# The Precautionary Action Approach to Environmental Protection

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**ABSTRACT**

The traditional approach to environmental protection is based upon an assimilative capacity approach. There are, however, marked deficiencies in the underlying concept. These have led to an environmental protection philosophy, based upon precautionary action, becoming highly influential in the formulation of policy and legislation. This approach may conveniently be implemented through methods of clean production. Overall, this provides a clear alternative to current philosophies and strategies. It can both protect against (and ultimately reverse) deleterious effects upon the environment entailed by use of present methods.

Through the implementation of a precautionary approach by means of clean production methods, all products and processes giving rise to hazardous wastes and emissions can be realistically phased out and replaced by environmentally sound counterparts. An appropriate policy action plan is proposed to effect wide application of the approach. This includes: 1) clean production audits applied to industrial sectors identify all toxic uses, and applicable clean production substitutes; 2) concrete reduction targets through the phasing out of identified toxic uses. 3) the establishment of an international network of and regional centres to promote implementation of clean production methods.

KEYWORDS: assimilative capacity, precautionary action, clean production, policy

## 1. THE "ASSIMILATIVE CAPACITY" APPROACH

Historically, industrial activity has always led to the generation of wastes, subsequently discharged to the environment. The large scale proliferation of industry during the Industrial Revolution led to widespread degradation of the environment. Popular writing of the time referred to UK rivers as "dank and foul" (see[1]) while reference was made to letters written using the discoloured river waters as ink [2]. Over a period of time the perceived need of industrial enterprise to be conducted somewhat less at the expense of environmental quality led to the introduction of the concept of assimilative or environmental capacity. This concept assumes that the environment can receive and in part render harmless, the vast quantity, variety, and complexity of anthropogenic inputs.

This concept has underpinned, for example, the management of rivers in the UK such as the Thames [3]. Any improvements in environmental quality achieved as a result must be regarded, however, as essentially local or "near field" in scope. Manipulation of a primary determinant of environmental quality such as dissolved oxygen levels does not address the "far field" effects attributable to more persistent chemical pollutants. In general, current philosophy has resulted in the continued creation and routine use of hazardous processes and products. This has lead, in turn, to the evolution of a tremendous amount of hazardous waste materials.

Hazardous wastes have been mobilised into the various environmental media with scant understanding of the long term implications, but nonetheless on the basis that they can be readily and safely assimilated. The assimilative approach is often termed the "dilute and disperse" approach to pollution control and until only recently has figured large in the formulation of international policy [4] Inevitably, perhaps, development of environmental policy has always lagged behind industrial development. Even the generation of "priority pollutant" lists, the most recent favoured tool of environmental legislators, (see[5]) is based upon retrospective activity. Most lists contain only chemicals determined as harmful with the benefit of hindsight. This is a direct consequence of a policy formulated around "allowable" emissions, or discharges.

A traditionally based permissive approach does not constitute a sound scientific basis for the protection of the environment. There have been a number of conspicuous failures which far from being evident simply in the "near field" have a global dimension to them. The polychlorinated biphenyls (PCBs) for example have not yet reached global equilibrium but are still entering the environment in quantity. Continued release, it has been postulated, could result in the extinction of all marine mammals [6]. The profligate use and release of chlorofluorocarbons has led to a sizable hole in the ozone layer above the Antarctic [7]. The use of the atmosphere to dilute "greenhouse" gases is likely to result in extensive changes in global climate (see: [8]). Areas with severely polluted soil, air and ground or surface waters can be found in all areas of the globe including those which are supposedly pristine [9].

At more fundamental levels too, the existing body of scientific literature makes it clear that even the most sophisticated environmental impact assessment models must contain substantial inherent uncertainty. This is due to the overwhelming diversity and complexity of biological species, ecosystems, and chemical compounds entering the environment [10]. Associated with this is the clear reliance of evaluative systems on variably robust models and surrogate indices as opposed to empirical values (see eg [11]). Hence, in many cases, what were once considered perfectly safe levels of particular inputs into the environment have subsequently been determined to be unsafe, usually when they were beyond the scope of simple remediation. The legacy of global environmental degradation attests to this simple fact.

An extract from the second edition of R. B. Clark's book, Marine Pollution,[12] illustrates the evolution of expert opinion since 1986 and the growing uncertainties attached to current environmental protection strategies. The preface states:

"*It is now five years since the first edition of this book was* *written. Since then, there has been a great amount of investigation into the behaviour and impact of wastes discharged into the sea and a steady strengthening of controls over waste discharges. In spite of all this activity, there is now more uncertainty (or at least more dispute) among scientists and certainly more public concern about marine pollution."*

## 2. THE "PRECAUTIONARY ACTION" APPROACH

### 2.1 Current Widespread Acceptance

In view of the increasing environmental harm resulting from applied philosophies and policies, a number of international fora have adopted a precautionary, preventative approach to environmental protection. This improved strategy upholds as a basic tenet that environmental releases can only be sanctioned where it can be demonstrated, after thorough analysis, that there is no reason to suspect harmful effects. Variable interpretation placed upon this broad definition led initially to a certain amount of confusion (see **[12]**) concerning the scientific basis for the approach. As pointed out by Johnston & Simmonds **[13]**, however, precaution overall represents a more sound scientific approach in that lack of knowledge is incorporated into the equation rather than being used simply to justify continued discharges or emissions pending further research. Furthermore, it removes a large element of subjectivity (in the form of professional judgment) commonly present in assessments of environmental effect based upon assumptions of assimilative capacity.

Fora which have adopted the precautionary approach include the North Sea Ministerial Conferences, the UNEP Governing Council, The Paris and Oslo Commissions, the Barcelona Convention, the Nordic Council's International Parliamentarian Conference on Pollution of the Seas, the Nordic Council of Ministers, the EC Parliament, the EEC (The June 1990 Declaration by the Dublin European Council on the Environment - "The Environmental Imperative"), the Bergen Conference (ECE) Ministerial Declaration, and the Vienna Convention on the Protection of the Ozone Layer. In addition, many national governments are adopting this approach to environmental protection.

### 2.2 Definition and Implementation

The essence of a policy based upon precautionary action is simply an acknowledgement that, if further environmental degradation is to be minimised and reversed, precaution and prevention must be the over-riding principles of policy. Application must ensure significant reduction and elimination of contaminants, especially persistent toxic substances, even where there is inadequate or inconclusive evidence to prove a causal link between emissions and effects. History has shown us that waiting for such proof is often too late to prevent significant and irreversible damage. Moreover, using the environment as a large-scale laboratory in which to gather evidence of harm must be seen as morally unacceptable given the difficulties in repairing the effects of positive experimental results.

Simply, the burden of proof should not be laid upon protectors of the environment to demonstrate conclusive harm but rather on the prospective polluter to demonstrate no likelihood of harm. Adoption of the precautionary approach implies a shift from the approach of giving the contaminant the benefit of doubt to giving the benefit of doubt to the environment and human health. Given the number of fora which have adopted the precautionary approach, and the rate at which they have done so, the issue is no longer one of whether such an approach is warranted. It clearly is. The important issue becomes one of how to implement it. A fully comprehensive solution is required which addresses the generation of wastes. One such approach involves the use of clean technologies and methods based on the principles of clean production.

## 3: THE ROLE OF CLEAN PRODUCTION

### 3.1 Definition of clean production

Clean production methods involve, as a key feature, avoidance of waste generation. Such methods therefore constitute a highly convenient way of implementing alternative environmental strategies based upon precaution. Recently, this approach has been recognised and adopted by the Second Special Session of the UNEP Governing Council in its Decision UNEP/SS.II/4B, entitled "Comprehensive Approach to Hazardous Waste"in August 1990. Even more recently, in November 1990, the London Dumping Convention adopted a resolution to phase out industrial waste dumping at the global level by 1995, by focusing efforts on alternatives to ocean dumping, in particular, clean production methods.

"Clean production" can be defined as production through processes which avoid, or eliminate hazardous waste and hazardous products. Goods produced in clean production systems are environmentally benign at all stages of the production/use/disposal cycle. Hence, consideration should be made at the design stage of the broader environmental aspects of the raw materials to be used and the processes involved subsequently in generating the finished product. If principles of clean production are adhered to then the finished product should be constructed of non-toxic, reusable and repairable materials and be designed to be easily disassembled in order to replace broken parts. Final recycling or benign introduction to the environment should be possible at the end of useful product lifetime.

"End-of-pipe" pollution controls fitted to manufacturing and disposal systems such as filters, scrubbers and chemical or physical treatment do not constitute Clean Production. Neither do other measures which simply reduce the volume of manufacturing waste by incineration or concentration. Such methods simply mask the hazard by dilution or transfer of pollutants from one environmental medium to another and do not eliminate waste.

Clean production, moreover, is not a futuristic concept which can only be applied years from now. It is presently available and applicable. As early as 1986, the United States Office of Technology Assessment issued a report **[14]** which stated that the generation of hazardous wastes in the United States could be cut in half within five years using present (1986) clean production methods. Unfortunately, it seems that there is little political initiative at present to implement clean production nor to fund vital research and development.

### 3.2 Economic Aspects of clean production

An approach which addresses the waste problem at its source, through the application of clean production methods, makes sound economic sense. The tremendous costs associated with waste treatment and disposal are greatly reduced or obviated, as are the astronomical costs associated with remedial activities. In addition, the social health costs of a multitude other health problems, are greatly reduced. On these pragmatic levels, economic benefits accrue to the waste generator immediately. In the longer term the economic benefits will become even more apparent, particularly if the social costs of environmental degradation, which are traditionally excluded from economic analysis, are included as part of the real costs of a particular activity.

Nonetheless, it is likely that an overriding factor in the acceptability of clean production methods from the industrial point of view will initially hinge on simple profit/loss accounting. At this primary economic level the benefits have been amply demonstrated through auditing procedures applied at a suitable level of sensitivity. Three examples from a US survey [15] illustrate this. In one case loss surveillance at the 1% level failed to identify a 0.06% loss of raw material used in phenol manufacture. This represented 180 tonnes $y^{-1}$ of raw material with a value of $100,000. Disparate losses from plants involved in similar manufacturing efforts are illustrated by two plants both using phenols. In one case one lost 0.08% of 2500 tonnes over a year while the other was unable to account for 17% of 1600 tonnes. Finally, of two plants each using 900 kg $y^{-1}$ of formaldehyde, one lost all in the waste stream, the other only 0.5%. There is obviously great scope in this one area alone for wholesale reductions to be achieved.

A Swedish experiment at Landskrona [16] linked university researchers to managers in troublesome industrial sectors. Some interesting solutions to previously intractable problems were found. In one company, replacement of mineral oils by vegetable oils in metal working, halogenated solvent degreasers by mild detergents and solvent based paints by powder based materials resulted in annual savings in excess of $400,000. Another industry found that a loss of 3% of raw material in the effluent represented losses of some $340,000 per annum. It should be remembered that this audit process is simply an initial step and does not always include a full evaluation of inputs of raw material and energy.

Various case studies related to substitution of the environmentally undesirable chlorinated solvents have been reported [17]. In the case of one metal finishing company, substitution of a solvent paint system by a waterbased system , computerisation of the electroplating system and a computerised energy management system led to annual cost savings of $1.8 million over short payback periods. Other case studies reported clearly indicate the benefits to workers and to the general public.

## 4.DISCUSSION

These findings give substance to the view, endorsed by UNEP (1990), that an approach to environmental protection embracing precautionary action can ensure the environmental benignity of industrial processes. Implementation of a precautionary policy should be through clean production processes. The primary obstruction to such a strategy is, apparently, the lack of a will to do so on the part of industry and government.

This lack of determination is puzzling but it must be realised there is general tendency to ignore the social costs of current industrial practices. Indeed, at best, current evaluation usually externalises the social and broader environmental costs of policy application. These considerations are thus excluded from the wider economic equation. Clean production, however, makes sound economic sense. In order to achieve a broad based move towards these techniques a concrete plan of action needs to be adopted.

Firstly, it must be recognised that a widespread adoption of the precautionary action approach based upon pollution prevention, rather than pollution control is necessary. A precautionary action approach requires giving the benefit of doubt to the environment and human health rather than the contaminant in question. Further, it must be accepted that scientific proof often comes too late to prevent ecological damage;

Secondly, it must be recognised that clean production provides the most appropriate means of implementing the precautionary action approach in order to facilitate the elimination of hazardous wastes and substances introduced to the natural environment. The strategic requirements of such a policy are broadly as follows:

a) Industry must be made subject to clean production audits which encompass the qualitative and quantitative identification of toxic materials in routine use. The database resulting from audits applied on an industrial sector basis should be fully accessible to the public.

b) Identified toxic uses should be subject to concrete reduction targets. This would provide an impetus for implementation of clean production methodologies. Substances recognised as hazardous by inclusion on priority pollutant lists of international conventions, should be targeted for zero discharge within a controlled time frame.

c) National and regional centres, as part of a global network, should be set up to expedite and optimise the implementation of clean production methods.

d) A moratorium should be imposed upon the construction of new waste disposal facilities and the expansion of existing facilities in order to promote clean production systems. This follows from the fact that cheap disposal options act as a disincentive to clean, alternative, production methods.

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