypical situation involving complex political questions over and above environmental concerns. In the usual case, there is no effective mechanism through which unresolved uncertainty can be recognized in itself as a risk requiring early limitations on technological development so as to forestall potential pollution.

It seems to be contrary to principles of democratic political philosophy to permit the scientific community in effect to control the nature and level of political debate on public policy issues related to technology. Scientists can tell us a great deal about the potential beneficial effects of a technology and also about its risks. They have no special competence, however, to determine whether the public will regard particular effects as a benefit, *i.e.*, something the public regards as worth the price which must be paid. Nor do they have any special competence to determine what risks—including risks incident to uncertainty—the public is willing to assume.

This suggests the necessity for building into the political process some device for identifying and pressing upon the public, in a form comprehensible to the public, the fact that uncertainty exists as to the potential environmental effects of technology. As a corollary, this device should also press upon the public early intimations that there may in fact be adverse consequences, even before these intimations have been confirmed. True, an effect of this procedure might be to create “undue” alarm and “premature” controls, and create a situation in which public debate and public policy are out of phase with scientific reality. On the other hand, the negativism engendered by such a procedure would be more than counter-balanced by the barrage of authoritative rebuttals which will emerge from the scientific establishment and the technology’s vested interests. The public, with access to both sides of the story, can reach its own conclusions just as it does with all other issues of public policy. The fact that “erroneous” political decisions may be made is not a valid argument against this procedure. In a democratic society, we recognize the inevitability, and indeed the utility, of erroneous judgments. Scientific questions, no less than economic and social questions, should be resolved in the crucible of uninhibited political debate in the faith that a democratic people is entitled, rationally or irrationally, to the public policies it wants, and that in the long run truth will prevail.