THE PRECAUTIONARY PRINCIPLE

Dr J. Brandt and D.E. Martin, Concawe, Belgium, consider the role of the 'Precautionary Principle' in the balance between environmental needs and the demands of economics.

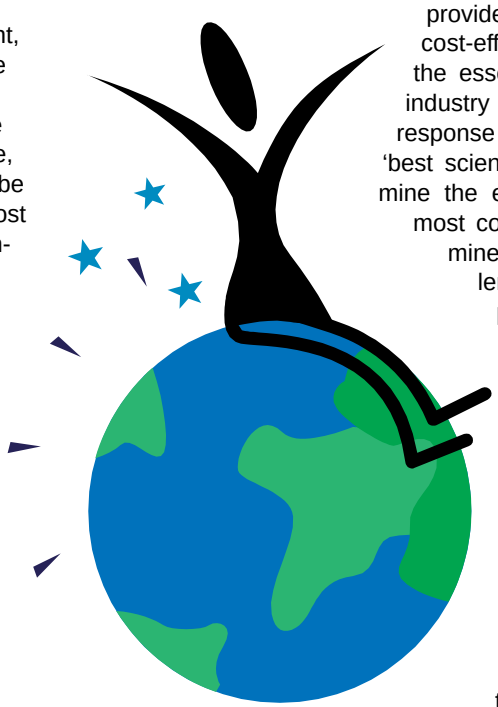
The 'Precautionary Principle' has become very much a part of the vocabulary of the general environmental scene today. It has found its way into various international declarations and conventions, is being reflected in national legislation and is also included in Article 174 of the Amsterdam Treaty of the EU. Often appealed to as the basis for 'we must act now', 'we must do more' or 'we must go further', it is viewed by many as a potentially powerful argument for the environmental agenda. In industry, this perception brings with it a real concern that its application threatens another key principle viz. that environmental legislation should be based on sound science and cost effectiveness.

The principle roots

The Precautionary Principle appears in many different forms. In some cases, reference is made to economic considerations but not in others. Perhaps the most quoted and widely accepted version is found as 'Principle 15' in the Rio Declaration on Environment and Development[1]:

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation."

This needs to be put in the context of the overall declaration. At its outset, it is clear that the declaration takes a holistic view of man and his environment. It includes a statement of the essential prerequisite of eradicating poverty as the route to a 'sustainable world'; it also includes a recognition of the potential for inappropriate and unwarranted economic and social costs if overly stringent ambitions are set, particularly in developing countries. In other words, there is recognition of the importance of economic factors in the process of designing appropriate environmental responses. There is also recognition of the need to consider priorities. This not only involves asking 'what first?' but forces the question 'At what point do we stop spending societal resources on this issue, with its diminishing societal benefit, and start spending on a now more pressing issue?' In other words it moves away from a single issue to a multi issue focus. For example 'according to their capabilities' recognises the need to respect the limits imposed by 'affordability'. 'Lack of full scientific certainty'does not imply a jettisoning of the need to bring the best understanding of science to an issue but rather recognises that serious issues cannot always wait for a full understanding. Finally, the inclusion of 'cost effective measures' reflects the concern to be precautionary with societal resources to assure a healthy economy.



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A problem with principle or practice?

The Rio version of the Precautionary Principle is clearly founded on the recognition that wise stewardship of economic resources must accompany its application in a given situation. Although it is concerned with ensuring that scientific uncertainty is not an absolute impediment to appropriate/timely action; it clearly implies a continued and important role for the best understanding science can provide. Finally, it affirms the need to seek cost-effective solutions. As such, this contains the essential main elements of what the oil industry has called the rational approach, i.e. response strategies should be based on using 'best science' to understand the problem/determine the environmental objective and that the most cost effective solution should be determined to deliver that objective. The problem then does not seem to be with this principle per se but with its application and its variants.

In light of the many problems facing society, how is the legislator to approach the task of ensuring that moneys are spent in a way that maximises overall benefit to society including both human health and the environment? This was a key concern to those who signed the Rio Declaration. The process of environmental legislation is so often a 'single issue' process; it is therefore vital that the relationship between societal expenditures and overall societal benefit is properly understood. Otherwise, the legislator cannot be in a position to wisely judge whether or not to act or at what point it would be better to stop spending on one issue and address another. Any action, even if performed to protect the environment, will itself have some effect on the envi-

ronment. If the Precautionary Principle is applied on the basis of preconceptions without as full as possible a scientific analysis, then greater problems may occur.

One response to the concern to ensure environmental expenditure results in an overall societal benefit has been a growing use of studies that attempt to place a monetary valuation on the 'benefits'. If the valuation of benefits equal or exceed the cost of delivering them, it must be justified. Apart from the enormous uncertainties in this process, it fails to address the key question of whether a much greater benefit would derive from spending this money on a different problem.

The second concern relates to the use of the Precautionary Principle on issues where the consequence of waiting for a fuller scientific understanding really cannot be said to represent 'a threat of serious or irreversible damage'.

The following sections outline a possible approach to address the multi-risk issue in a way that maximises overall benefits to society.

Risk analysis

It is an illusion to think that it is possible to reduce risks for the human population (and the environment) to zero. There exist a multitude of hazards that can be minimised but never eliminated. Risks endangering human health have existed throughout the history of mankind. Although industrialisation has resulted in additional risks (e.g. caused by pollution), it is obvious that the ever increasing life expectancy of human beings in industrialised countries clearly indicates a significant reduction of the overall risk as compared to previous times.

Risks in today's society can be categorised into two groups:

- Category one. Risks which can be reduced by financial funding (e.g. those arising from traffic accidents, accidents at work, non-optimal medical treatment due to lack of funds, pollution of air/water/soil, etc.).
- Category two. Risks which can hardly be influenced by spending money (e.g. those arising from passive/active smoking, accidents at home, an 'unhealthy' life, etc.).

A rational legislator should take a global view on all these individual risks to the population and strive for minimising the overall risk. Although in principle category 2 risk cannot be financially influenced, they need to be taken into account to quantify the overall effect of any measures considered to reduce category 1 risks. The ultimate goal of the rational approach is to spend society's tax money in a way that guarantees the highest benefit in terms of health and environmental protection or quality of life. What needs to be avoided is the current practice of concentrating legislative efforts on just one risk source arising from, for example, air pollution without due consideration of other risks.

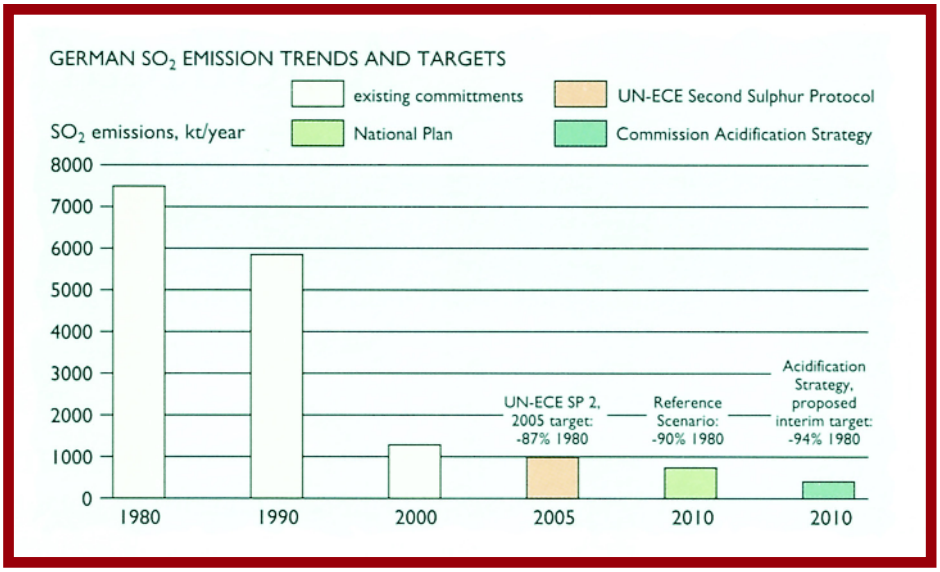

Figure 1. Existing international commitments will result in significant progress towards achieving the critical loads.

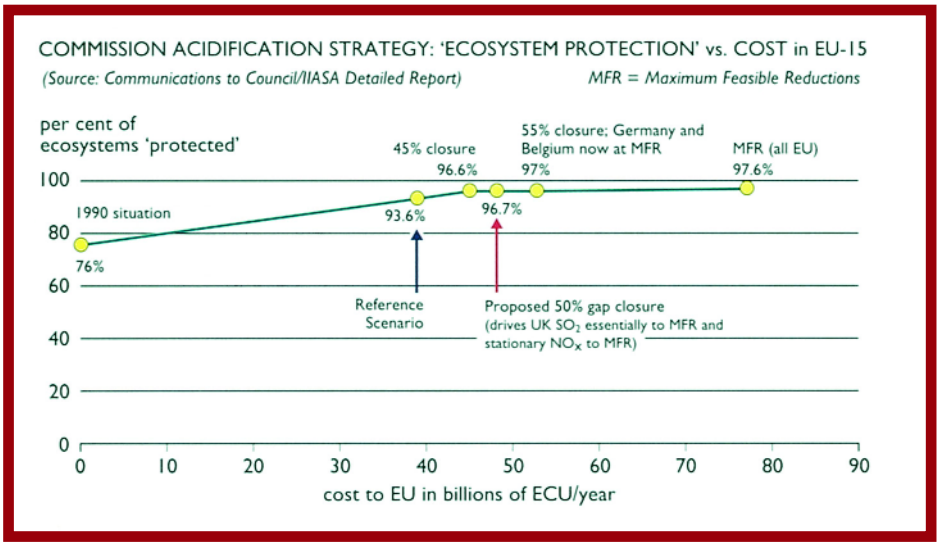

Figure 2. The application of maximum feasible reductions offers little further compliance than already mandated measures.

Addressing the overall risk appears to be a much more valid basis for decision makers than asking individuals for their willingness to spend money on solving a specific health/environmental problem in isolation. The approach of enquiring via public polls society's opinion on their 'willingness to pay', and to generate from this a value of a statistical life (VOSL) is highly artificial. Willingness to pay is not dealing with real money and, most importantly, the public is not given an alternative choice for spending this money.

Risk characterisation

All major risks which can be mitigated by assigning additional funding need to be assessed within a multi-disciplinary exercise, i.e. including all the governmental departments responsible for the individual risk related problem areas as well as competent outside experts. The objective of this assessment would be to define the risk

reduction of society's various problem areas in terms of, for example, numbers of years life saved, if increased amounts of money are allocated to individual problem areas. For each problem area, cost/benefit curves with associated upper and lower confidence limits have to be established on a reasonably comparable basis. These curves then represent the basis for the subsequent risk management process.

Risk management

The risk management process has to deal with two aspects. Firstly, in order to reduce the overall risk to society from adverse effects resulting from the various hazards, how should the available limited financial resources be distributed to achieve the highest possible overall benefit for the population? Ideally, the distribution of funds should be arranged in such a way that for each of the cost/benefit curves of the problem areas, the marginal costs for the most expensive measure per problem area are identical. Figure 3 illustrates the principles of optimising the funding for remedial measures in two problem areas.

If expressing the benefit in terms of, say, years of life saved in the population, then the above graphs show that money spent on remedial measures in Problem Area 1 would yield higher benefits than in Problem Area 2. In quantitative terms and taking a given 'critical slope' of the cost/benefit relations as a basis, available funds should be split between Problem Areas 1 and 2 at a ratio of 8:5. The principles of this calculation apply irrespective of whether the "critical slope" occurs at different cost levels or whether more than two problem areas are taken into account. The cost-benefit curves are established by ranking the remedial measures in a decreasing order of cost effectiveness and then relating the accumulating costs to the accumulating benefits. Depending on the overall size of the fund dedicated by a government to address society's major problems (which would basically fix the critical slope in the various cost/benefit curves), distribution of the financial resources among the problem areas would lead to a maximum overall benefit at minimum costs. The major advantage of this approach is that it is not necessary to value the years of life saved in the population.

Secondly, once the above described risk management process has been concluded and the necessary measures are implemented, it should be investigated whether there are additional possibilities to further reduce risks to society. In particular in the area of air quality, there are additional risk management measures that could be taken to further reduce the residual adverse impact of air pollutants on health and environment.

In view of the extremely high costs to meet air quality standards at all times (even during highly unusual weather conditions) and all places (even under heavily congested traffic conditions in cities), occasionally exceeding air quality standards appear unavoidable. Hence, residual risks would persist which could be reduced by what might be called 'ad hoc' measures geared towards the special conditions of pollution episodes or 'hot spots'. In this case, national/local authorities should design action plans that could reduce sporadic or localised air quality problems in a pragmatic way. Shutting down power plants or the temporary use of cleaner fuels in power plants, traffic bans, informing people to stay at home or refraining from excessive physical exercise are just some examples of cost effective countermeasures to cope with temporary problems. By the same token, pollution at 'hot spots' in street canyons should not be tackled by overly severe national or even European legislation but rather by improved local traffic management measures.

An example of the law of diminishing benefits can be found in the European Acidification Strategy, which is designed to make further progress toward the ultimate ambition of achieving 'no-exceedance' of critical loads in the European Union. There have already been significant international commitments in response to this problem, particularly in Northern European countries like Germany. As a consequence, sulfur deposition levels are anticipated to fall by factors of five or more in the critical areas of Europe compared to peak levels in 1980 (Figure 1). Together with substantial NOx reduction measures in transport and emission reductions from other sources, this will result in significant progress toward achieving the critical loads. However, it is anticipated that there will still be exceedances in limited areas.

Besides being subject to significant scientific uncertainty, by its very nature the critical load concept is a static concept. It does not include any aspect of the dynamics of damage or recovery. It is essentially interpreted as an 'OK' or 'not OK' concept. No attempt is made to quantify the difference in the potential for damage whether at 10%

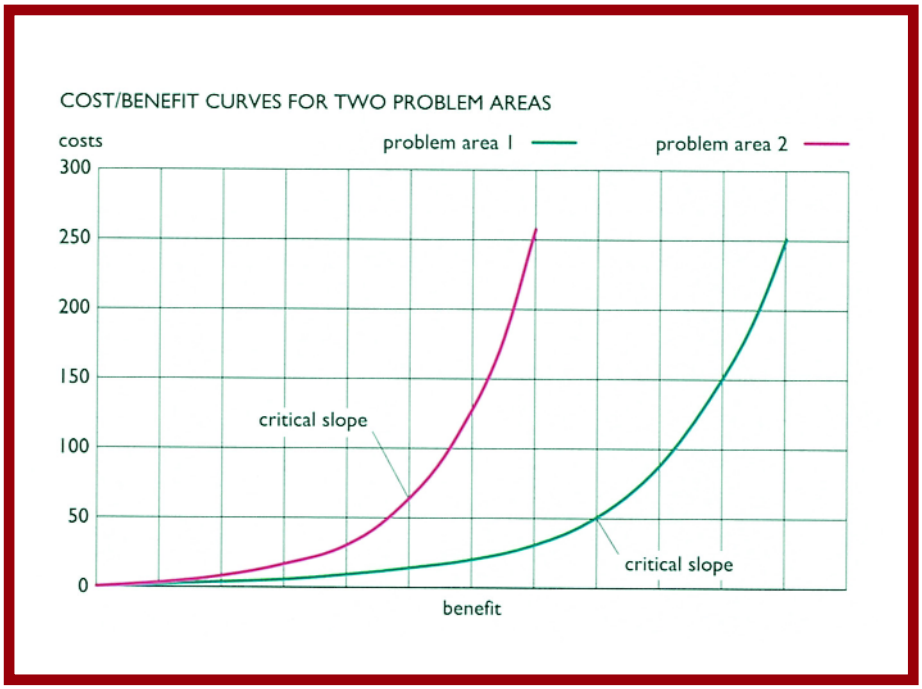

Figure 3. The cost/benefit curves in the graph illustrate the principles of optimising the funding for remedial measures in two problem areas.

above the critical load or at ten times the critical load! This must be seen against the backdrop of a growing body of evidence to suggest that the environment is already responding positively to measures taken to reduce acidification. This can only accelerate, as already mandated measures result in further substantial reductions through the next decade.

However, even the application of maximum feasible reductions offers little further compliance with critical loads in 2010, beyond that offered by already mandated measures (Figure 2). On the other hand, the economic consequences of such reductions are extreme. As well as placing a significant and widely varying burden on national economies, this would have profound implications for the viability of certain industries e.g., coal. In light of this, it would seem that a more prudent response would be to monitor how the environment responds to already agreed substantial measures before defining/implementing further measures. Ironically this seems to be much more in harmony with the Rio Declaration!

Conclusion

The Precautionary Principle per se is not the problem (at least the form of words in the Rio Declaration) but rather its application. It implies a continued role for 'best science'. It sees a central role for the consideration of economic and social factors including issues such as affordability and cost effective solutions. It recognises the multiplicity of risks facing society. If these factors were properly accounted for in applying the principle with full transparency, it is more likely to enjoy overall industry acceptance.

Society is becoming increasingly aware of their exposure to risks arising from a multitude of problem areas. For several years, the attention of legislators and the media has focussed on the pollution of air, water and soil and its impact on health and environment as the main problem society is confronted with. Authorities at the European and national level who are responsible for health/environmental legislation have been very successful during the last two decades in implementing measures which have led to a significant improvement of the situation. However, it is felt that during recent years, most of the cost effective measures for cutting pollution have been implemented and further improvements are becoming increasingly costly while the incremental benefits resulting from additional measures are getting proportionally smaller.

Under these circumstances, it seems to be advisable to consider the cost/benefit aspects of future additional measures in the field of health/environmental protection no longer in isolation, but in the context of other major risks to society. The relevant risks to society, including those resulting from air/water/soil quality deficiencies, can be evaluated in a global context by involving individual competent authorities and industry experts in an interdisciplinary fashion. Then it will it be possible to assign the available limited funds in the most beneficial way to minimise the overall risk to society.

The difficulties and complexities of the proposed approach together with the lack of reliable data on individual risks and related costs are significantly more challenging to authorities than the traditional approach of prescribing Best Available Techniques. However, when the goal is minimising the overall risk to society in a cost effective way, then the suggested methodology appears to have no alternative.

References

1 Rio declaration on Environment and Development Annex B.