

Acc. No. 12884

99



WORLD BANK

ESMAP

Urban Air Pollution

South Asia Urban Air Quality Management Briefing Note No. 4

What Do We Know About Air Pollution?—India Case Study

Governments in South Asia are urged to address urban air pollution as a matter of high priority in its most affected cities. In order to devise effective intervention measures, however, we need to understand which sources are responsible for the high exposure of the general public to air pollution. Tata Energy Research Institute (Teri) in Delhi recently reviewed the information available since 1990 in India to answer this question [1]. Their report shows that gaps in data and analysis are sufficiently large to make answering this important question difficult. This briefing note summarizes key findings in that report.

Particulate matter is the most serious pollutant in large cities in South Asia. There are many sources of particulate pollution: large industrial plants, medium- and small-scale industries, refuse burning, households burning biomass for cooking and heating, vehicular exhaust, re-suspended road dust, construction, particles migrating from other regions, and naturally occurring dust. These sources emit particles of varying sizes—small particles affect public health much more than large particles. It is important to have a good understanding of the level of exposure of the general public to particulate air pollution, and of the relative contributions of these different sources (referred to as source apportionment).

Available Data on Ambient Concentrations

Ambient air quality has been monitored in India since 1967. There were 204 monitoring stations in operation in 2001. Sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and total suspended particles (TSP) have been historically monitored on a regular basis. Respiratory suspended particulate matter (RSPM), with the particle diameter cut-off somewhere near 10 microns (μm), has been added recently at a number of monitoring stations, totaling 77 by the end of 2000. TSP is much less relevant to the health impact of air pollution than RSPM and smaller particles. For this reason the trend worldwide is to focus increasingly on measuring the concentration of smaller particles which can penetrate deeper into human respiratory systems. For example, the US Environmental Protection Agency (EPA) discontinued monitoring of TSP in 1987 in favor of PM₁₀ (particles smaller than 10 μm), and achieved its first year of nation-wide monitoring of PM_{2.5} (smaller than 2.5 μm) in 1999.

The available data in India show that pollutant concentrations are typically within the national ambient air quality standards [2] with the exception of particles. A recent case study [3] monitored RSPM twice a week at 10 stations in Delhi over a 13-month period between July 2000 and July 2001. The mean RSPM concentrations averaged 204 μg/m³, considerably above the US annual PM₁₀ standard of 50 μg/m³. The correlations between NO₂ and RSPM concentrations were extremely weak, suggesting that sources other than road traffic were contributing significantly to ambient RSPM.

There is essentially no information on background particulate concentrations. This information would be important for devising effective mitigation measures and setting realistic targets, because it matters a great deal whether high ambient concentrations are a result of human activities in the city, or as a result of naturally occurring particles, or even particles migrating from other regions. If background concentrations are high, imposing strict controls on human activities in an attempt to reduce air pollution may yield much smaller benefits than anticipated.

Discussions with practitioners in air quality monitoring suggest that quality assurance and quality control needs strengthening. The areas that call for attention include not only the accuracy and reproducibility of the measurements but also data analysis; timely publication of, and access to, raw data; re-examination of site-selection in light of changes in land use patterns; the actual (as opposed to stipulated) monitoring frequency; and the positioning of the instruments at a given site.

With respect to how data are used, there is often a tendency to collect data at "hot spots," and to base city-wide policies on the data collected at sites that rank among

the most polluted. However, such an approach is not optimal for addressing air pollution at the least cost to society.

Identifying Sources

Broadly speaking, there are two approaches to quantifying the contributions of pollution sources to human exposure.

1. The first approach, dispersion modeling, starts with emissions from different sources (emissions inventory) and calculates ambient concentrations in the vicinity of the “receptor” (where ambient concentrations are measured). The final results should match the measured ambient concentrations, but are often significantly below them. Ambient concentrations are used to calibrate the models for running future scenarios.
2. The second approach, receptor modeling, analyzes particles in the atmosphere at a given location and matches their characteristics with those of chemically distinct source types (finger-printing).

These two approaches should give the same results, but examples of conducting and comparing studies using the two approaches are rare even in developed country cities where much more detailed data are available (see Box-1). The two approaches—constructing an emissions inventory followed by dispersion modeling in the first, and chemical mass balance receptor modeling in the second—and their applications to cities in India are discussed below.

Approach 1

Emissions inventory

Emissions inventories have been developed in large cities such as Delhi and Mumbai. However, they are limited by the lack of availability of needed data and are hence sketchy for the following reasons.

- Emission factors suited to Indian cities are often not available. In their absence, the factors from North

America or Europe are used after some adjustments, but they could seriously under-estimate emission levels in South Asia. One consequence is that emission factors used vary markedly from study to study, sometimes differing several-fold.

- Industrial emissions depend on a number of factors, including how the plants are run and maintained. When the emission factors are based on the data provided by manufacturers (of boilers, for example) who tend to assume very good equipment maintenance, the factors may be seriously under-estimated.
- The numbers multiplying the emission factors, such as the amount of fuel used, can be estimated only roughly in many cases. When the amounts of transport fuels sold in a city are compared to those calculated from the vehicle fleet data, for example, they have been known to differ markedly.
- For certain source categories—re-suspended road dust, refuse and leaf burning, generators, to mention a few—data are typically not available. As a result, they may be under-estimated or omitted altogether, and correspondingly those from other sources are over-estimated in relative percentage terms.

Two important points are worth flagging. The first is that an emissions inventory, however accurate, should not be the basis of policy formulation. What ultimately should drive policy is not which source is emitting more, but which source is likely to lead to greater exposure to health-damaging pollutants. A coal-fired power plant at the edge of a city with a tall stack may in absolute tonnage be the largest emitter of particles, but may be contributing less—from the point of view of overall human exposure—than, for example, all the households burning biomass.

A common mistake is not only to rank different sources based on an emissions inventory, but to add up all the pollutants (regardless of their toxicity to human health) in

Box 1. Confounding conventional wisdom: Lessons from the United States

One of the most extensive comparisons of the two approaches to source apportionment is a study in Colorado, USA [4] which examined source contributions to $PM_{2.5}$. The available emissions inventory indicated that diesel accounted for two-thirds of on-road vehicle $PM_{2.5}$ emissions and gasoline the remaining one-third. However, the use of the chemical mass balance model suggested that diesel actually accounted for only a third and gasoline two-thirds, and that $PM_{2.5}$ emissions from gasoline vehicles were seriously under-estimated, both with respect to diesel and on an absolute basis. The discrepancy was due mainly to the presence of gasoline “smokers” and high emissions during cold start.

A recent study conducted in southern California [5] found that some gasoline-fueled passenger cars emit as much as 1.5 grams per kilometer, an emission level normally associated with heavy-duty diesel vehicles. Comprising only 1 to 2 percent of the light-duty vehicle fleet, these gross polluters were estimated to contribute as much as one-third to the total light-duty particulate emissions. It is possible that the proportion of “smoking” gasoline vehicles is much larger in South Asia.

weight before doing so. This almost always leads to the conclusion that road traffic is by far the largest contributor to urban air pollution, because in absolute tonnage, carbon monoxide (CO) dominates all other pollutants, and the majority of CO is from vehicles. But the toxicity of CO is much lower on a weight basis than those of other pollutants, so that these results cannot be correlated with health effects.

The second point is that the science of the health impact of particulate air pollution increasingly points to the importance of ultra-fine particles, and significant contributions of combustion processes to the size fractions now considered most damaging to public health. A study in the United Kingdom reported that road traffic nationally contributed 25% of primary PM₁₀ emissions, but the relative importance of road traffic emissions increased with decreasing particle size and road transport accounted for an estimated 60% of PM_{0.1} [6]. The question of which sources are contributing most to public health damage depends critically on the particle size range for which source apportionment studies are carried out.

Dispersion modeling

A limited number of studies have carried out dispersion modeling in India. Most have not looked at the chemical transformation of pollutants (such as secondary particulate formation from sulfates and nitrates). The majority have examined pollutant concentrations—typically CO, NO₂ or lead when leaded gasoline was still used in India—along traffic corridors. The objective of these studies, which met with varying success, was not to quantify source contributions, but to compare model outputs with the actual concentration measurements at selected locations in order to validate the models. As such, dispersion modeling in India is in its early stages of policy relevance.

Approach 2

The first step in any chemical mass balance receptor modeling is detailed chemical analysis of receptor and source samples. The level of detail required is considerable, presenting difficulties. For source attribution, source profiles are needed. It would be straightforward if one compound or element served as a tracer for a single source type, and that tracer was not present in any other source type, but this is rarely the case. It may even be that sources cannot be “fingerprinted”: similar sources may not have similar profiles, or different source categories may have similar profiles.

The majority of the studies conducted in India to date have focused on trace metal and water-soluble element analysis. Because of the widespread availability of leaded gasoline in India until 2000, a number of studies examined lead in particles along traffic corridors.

Carbon analysis, in contrast, has not been conducted until recently, the first study being carried out only in 2000–2001. Carbon analysis is useful for estimating combustion-generated particles. Comparison of black (also called elemental) carbon and organic carbon may help to distinguish between the combustion of biomass and fossil fuels. Trace organic analysis (identifying key hydrocarbons) is an important tool in receptor modeling, but this has not been carried out in India for small particles.

Carbon analysis of 15 RSPM samples collected in Delhi between August 2000 and February 2001 [1] showed that total carbon constituted 36% of RSPM. Total carbon averaged 122 µg/m³, and black carbon 72 µg/m³. These figures are high by any measure, and the high proportion of black carbon points to significant contributions from the combustion of fossil fuels.

Summary of source apportionment of particles in India

No more than a dozen source apportionment studies appear to have been conducted in India, and most of them identify major sources without quantification. The two main approaches to source apportionment mentioned above have been utilized. The majority have concentrated on TSP. The selection of TSP, which includes a large fraction of coarse particles, tends to highlight the importance of wind-blown dust and other natural sources of particles at the expense of anthropogenic sources, although the latter are much more damaging to public health.

There has been only one study attempting to investigate source contributions to PM₁₀ [7]. About 20 elements were measured in Mumbai over a year and factor analysis was carried out identifying four pollution sources: re-suspended dust, refuse and vegetation burning, sea-salt and road traffic. As expected, soil-derived dust was found to be a major source of larger size particles whereas refuse burning and road traffic were identified as major sources of smaller size particles.

Similarly, only one study appears to have built upon an emissions inventory and dispersion modeling to quantify source contributions. The Urban Air Quality Management Strategy in Asia, URBAIR, used a multisource Gaussian model to estimate TSP concentration distributions in Mumbai [8]. Based on the estimates of PM₁₀/TSP ratios for different sources, the study suggested that 30% each of PM₁₀ was from background and vehicle exhaust, respectively, 20% from road dust re-suspension, 15% from area sources (domestic fuel combustion, small industries, stone crushing and refuse burning), and 3% from large and medium-size industrial plants. These estimates contain large uncertainties and should be interpreted with caution.

There has been one study [9] using chemical mass balance to examine source contributions to TSP in Mumbai. The US EPA chemical mass balance receptor model was used. Model results were unsatisfactory at highly polluted sites, suggesting that US EPA profiles were not suitable for India.

Another study [10] used particle size distribution data rather than chemical analysis to attribute sources. Particle size is sometimes indicative of emission sources, with coarse particles typically from mechanical processes and finer particles from combustion and secondary particulate formation. The study divided particles ranging in size from 0.05 to 25 μm into four size groups, with the smallest size fraction corresponding to secondary particles and products of combustion, and the largest to dust and marine aerosols.

Conclusions

Data that can be used for policy formulation in urban air quality management are scarce in India. How to make best use of the available information, and how to bridge the gaps in data and analysis are the two challenges facing researchers and policymakers.

- Based on epidemiological evidence, monitoring of TSP is increasingly abandoned in favor of PM_{10} and $\text{PM}_{2.5}$ elsewhere in the world. These smaller particles should be monitored regularly in the future.
- Regular monitoring of PM_{10} and $\text{PM}_{2.5}$, while being an important first step, has a limited role to play in policy appraisal because it can merely signal that there is a problem. Monitoring needs to be supplemented by studies to identify sources and assess effects on public health. No single methodology will answer all or even most questions, and instead a wide range of approaches will be needed. Collaboration between government agencies and scientific institutes to this end should be given high priority.
- The most important gap in the work to date in India on particulate source apportionment is the near-complete lack of data on emissions from the area sources listed above under URBAIR. This gap has led to a potentially biased focus on emissions control in the transport sector, and can be systematically addressed in a relatively short time.

- Those findings from other countries that challenge the conventional wisdom (Box 1) should inform researchers and policymakers.

References

1. Tata Energy Research Institute. 2001. "Review of past and on-going work on urban air quality in India," report submitted to the World Bank, December. Available at <<http://www.worldbank.org/sarurbanair>>.
2. Available at <http://www.whoindia.org/AMBIENT_AIR_QUALITY_STANDARDS.htm>.
3. Data available at <http://www.teriin.org/camps/mon_air.htm>.
4. Available at <<http://www.nfraqs.colostate.edu/>>.
5. T.D. Durbin, M.R. Smith, J.M. Norbeck and T.J. Truex. 1999. "Population density, particulate emission characterization and impact on the particulate inventory of smoking vehicles in the South Coast Air Quality Management District," *Journal of Air and Waste Management Association*, 49:28-38.
6. Airborne Particles Expert Group. 1999. "Source Apportionment of Airborne Particulate Matter in the United Kingdom," January. Available at <<http://www.scotland.gov.uk/environment/airquality/publications/1999/apeg/apeg.asp>>.
7. V. Meenakshy, B.S. Negi and S. Sadasivan. 1996. "PM-10 aerosols at Chembur, Bombay: their elemental concentrations and sources," Proceedings of the 5th National Symposium on Environment, March, pp. 227-230.
8. Jitendra Shah and Nagpal Tanvi, ed. 1996. "Urban Air Quality Management Strategy in Asia URBAIR: Greater Mumbai Report," October, Washington D.C.
9. V.K. Sharma and R.S. Patil. 1994. "Chemical mass balance model for source apportionment of aerosols in Bombay," *Environmental Monitoring and Assessment* 29(1): 75-88.
10. V.K. Sharma and R.S. Patil. 1992. "Size distribution of atmospheric aerosols and their source identification using factor analysis in Bombay, India," *Atmospheric Environment* 26B(1): 135-140.

This briefing note was prepared in March 2002 as part of the South Asia program on urban air quality management, funded in part by the joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP).

The objective of the program is to support the region-wide process of developing and adopting cost-effective and viable policies and efficient enforcement mechanisms to reverse the deteriorating trend in urban air.

A full set of briefs and other materials are available at <<http://www.worldbank.org/sarurbanair>>.

For further information, contact

Sameer Akbar (sakbar@worldbank.org) or Masami Kojima (mkojima@worldbank.org) about the program.

Ireland

Cork Institute of Technology, Clean Technology Centre: Noel Duffy and Brendan Ryan, with assistance from Pat Griffin and Pierette O'Shea.

The Netherlands

Erasmus University: Leo Baas, with additional contributions from Frank Boons.

Denmark

Roskilde University: Associate Professor Børge Klemmensen and Dr Søren Kerndrup, of the Department of Environment, Technology and Social Studies, were the coordinators of the team at Roskilde University, which also involved: Birgitte Steen Hansen, Ole Erik Hansen, Birgitte Larsen, Ulf Nielsen, Inger Stauning and Jacob Hass Svendsen.

This book was written by Anthony Clayton, Graham Spinardi and Robin Williams. Dr Clayton is currently the Alcan Professor of Caribbean Sustainable Development at the University of the West Indies Centre for Environment and Development, Dr Spinardi is a Senior Research Fellow and Dr Williams is a Reader and Director of the Research Centre for Social Science at the University of Edinburgh.*

We would like to express our sincere thanks to all the members of the research team, to Andrew Sors and William Watts of DG XII for funding and support throughout the original study, to Moyra Forrest and Barbara Silander, the information officer and project administrator, and to all the other support staff at the institutions that undertook the research, to Jonathan Sinclair Wilson, Rowan Davies, Ruth Coleman and Frances MacDermott at Earthscan, and – above all – to the companies who allowed us generous access to their plants, their files and their people.

The final form and content of this book and any errors are the sole responsibility of the three authors.

Anthony Clayton, Graham Spinardi and Robin Williams, 1999

Policies for Cleaner Technology: A New agenda for Government & Industry, By Anthony Clayton and others, 1999, Earthscan

* Please address any enquiries relating to the research to:

Dr Robin Williams, Director, Research Centre for Social Science, University of Edinburgh, Old Surgeons' Hall, High School Yards, Edinburgh, EH1 1LZ, Scotland, UK.

Email: R.Williams@ed.ac.uk. Fax: +44 (0)131 650 6399. Tel: +44 (0)131 650 6384.

1 CLEANER TECHNOLOGY AND THE GREENING OF INDUSTRY: AN INTRODUCTION

Anthony Clayton, Brendan Ryan and Robin Williams

INTRODUCTION

Polluted rivers, contaminated ground, acid-damaged trees, eroding soils, disappearing species, ozone depletion, global warming ... it now appears that human activity can, potentially, affect the global ecology in ways and to an extent not previously thought possible. There is a growing consensus about the need to reduce the environmental impact of human activities, and about the failure of current approaches to deliver the necessary improvements. Our technology, for example, has become very much more sophisticated and efficient during the course of this century, but consumption of fossil fuels has still increased some 50-fold since 1900 as growth in demand has dramatically outpaced the rate of technological improvement. It has been suggested that we must now reduce our wastage of energy and materials at least by a factor of four if we are to achieve environmentally sustainable development (Weizsäcker et al, 1997). But how can this level of improvement be achieved? This is not just a question of which technical means might be available but, more importantly, how to bring about the necessary changes in our economic and social systems.

This book explores these questions by addressing the scope for adopting technologies and production systems that are fundamentally 'cleaner' in terms of the resources they use and the wastes they generate. Cleaner technology seems to offer a more effective approach to environmental improvement than traditional methods of applying 'clean-up' or 'end-of-pipe' controls to existing 'dirty' industrial processes. This is partly because many end-of-pipe controls displace problems, rather than solving them,¹ and partly because end-of-pipe controls themselves consume energy and resources, and can thus increase the total energy and resource demand associated with a particular industrial process. Cleaner solutions, on the other hand, aim to solve problems at or near their source, with the goal of eliminating problems entirely or even of converting them into positive assets.

Cleaner technology has come to be seen as an economically attractive approach, allowing firms to save costs through more efficient resource utilization and reduced waste-disposal charges, and to reduce pollution, thus offering a 'win-win' solution. In addition, it has become clear that the integration of pollution prevention with process design can help firms to reduce the risk of

making an inefficient investment in pollution control technology. End-of-pipe pollution control costs tend to escalate as environmental standards become more stringent. If environmental standards become significantly more stringent, it may become necessary to upgrade or replace existing end-of-pipe controls before the end of their design life, thus writing off part of that earlier investment. Waste problems that are solved by being eliminated, however, generally remain solved, thus protecting that investment.

Thus cleaner technology appears to offer a way of reconciling economic and environmental objectives. This is why the Report of the World Commission on Environment and Development (the Brundtland Report, 1987) argued that it was essential to develop and disseminate such solutions if the people of the world were to make a transition to a more sustainable way of life.

But if cleaner technology does indeed represent a 'win-win' solution, why has it not been adopted more widely? What is impeding the universal uptake of such solutions? Is this a case of market failure? Are there factors – or forces – inhibiting these solutions? Alternatively, is there still a gulf between rhetoric and reality in terms of what cleaner technologies can actually offer industry? What are the types and sources of cleaner technology and industrial systems, and where are these new solutions actually being generated? And what measures could be adopted to promote their wider development and uptake?

Much of the focus to date has been into the research and development of new technologies that might enable cleaner and more efficient industrial processes. More recently, however, a number of studies have suggested that the real impediments to the widespread adoption of cleaner technologies may be social and economic as much as technical in nature. This is significant, as it indicates why support for technical development alone has not been sufficient to promote the adoption of cleaner technologies.

It is clearly important, therefore, to analyse and explicate the socio-technical and socio-economic factors that determine, in practice, whether cleaner technologies are developed and adopted. This can be resolved into three key issues:

- What are cleaner technologies, and how are they developed and adopted?
- What are the motives and incentives for their development and adoption, and what are the obstacles?
- What are the sources of relevant innovation?

We set out to examine these issues in a set of 31 comparative case studies of innovations in firms in nine selected industrial sectors in four regions of Europe (the regions containing and adjacent to the cities of Cork, Edinburgh, Roskilde and Rotterdam). By comparing the behaviour and performance of firms in particular regions and sectors, we hoped to explicate the factors that shaped the relevant decision making by the firm, including its internal constitution, its commercial context, its relationship to broader innovation systems and the regional regulatory setting.

CONTENTS

Chapter 1 explores what we mean by clean technology, sets out the debates that form the background of this study, then explains the methodology adopted in our detailed study of the implementation of cleaner technology. An important element here, discussed in Chapter 2, is a cross-regional comparison, highlighting in particular the influence of the regulatory setting.

Chapters 3 to 11 present the detailed findings of our case studies in our selected industries, respectively:

- oil refining,
- petrochemicals,
- fine chemicals,
- pharmaceuticals,
- dairies,
- brewing,
- sugar,
- paper mills,
- plating.

Chapter 12 analyses these findings to identify the factors that may promote or impede the adoption of cleaner technologies and makes some policy recommendations.

Finally, Chapter 13 explores the wider implications for understanding cleaner technologies, including the uneven economic pressures to improve resource efficiency, the scope for initiatives across the product supply chain and the stimulation of innovation.

THE TRADITIONAL CONFLICT BETWEEN THE ENVIRONMENT AND THE ECONOMY

Economic needs and environmental concerns have often been seen to conflict. Many aspects of our current economic system were established with little apparent regard to the long-term effects of human activity on the environment. Some have therefore suggested that long-term sustainability will require far-reaching changes to our current systems of production and consumption. The particular significance of cleaner technology in this regard is in the potential that it appears to offer to reconcile the traditional conflict between the environment and industrialized society, and thus to enable a move towards a more genuinely sustainable economy.

A key cause of environmental degradation is that many direct and indirect environmental inputs into economic processes have been significantly undervalued. Forests have been felled with no allowance made for their function in

maintaining biological diversity. The pollution absorption capacity of the atmosphere has been partly consumed by the generations who have enjoyed the benefits of cheap fossil fuel, and who have not met the full cost of this consumption. In general, inputs that are undervalued will tend to be used to excess. There is little incentive to economize on the use of resources that are apparently cheap and plentiful. There is now evidence, however, that some resources – such as atmospheric pollution absorption capacity – may have become seriously overstretched as a result of this failure to recognize the value of these resources.

Some have argued that environmental damage arises from the pursuit of profit.² Indeed many environmentalists have seen unsustainable use of resources as deeply rooted in the system of capitalist competition. The historical evidence does not entirely support such a simplistic analysis. It is now known that environmental damage in countries with centrally planned economies has been more severe than in capitalist economies (for example, some 16 per cent of the geographical area of the former Soviet Union has been very severely environmentally damaged (Mnatsakanian, 1992)). However, the history of corporate operations in relatively unregulated environments, such as in developing nations, is not dissimilar. Some of the more rapacious mining, timber and other resource extraction and processing operations in Southeast Asia or South America, for example, have clearly inflicted immense environmental damage. The fact that environmental problems have arisen in diverse political and economic conditions – in both Western and Eastern Europe, for example – implies that different political and economic systems can generate some similar problems, and that these outcomes may therefore be related to particular patterns of industrial production and consumption per se. Given the importance of economic growth to both capitalist and socialist states, it is perhaps not surprising that, at times, the state's industrial promotion role has taken precedence over protecting the environment. The key question then concerns the separation of powers and the extent to which the state's environmental regulation functions are unbundled from its economic role and are effectively enforced. As we see in Chapter 2, the latter depends, in part, on how well these roles are institutionalized, and also upon public scrutiny and whether there is a broader social contract about the need to protect the environment.

It is hard to deny, however, that the profit motive has provided an incentive to many firms to externalize as many of their costs of production as possible, by operating with minimal environmental controls, paying the lowest possible prices for raw materials, and avoiding payment for any wider environmental costs that the use of these materials might entail. In this way firms have transferred part of their production costs to the environment, thus securing a hidden subsidy. Society has, however, suffered a general loss of welfare as a result. Some of this loss is immediate and obvious, as in the severely reduced environmental quality and increased rates of respiratory disease in heavily industrialized areas, but much is less obvious, such as with the long-term changes in soil structure associated with acid deposition, or the increased risk of climate change and the associated consequences for future generations.

There has been a dramatic increase in the rate of environmental damage during the course of the 20th century, largely driven by the remarkable increase in the rate of global economic development. Over the last century global industrial production has increased some 100-fold (Graedel and Allenby, 1995). This unprecedented economic growth has brought widespread social improvements. There are, however, serious questions as to whether these developments can continue indefinitely, because of the serious environmental costs involved. As Graedel and Allenby (1995) point out, the increases in global industrial production and in the volume of international trade have been strongly correlated with increased consumption of resources. For example, between 1950 and 1997, fossil fuel consumption quadrupled, while the consumption of timber tripled, partly driven by the increase in the consumption of paper, which rose six-fold over the same period (Brown et al, 1998). Some resource bases are now seriously overstretched as a result, while the Earth's pollution absorption capacity has been partly consumed and reduced by the flows of waste generated by these activities.

The process of economic development has also led to the creation of entirely new categories of pollution (Graedel and Allenby, 1995). Global output of synthetic organic chemicals, for example, was minute in 1900, but by 1995 some 225 billion pounds per annum were produced in the US alone. The rate of development and manufacture of these new compounds is now such that it greatly exceeds the current capacity to carry out a full assessment of potential environmental and health impacts (National Academy of Science, 1984).

THE TRANSITION TO AN ENVIRONMENTALLY SUSTAINABLE ECONOMIC SYSTEM

If we are to meet expectations that living standards will be maintained and improved, and in particular meet the growing aspirations of the developing world, without escalating levels of environmental damage, far reaching changes will be needed in our current system of industrial production and patterns of consumption. Substantial reductions in the resource costs of our activities will be needed before they could be sustainable in the long term. Weizsäcker et al (1997) argue that we need to increase energy and resource-use productivity by a factor of four, in order to double total wealth while simultaneously halving total resource use. This will necessitate profound changes to the technologies and production processes currently deployed as well as in broader patterns of consumption and waste management. Some see environmental sustainability as requiring a shift to radically different sets of technologies and ways of meeting human needs. This might imply the need to conduct basic research and development to develop industrial processes that are radically different to those currently deployed and cleaner in terms of resources used and wastes created. However there are serious questions about how, and indeed whether, such a radical transition is achievable. Amongst those who accept the need for far reaching

change, there are questions about whether this idea of a quantum jump represents the best path towards sustainability. In particular, studies of the development of our existing technologies and practices show that these have become deeply entrenched in society and our industrial system, and cannot be readily changed by fiat.

'Entrenchment' refers to the ways in which particular technological solutions and designs come to dominate and so constrain subsequent developments. This arises because new technology tends to develop cumulatively over time, incorporating earlier technical advances, and because an increasing array of actors become closely tied up with, and committed to, the production and use of certain artefacts. As economies develop skills and sink capital into particular solutions, the cost (in terms of risk, time and capital) involved in moving to a fundamentally different approach becomes a serious deterrent (Miles and Green, 1994). Sunk investment, alignments of views about the nature of problems and how they may be solved, standards, decision-making criteria can all contribute to 'lock-in' to particular approaches (Williams and Edge, 1996) and to dominant technological regimes. Thus an economy can become *path dependent*; locked into just one of the possible paths of development which it could have followed (Goodstein, 1999). Relatively major perturbations may be required to shake an economy or an industry out of a deeply established mode (Miles and Green, 1994; Kemp et al, 1998).

A striking example of entrenchment is the emergence in the developed nations of the transport system based largely on the use of private cars. This 'large scale technological system' has arisen through the activities of a range of players (vehicle builders, developers of engines, oil companies, road builders etc) developing and promoting products around a shared view and interest in the petrol/diesel-powered private car. In the US, for example, the government's decision to construct the interstate highway system after the Second World War enabled suburban development, which required mass individual car ownership, which then locked in this particular development pathway (Goodstein, 1999). Any 'head on' attempt to reduce the role of the motor car and reverse its deeply entrenched technological trajectory must confront a powerful alliance of interests, and is very unlikely to succeed, especially in the short term, as current products, available technologies, and customer views as to what products might be suitable and desirable are mutually reinforcing. There are many interlocking barriers to change including current urban geography, the availability of alternative technologies, price, performance in relation to customer expectations and the culture that surrounds the car (Sørensen, 1994). The continued failure of 'the electric car' over recent decades provides a case in point (Callon, 1980). A gradualist and multi-level strategy may therefore be required to reverse the existing processes of 'lock-in' and re-orient the system around a different paradigm incorporating ideas of cleaner engines, electric cars and cleaner transport systems (Schot, 1992; Kemp et al, 1998).

Similarly, Miles and Green (1994) have argued that a transition towards environmentally cleaner industrial systems will not come about through 'technology push' alone (ie the development of new generic core technologies), but

will depend on an iterative process involving 'societal and demand pull' as much as technology push. There is evidence that technological trajectories may be reversed as a result of changing circumstances, particularly if the array of forces that tended to sustain and reinforce it become fragmented and disrupted (Fleck et al, 1990; Williams and Edge, 1996). This raises the possibility of reshaping existing technological trajectories through external pressures and incentives, gradually shifting design criteria and market signals and establishing a new development pathway (Schot, 1992; Miles and Green, 1994). In this way a new technological regime could be created involving different priorities in relation to resource utilization and waste reduction.

Not all technological regimes are as deeply entrenched as the motor car system (and today even that is beginning to change). Other areas may offer more immediate opportunities for changing technological paradigms and trajectories. For example, McMeekin and Green (1994) have found a number of 'buried' technological development trajectories within firms with more environmentally benign products and processes, which had not been developed previously when environmental concerns were not a priority. There may be a reservoir of untapped innovation within industry, and processes and products that could be developed, given the right external signals.

Though the kinds of change needed are substantial, some have argued that it is feasible. Weizsäcker et al (1997) underpin their call for a fourfold increase in resource efficiency by more than fifty examples of similar or greater improvements in energy and resource-use productivity, including several examples of ten to hundred-fold improvements, from a wide range of industries. They point out the vast scope for savings. For example some 97 per cent of the fuel energy employed for lighting is wasted, and some 99 per cent of the original materials contained in or used in the production of goods made in the US becomes waste within six weeks of the sale of the finished product. The authors estimate that this inefficiency costs the US about US \$1 trillion per annum and that, globally, the figure could be as much as US \$10 trillion per annum.⁴ The authors conclude that enhancing resource productivity and reducing this level of wastage could bring multiple benefits including an improved quality of life, reduced pollution and resource depletion, enhanced profitability, improved market and business efficiency, better use of scarce capital, greater equity and increased employment.

THE GREENING OF INDUSTRY?

Recognition of the scale of change needed for sustainability, and the urgent need for such change has led environmental advocates to move away from their traditional oppositional stance towards industry – in which industry is seen as solely a source of environmental 'problems' – towards a model of constructive engagement which seeks to involve industry around more proactive strategies of pollution prevention. There is evidence of the start of a new synthesis between industry and the environment, captured in the slogan 'the greening of industry'.

This perspective sees the involvement of industry as not just desirable but crucial if the world is to achieve such sustainable development.⁵ Industry possesses many of the key resources needed for achieving such change (Hawken, 1994). Furthermore many sectors of industry have accepted that environmental regulation is now a permanent feature of the business landscape, and are potentially open to environmental concerns (Irwin and Hooper, 1992). The idea of greening of industry implies that firms accept environmental goals as intrinsic to their activities rather than as an externally imposed obligation. What is needed is to get firms to move beyond their reactive stance towards environmental concerns and regulations and take on a proactive, and indeed leading, role in achieving sustainable development (though it is clear that most firms are not yet anywhere near this position) (Hawken, 1994).

An important element of this new approach involves using market forces to provide incentives to change the behaviour of firms and individuals (Hawken, 1994; Porter and van der Linde, 1995). Porter and van der Linde (1995) in particular have argued that the idea that economic development must inevitably be at the expense of resource consumption and environmental degradation is fundamentally incorrect, because enhanced resource productivity can lead directly to enhanced economic competitiveness – the ‘win-win’ scenario. This is linked to the idea – which we return to in Chapter 2 – that regulation and other policy instruments could be used to promote innovations that are more efficient in resource use, and thus more competitive as well as ‘cleaner’. This is, clearly, an attractive suggestion, as it implies that market forces can drive business and industry in the direction of ever greater resource efficiency, thereby reducing environmental impacts. It also implies that economic development and environmental protection can be genuinely reconciled, and that the same factors will drive firms to improve both their economic and their environmental performance.

This view is not universally accepted. For example, Welford (1997) offers a radical critique of the greening of industry approach. Taking a traditional green view that industry alone cannot or will not make a transition to more sustainable practices and that only a profound reconstruction of industry and attendant social relationships and political structures will enable society to make a transition to a genuinely sustainable development path, he suggests that industry has in fact pre-empted and neutered the debate by capturing and restructuring the environmental agenda, excising radical elements in ways which are compatible with the exigencies of a liberal capitalist economy frame of reference.

Many commentators are not convinced that business and industry, historically responsible for many of the worst pollution problems and still driven primarily by the need to make profits, can really be expected to reform to the extent required. For example, some European steel manufacturers avoided the additional costs of complying with relatively stringent environmental standards adopted in Germany during the 1980s (which added about 50 DM to the cost of manufacturing a tonne of steel compared to 25 DM per tonne under the relatively low environmental standards in Spain and Italy) by shifting operations to southern European states. Similarly, with the creation of the North American Free Trade Association (NAFTA), a number of US companies saw the opportunity

to move out of the relatively tough US regulatory regime, and to take advantage of the much laxer environmental standards then operating in Mexico. The US companies switched the most dangerous and polluting parts of their operations south of the border, then re-imported their own finished products back into the US market, thereby evading environmental and health and safety regulations.⁶

In addition to such deliberate avoidance, and probably more typical, there appear to be many instances in which firms simply neglect the potential benefits of improving resource efficiency and reducing waste. Weizsäcker et al list some of the institutional and other factors that appear to be effectively preventing progress, including the lack of relevant skills, transaction costs and organizational inertia, unwillingness to write off the capital sunk in old technologies, discriminatory financial criteria, split incentives (so that the benefits of an action do not accrue to the person bearing the cost), distorted prices, lack of organizational time (so that one large project can be easier to manage than many little projects, even though the little projects might offer greater gains overall), obsolete regulatory requirements and inappropriate reward schemes (utilities, for example, are rewarded for selling more energy or resources, so have an incentive to promote inefficiency).

TECHNOLOGY AND THE CONTROL OF ENVIRONMENTAL HAZARDS

Many of the currently available environmental technologies were developed during the 1960s and 1970s in response to increasing regulatory pressure, which was in turn based on growing awareness of the damage that pollution (discharges of gas and liquid in particular) could do to local air and water quality. Most of them resulted from the application of traditional separation processes to waste gases and liquids. Gases were scrubbed with appropriate solvents to remove undesirable materials. Dust was removed by filtration, centrifugation or precipitation. Liquids were cleaned up by distillation, liquid extraction processes or by the precipitation of undesirable dissolved solids. Biological waste water treatment plants were used to convert organic material to carbon dioxide, water and so on. In many cases dilution or dispersion of existing waste was the preferred solution. Stack heights were increased and pipelines were extended out to sea or into deeper or faster flowing water.

It gradually became apparent, however, that the standard methods of treating effluents left significant residual problems. Much of the treatment basically involved a simple transfer of the material from one medium to another. When effluent gases were scrubbed with solvent, the clean gas could be discharged but the contaminated solvent remained. This would then require further treatment, which might involve either some form of water treatment plant or perhaps incineration. The former process could involve the incidental evaporation of volatile material from the liquid into the atmosphere, while the latter, particularly

at the relatively low temperatures that were used in the early days, could involve the discharge of highly toxic dioxins and other pollutants into the atmosphere. Either method would usually result in the generation of solid waste which could be contaminated with residual toxic materials and which would still present a disposal problem.

It also became clear that dilution and dispersion was not a satisfactory solution, with the growing recognition that long-term exposures even to low levels of pollutants could damage the environment. There was increasing evidence of acid deposition with its transnational impact on buildings and forests. Many industrialized countries started to become aware of problems with their ground water quality, and there was also evidence of accumulation of toxic material in many marine environments, with associated biological impacts. Baas et al (1990), for example, reviewed the additional problems that can arise when a number of countries share a common waste sink, in this case the North Sea which receives the discharges from a large number of different national sources. They concluded that a twin track approach was required, and that this would involve both promoting cleaner production across Europe and designating the North Sea an 'environmental clean-up demonstration area' in order to focus sufficient attention on this common problem.

The dilution/dispersion approach also stored up problems for industry. As environmental standards rise over time (which they generally do), the acceptable levels of discharge are progressively reduced, thus causing treatment costs to escalate (Clift, 1995). The basic principles of thermodynamics mean that the cost of separation, for example, starts to increase exponentially at low concentrations. It may be relatively easy to remove 90 per cent of a contaminant, for example, but much harder to remove 99 per cent, and very hard indeed to remove 99.9 per cent. Translated into economic terms, a distillation column designed to extract 99.9 per cent of a material could (depending on equilibrium relationships) be perhaps ten times more expensive than a column which achieved 99.0 per cent extraction. The same underlying relationship between thermodynamics and economics explains why it would cost about \$50 per kilowatt to remove 70 per cent of the SO_2 from coal fired generating station effluent gases, \$2200 per kilowatt to remove 95 per cent of the SO_2 , and \$4270 per kilowatt to remove 99.9 per cent of the SO_2 (Commoner, 1994).

The dilution/dispersion approach also appeared to fail to achieve the desired results, and concern about levels of pollution has continued to rise. A number of local and national environmental issues started to become more pressing during the 1970s and 1980s. Many authorities started to feel that, however defined, the limits of assimilative capacity were being reached and exceeded in many cases. There was growing concern about acid deposition and leachate. Several nations started to experience problems with landfill as a disposal option; existing sites were starting to reach capacity and it was becoming increasingly difficult to find new sites. Opposition to waste incinerators became particularly intense following fears about dioxin discharges. Some firms began to be concerned about whether their waste disposal routes would be secure, especially in the longer term. Toxic waste became an internationally traded commodity as firms and city authorities

tried to find a country somewhere that was prepared to accept their waste for burial. Some firms started to export their waste to developing nations for landfill via unscrupulous operators who were prepared to relabel drums of toxic waste and give assurances that they contained only inert material.

In addition, what were previously seen as essentially local pollution issues came to be regarded as instances of globally unsustainable trends and changes. Global warming and ozone depletion, for example, are now acknowledged to be truly global issues, which have elevated environmental concern to a new and unprecedented level of political significance. The majority of the nations of the world sent their heads of state to the Earth Summit in Rio de Janeiro in 1992, indicating the level of political attention now being given to these matters.

THE TRANSITION TO CLEANER TECHNOLOGY

The concept of cleaner production arose out of these combined demands for pollution-free, resource-efficient and sustainable modes of production (Huisingh, 1990). A number of partly interlocking considerations tended to favour the idea of waste minimization at source, and changes to industrial processes to improve resource efficiency, as an alternative to conventional control strategies of capture (or dispersal) of emissions and wastes generated by industrial activities.

In particular, during the 1970s and 1980s, three factors led to a gradual evolution in approach to the control of pollution:

- The established procedures for dealing with waste were becoming increasingly difficult and costly.
- The number of pressing environmental issues and problems was growing, which was starting to generate increasing pressure on firms and governments.
- Public awareness and concern was also growing, and the public debate was becoming increasingly sophisticated, which was making a number of previously acceptable and established 'solutions' increasingly untenable.

These factors led to a fundamental reappraisal of existing practice, which initiated a paradigm shift in environmental management thinking (Hirschorn et al, 1993). It had gradually become apparent that innovative pollution prevention strategies, involving elimination of problems at source or minimization of the output of pollution, could be a viable and attractive alternative to the increasingly costly pollution abatement technology.

The new emphasis on pollution prevention also reflected growing concern about how to control the increasing number of diffuse, non-point sources of environmental hazards. Industry started to become more aware, for example, of fugitive and other previously unrecorded emissions. Some of the findings, however, broadened the focus beyond the factory itself. The main source of heavy metals in sewage treatment plants in the UK, for example, proved to be the storm drains that received the water running off roads and hard standings for vehicles (which would thus carry the used sump oil, brake fluid and so on leaking from

vehicles), rather than manufacturing or process plants. Thus transport was an example of a source of environmental damage that could not be remedied by pollution abatement technology alone. Similarly, one of the main sources of nitrates in aquifers proved to be agriculture, partly as a result of the ploughing-up of grassland during and after the last world war in order to plant crops which released stored nitrates to start migrating towards the water table, and partly as a result of a progressive increase over the post-war years in the use of nitrogenous fertilizer, with an attendant increase in fertilizer run-off. So this problem also proved to have extensive multiple sources, and to be beyond the reach of any one pollution abatement technology.

Thus it started to become apparent that pollution was no longer exclusively – or even primarily – a phenomenon related to industrial production alone. It was increasingly acknowledged that every stage of the production cycle (extraction, refining, processing, manufacture, consumption, degradation and dispersion (Van Weenen, 1990 p155)) added to the total environmental burden. The demand for improved environmental performance, therefore, expanded to require a review of every stage of the production cycle. This then started to fuse with the growing concern about the finite nature of most natural resources. Thus general environmental concern, initially focused on the elimination of the various threats from pollution, was increasingly subsumed into a much wider debate about sustainability and sustainable development.

The search for cleaner production may therefore call for an assessment of the entire life cycle of a product, addressing resource extraction, every stage of production, to final use and waste disposal. Within this, cleaner *technology* is understood to refer more specifically to the changes which are made to the production process in order to meet the necessary condition of pollution prevention, which in turn represents one stage in the progress towards the desirable objective of cleaner *production*. As 100 per cent energy or resource-conversion efficiency is thermodynamically impossible, no process can be defined as absolutely 'clean' and the concept is usually expressed relatively, in terms of 'cleaner' technology.

Cleaner technology, however, is still a very broad concept, used generally to describe the entire range of responses by firms to the need to prevent or reduce the generation of environmentally hazardous material. There is at least a basic consensus that if an action is to be called 'cleaner technology', it must involve improving overall energy and resource-use efficiency, typically by minimizing or eliminating wastes at source or by using them as inputs into other processes. This can be contrasted with the traditional 'end-of-pipe' approach to the control of environmental hazards, in which the production process remains unchanged, and the waste streams it generates are processed before they are released into the environment. The end-of-pipe approach is, typically, addressed primarily to local pollution control rather than to overall energy and resource-use efficiency. Cleaner technology, by contrast, seeks to reduce environmental impact by eliminating rather than by detoxifying or diluting waste streams.

This still leaves room for a great deal of debate as to which solutions and techniques should be called cleaner technology. The UK Department of Trade

and Industry (DTI), for example, has tended to see the search for cleaner technology primarily in terms of new and innovative engineering solutions, which might, for example, emerge from research and development into fundamentally cleaner technologies. In practice, however, many cleaner solutions only involve the application of already known technologies, and may often simply require the reorganization of production processes without the introduction of any new technology at all (Remmen, 1995). Thus cleaner technology has to be seen as an approach rather than a specific type of solution.

The production process, of course, is still crucial, as it is the point within which most *resource transformations* take place. These transformations – defined as the processes by which natural resources are converted into useful products – are usually accompanied by the intensive use of energy, and the generation of both unsaleable by-products and residual raw material so contaminated as to render it no longer commercially valuable, both of which represent waste.

Jackson (1993a) points out that the concept of cleaner production is based on three principles:

- precaution (assume reasonable worst case scenarios);
- prevention (look at the production process as a whole and eliminate as many areas of potential risk as possible); and
- integration (protect the environment across all areas of activity by factoring it in to all decisions).

The search for cleaner production may thus involve two elements:

- increasing resource-use efficiency and reducing material flows; and
- substituting less hazardous materials where possible.

The goal is to handle *smaller quantities of less hazardous* materials. Jackson notes that substitution is often a better option than recycling for particularly hazardous materials, as it is impossible to eliminate all risk of leakage or contamination. The goal is not 100 per cent elimination of all hazardous materials – which would be unrealistic, and might prove counterproductive (as most materials can be hazardous in the wrong circumstances) – but to remove wherever possible the most generally dangerous elements and compounds.

Resource-use efficiency can be achieved both within and beyond the firm. Production processes can be improved by eliminating leaks and spills, closing internal materials loops and upgrading plant and equipment. Product cycles can be made more efficient by reusing, reconditioning and recycling products. Consumption patterns can be reformed by designing for longer service life, or for disassembly, with sub-components then being streamed for refurbishing and reuse or recycling.

There are limits, of course, to the extent to which it is possible to improve efficiency in this way; improvements in efficiency at one point in the system are often only achieved at the expense of an increase in the total consumption of resources at another point (recycling, for example, consumes energy).

A variety of definitions of cleaner technology have been advanced in this debate. Despite some minor differences in emphasis and (in particular) scope,⁷ cleaner technology responses can be seen as including:

- changes in processing techniques which result in a reduction in the use of raw materials;
- changes in processing techniques which result in a substitution of environmentally hazardous by less hazardous process materials;
- changes in operating systems and processing techniques which result in a reduction in either the environmental toxicity or volume of waste streams; and
- process energy integration which results in more efficient use of energy (eg 'pinch' technology).

Similarly, a recent report for the EU states that 'cleaner technology is the conceptual and procedural approach to the development, purchase, and use of processes and products preventing and reducing internal and external environmental problems throughout a product's life cycle by integrating options to:

- minimize volumes and hazards of gaseous, liquid and solid wastes;
- minimize the risk of accidents involving chemicals and processes;
- minimize consumption of raw materials, water, and energy; and to
- use substitute chemicals and processes less hazardous to human and ecological health.' (Rendan, 1994 p2)

Zwetsloot (1995) has broadened the scope of this discussion, arguing that cleaner production programmes are no guarantee of continued progress towards higher environmental standards, and that they must themselves form part of a larger commitment to systemic environmental management. Zwetsloot also suggests that the most relevant lessons are frequently those learned in quality management issues and in the management of working conditions.⁸ Jackson has extended this argument further by pointing out that, broad though the above definitions are, the term clean production is still used largely in a fairly technical, goal-oriented context, and cannot therefore by itself provide answers to questions about some of the wider technological, economic and social choices that are at least equally important. It is important, therefore, to continue to see clean production as a part of a wider process of social change.

Table 1.1 identifies the characteristics of various, increasingly comprehensive, responses to environmental pressure. These responses are located on a spectrum that ranges from traditional (eg end-of-pipe) pollution control to a comprehensive societal review of the entire production chain, thus integrating across the range of technical, managerial and social options, and locating all responses in a single matrix.

Some technological responses to environmental pressure nevertheless remain difficult to classify. In particular, not everyone agrees that *external reuse and recycling* – which involves sending material on to another firm or into another

Table 1.1 Elements of various (increasingly comprehensive) environmental responses

	Best available technology BAT/BPT	Clean(er) technologies	Pollution prevention and waste reduction	Cleaner production
Pollution control	x			
Prevention		x	x	
Technological	x	x	x	x
Non-technical			x	x
Process oriented		x		x
Product oriented			x	x
Strategic management			x	x
Society oriented				x

Source: adapted from Baas, 1996 p216

process for utilization – are really cleaner options.⁹ Some have argued, for example, that external reuse reduces the pressure on firms to address problems at source. These arguments tend to be inconsistent, however, for three reasons:

- Internal reuse and recycling is universally regarded as mainstream cleaner technology, which makes it difficult to argue that external reuse and recycling should not be seen in this way. Why should the (often circumstantial) question of the boundaries of firm ownership determine whether a process is considered 'clean'?
- If a market is found for a material which would otherwise have to be treated and dumped, then (a) the environmental impact associated with the disposal of the waste is reduced and (b) there will be a reduction in the demand for the raw material for which the waste is being substituted, which means that there will be a reduction in the environmental impact associated with the supply of the raw material.
- The concept of industrial ecology, itself a significant extension of current models of cleaner technology, largely revolves around the attempt to find secondary recycling opportunities for every material for which primary recycling is inappropriate.

It may be important, here, to distinguish between different kinds of external reuse and recycling, as some of the criticisms are more valid than others. It would be possible, for example, to count the incineration of hazardous waste in an incinerator run by another firm as a case of external reuse provided that the incinerator was being used as, say, a source of energy.¹⁰ Many would not, however, regard this as a cleaner technology response. The issue is whether the overall balance of energy and resource use and waste creation of the set of activities is improved and whether such a route holds out the prospects of further improvements in future.

FACTORS PROMOTING AND IMPEDING THE ADOPTION OF CLEANER TECHNOLOGY

The rhetoric of cleaner technology mainly paints a very positive picture of how industrial economies can be more environmentally sustainable. There is a growing body of supportive case studies. Many of these are associated with particular public initiatives, however, and have been carried out by people closely associated with these programmes. This book subjects the concept of cleaner technology to an independent and perhaps more critical appraisal. We seek to explore the reality of cleaner technology implementation, and in particular to address the key factors promoting or discouraging its adoption. One key question, as noted in the introduction, stands out above all: Given that cleaner technology apparently offers such a range of seemingly attractive and readily attainable benefits, why are not more businesses spontaneously initiating such improvements? Why, in fact, do many companies still treat pressures to improve the environment as a potential cost which should be avoided if at all possible?

Clearly, there is substantial support for the idea that clean technology does indeed represent a win-win scenario, offering cost savings as well as reduced environmental burdens. There is a growing body of case-study material which supports such a view. The Centre for the Exploitation of Science and Technology studies (1995a, b) of the Aire and Calder Project (one of the most extensively studied waste minimization projects in the UK), for example, revealed that the 11 participating companies were able to identify some 671 resource saving measures, which reduced the total volume of discharges to the river by 36,000 cubic metres, to sewer by 623,394 cubic metres, to landfill by 4842 tonnes and to air by 30 tonnes, and generated some £3,350,000 in direct savings in the first two years of the project. Some two-thirds of these identified financial savings resulted directly from reductions in input use. Some of the measures could be adopted at very low cost, and the majority had short payback periods. Good housekeeping measures (simple improvements in basic practice) generated about 40 per cent of the savings and reuse of previous waste material accounted for a further 12 per cent, while technical modifications generated some 42 per cent. These findings of course, bring us back to the paradox of why the companies involved had not implemented some of these improvements before the start of the project, given that 52 per cent of the savings required no technical modifications at all.

In contrast, Howes et al (1997) offer a more sceptical account of cleaner technology, pointing out that many of the advantages of cleaner technology are simply asserted in the literature without hard empirical data, and that this portrayal of clean technology as offering cheap and easy 'win-win' financial and environmental outcomes has created some unrealistic expectations. They argue that pollution prevention does not invariably pay (at least not for the company concerned), which will be a major obstacle since cost pressures are still by far the most important determinants of particular courses of action. Buriks (1989) similarly points out that the implementation of waste reduction technology may involve costs and in particular uncertainties about whether the proposed

change will work or represents the most cost-effective solution and the best use of the company's money. Moreover, some industrial waste reduction technologies may present challenges to established patterns and views of industrial production and its development. This kind of radical innovation may require the development of particular management strategies, structures and technical skills within an organization (Geffen, 1995). Such factors can encourage resistance to change, including cleaner innovation, and deter many less committed firms (Buriks, 1989; Geffen, 1995). Thus many firms appear to require an initial regulatory stimulus before they will even search for cost-saving opportunities.

It is known that levels of uptake and awareness of cleaner technology vary considerably between different regions of Europe, between industrial sectors and between firms. This raises some fundamental issues. Traditional (eg neo-classical) economic theory would suggest that all firms should seek to maximize their profits by adopting cleaner innovations that offered financially beneficial improvements in resource efficiency. Assuming that people in different regions of Europe, industrial sectors and firms are equally rational, why do some take advantage of the opportunities offered by cleaner technology while others do not?

Certain national differences are clearly quite important. For example, McMeekin and Green (1994) found that the general level of understanding of clean technology in UK industry was still low. Though there did appear to be some slow movement towards a greater uptake of waste minimization and source reduction ideas, there was little awareness of the potential commercial gains. Remmen (1995), in contrast, notes the broad political consensus in Denmark on the need to move to cleaner technologies, as opposed to end-of-pipe solutions (for example the Danish Ministry of the Environment switched its policy to support cleaner technologies as far back as 1986). Despite these historical differences a clear consensus has emerged during the 1990s across Europe and beyond about the importance of pollution prevention, which represents a significant change over the last decade.

State intervention has played an important role here, not only through measures directed towards raising awareness, but also, and it appears most significantly, through direct intervention. For example, Sweeney and Mega (1996) found that compliance with regulation and the requirements of grant aid for restructuring had been the primary determinants to date of environmental responses in Ireland. Similarly, Conway and Steward's (1998) comparative study of environmental innovation in the UK and Germany pointed to the importance of regulation (of products and processes), particularly in Germany where environmental requirements were institutionalized to a much greater extent. This draws attention to international differences in the content and manner of enforcement of regulation. For example, much environmental regulation has explicitly or implicitly been focused upon remediation and treatment technologies rather than pollution prevention technologies (Geffen, 1995, in the case of the US).

Furthermore, industry is not homogeneous, and firms can respond in a very wide variety of ways to regulatory pressures and public concerns (Howes et al,

1997).¹¹ For example, some firms tend to react defensively to change, while others will adopt a more proactive response (Fischer and Schot, 1993). Where some firms seek specific solutions to environmental problems, others will attempt a more profound assessment of their products and operations, and will consider more radical or otherwise cleaner technological solutions.

This highlights the extent to which the actual response of the individual firm is shaped by an internal array of social, economic and technical factors. There may be a degree of inertia to be overcome before firms will switch into new development paths (Duncan, 1996). Regulation may play a role in stimulating a reassessment of current activities and methods of operating. On the other hand, regulation can sometimes encourage the adoption of traditional environmental control strategies. Some have therefore suggested that cleaner innovation may best be promoted by focusing on the core business and technical innovation strategies of the firm, rather than on environmental compliance (Zwetsloot, 1995; Geffen, 1995).

One of the key organizational factors addressed in the literature concerns firm size and structure. Some have pointed to a growing divide between large and small companies, suggesting that many large companies are now becoming more environmentally proactive, moving to implement environmental management systems, more ready to perceive common interests, and more willing to move into partnership arrangements with other firms, regulatory bodies and others to help to resolve problems. In contrast, small and medium sized enterprises (SMEs) are generally seen as less likely to be proactive, to implement environmental management systems or to participate in wider schemes, for example in waste management (Howes et al, 1997).

This appears to be because many SMEs have limited technical and financial resources, and just do not have the expertise or the spare management time to look beyond their immediate horizons and examine the scope for improved practice (Partidario, 1997). Even in Denmark (a relatively advanced state in this regard) many SMEs were found to lack the information and understanding of material flows needed to carry out even basic environmental audits (Christensen and Nielsen, 1993).¹² This has important policy implications since some 99.8 per cent of all companies (and 80 per cent of industrial firms) in Europe are SMEs, and they account for 66 per cent of total employment and 65 per cent of total business turnover (Partidario, 1997).

THE RESEARCH PROJECT

Numerous successful cases of cleaner technology adoption point to the potential of cleaner technology, particularly in certain regions and sectors. However this unevenness in uptake points to the existence of barriers to implementation. Progress in implementing cleaner technologies in countries such as Denmark and The Netherlands indicates the importance of regulation and public policy initiatives directed towards this goal. However cleaner innovation is neither uniformly adopted in, nor restricted to, these countries. This underlines the

complex range of factors shaping corporate decision-making over industrial processes and environmental responses.

If we wish to assess and unlock the potential of cleaner technology, therefore, one key task is to identify the social and economic factors that might encourage or obstruct the development and uptake of cleaner technologies. One way to explore these factors is by examining systematic differences in firm behaviour between sectors and regions, while keeping other factors (such as the function of the firms) as similar as possible. Such a comparative study would allow us to contrast the culture, strategies, attitudes and responses of otherwise similar firms in different regional and national settings, and examine the effects of these factors on the process of decision-making in the firm.

This study was conceived from the outset as an interdisciplinary research project. Expertise in assessing the environmental impact of industrial operations was combined with expertise in socio-economic analysis of technology. The primarily technical focus of the former was combined with the theoretical and policy insights of the latter (drawing especially upon studies of technological innovation and of the implementation of new technologies within organizations). This research, particularly from the *social shaping of technology* perspective, provided valuable concepts for understanding the detailed processes of innovation; the interplay between social and technical factors (indeed the 'socio-technical' character of innovation); and factors promoting and inhibiting social and technological change (Williams and Edge, 1996).¹³ One finding from this research, of potential relevance to cleaner technologies, is that industrial technologies may embody features from the context in which they emerged, such as the research and development laboratory, and may need to be further innovated and adapted to fit them to the particular circumstances and requirements of industrial users (Fleck et al, 1990). This suggested two of the hypotheses explored in this study:

- 1 that there might be difficulties in implementing radical clean technologies arising from the efforts of suppliers or public sector research institutes; and
- 2 that industrial users might constitute an important reservoir of expertise relevant both to adapting external cleaner solutions and developing them in-house. A further implication concerns the need to avoid the adoption of prior conceptions of what is clean technology, that is, of the most appropriate types and most significant sources of cleaner innovation. Cleaner innovation may take different forms, and is not necessarily restricted to those developments typically promoted as exemplars of cleaner technology.

Objectives

The objectives of the study can be summarized as follows:

- To assess the different types of environmental response and cleaner innovation and their contribution to waste minimization and resource efficiency (for

example contrasting incremental improvements developed in-house with radical innovations, based perhaps upon external research and development effort); to examine the compatibility of the various technological options with the productive and commercial circumstances and policies of firms, and in this way to develop a more comprehensive understanding of the *sources of cleaner innovation*.

- To improve understanding of industrial decision-making and of the *behaviour of the firm* in relation to cleaner technologies, focusing both on the environmental responses and strategies of firms and their selection/development/adoption of particular industrial technologies, processes and practices.
- To identify the socio-economic factors affecting the adoption and dissemination of cleaner technologies, including the internal culture and strategy of the firm, its products and markets, financial and technical resources and its regional, national and global context, including competitive and regulatory pressures and public concerns.
- To explore the policy measures best able to promote the adoption of cleaner responses by identifying the barriers to and drivers of particular kinds of change.

These objectives were pursued through a tightly controlled set of case studies of firms in selected process industries in four regions of Europe (including regions with well-established clean technology programmes and policies, and regions that are less well developed in this regard). Differences between cases could be related to features of the firm, its sector and product market and its broader economic, political and regulatory context. Detailed comparison between the outcomes in different cases revealed some of the forces inhibiting and promoting the adoption of cleaner technology. In particular, the regional comparison drew attention to the range of policy instruments – from formal regulation to informal pressures – and their effects on the environmental performance of firms. This in turn pointed to some of the policy measures through which the development and adoption of cleaner technologies could be encouraged in particular settings.

These factors are summarized in Figure 1.1.

Methodology

The research programme was focused on process industries and on their liquid wastes, although the full range of resources used, wastes produced and shifts in disposal media were taken into account. Process industries were chosen because they are more homogeneous in their production processes than, for example, manufacturing industries, which makes it easier to characterize their technologies. A sample of firms was chosen from nine sectors:

- oil refining,
- petrochemicals,
- fine chemicals,

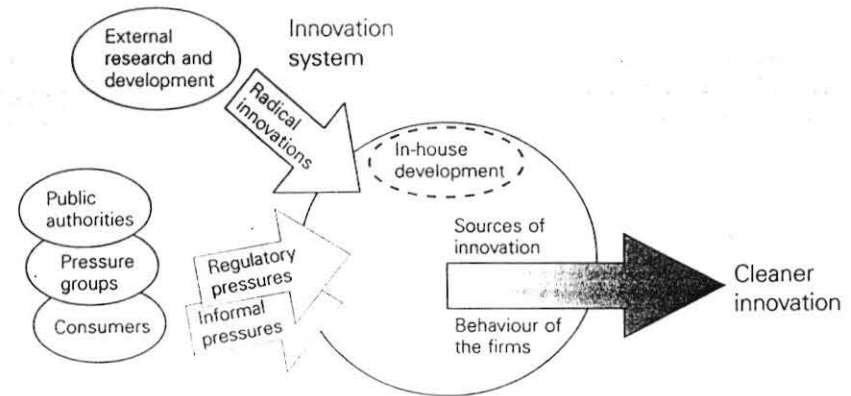


Figure 1.1 Model of factors that may affect the adoption of cleaner responses

- pharmaceuticals,
- dairies,
- brewing,
- sugar,
- paper mills,
- plating.

These sectors were chosen because of their economic importance and environmental significance, because there was sufficient representation of these industries in the four regions of the study to enable comparisons to be made, and because they usually generate significant flows of liquid wastes.

We chose to focus on liquid wastes because they are easier to measure than airborne effluents, because reasonably extensive and reliable records are – in general – publicly available, because there have been important recent changes in various national and EC regulations which have stimulated various reactions from industry, and because it is usually possible to make relatively clear distinctions between end-of-pipe control and cleaner technologies in regard to the treatment of liquid wastes.

The company case studies were drawn from four regions in four different EU member states: Storstrøms county (amt) in Denmark, Cork county in Ireland, the Zuidholland region in The Netherlands and Lothian region in Scotland.¹⁴ These regions either contained or were adjacent to the cities of Roskilde, Cork, Rotterdam and Edinburgh.

THE CASE STUDIES

Eight detailed case studies were developed in each region from the selected process industries. Firms were chosen on the basis that they had introduced some

significant change which had improved their environmental performance (irrespective of whether it involved cleaner technology or end-of-pipe pollution control, or whether it was motivated for environmental or commercial reasons). A few cases were included not primarily because of their intrinsic interest but to ensure that a sector was represented in a particular region – to provide a cross-match with firms in other sectors or regions, or to provide an indication of the industry norm. This allowed us to include at least three regions in each of our sectors, except the paper processing sector (which was not represented in every region) and the plating sector (which was developed in the course of the study as a reserve candidate¹⁵). A slightly different approach was adopted in two sectors: oil refining and brewing. Here the high level of integration of plant and the basic similarity in operations between cases created the possibility of developing a benchmark study of the overall technological configuration of a plant and its implications for environmental performance, so particular projects were addressed as part of a broader assessment of overall operations. A total of 31 detailed case studies were made.¹⁶ Table 1.2 shows how these broke down across the nine sectors and four regions. The cases have been anonymized, here and in the chapters that follow.

DATA COLLECTION

The empirical research involved four phases:

- 1 Background enquiries and screening surveys to select firms for detailed study.
- 2 Detailed case studies based on company-level interviews to elicit the general corporate position on environmental issues, and to explicate the decision-making processes in relation to production processes and environmental responses. This also included the identification of recent projects affecting the firm's environmental performance and selection of one for detailed study.
- 3 Detailed studies of selected projects, focusing on the factors shaping the choice of techniques and technologies.
- 4 A study of the regional and sectoral context of each case.

The detailed company case studies (phase 2 and 3) included several series of semi-structured interviews with managers with responsibility for environmental performance, managers and technologists in research and development and production, and senior managers, as appropriate. Information from both internal and external sources was collected over a period of some 20 months.

Phase 2 interviews and data collection focused on such issues as:

- detailed information on the commercial and environmental performance of the firm, its products and markets;
- the history of the selected firm, with particular reference to its environmental behaviour and its choice of industrial processes;

Table 1.2 The case studies and their distribution by country and sector

Sector	Country	Case study (anonymized)
Refining	Denmark	DK Refinery 1
	Denmark	DK Refinery 2
	Ireland	IRL Refinery
	UK	UK Refinery
Petrochemicals	Ireland	IRL Chemicals
	The Netherlands	NL Chemicals 1
	The Netherlands	NL Chemicals 2
Fine chemicals	UK	UK Chemicals
	Denmark	DK Fine Chemicals
	Ireland	IRL Fine Chemicals
Pharmaceuticals	UK	UK Fine Chemicals
	Denmark	DK Pharmaceuticals
	Ireland	IRL Pharmaceuticals 1
	Ireland	IRL Pharmaceuticals 2
	The Netherlands	NL Pharmaceuticals
Dairy	UK	UK Pharmaceuticals
	Ireland	IRL Dairy
	The Netherlands	NL Dairy
Brewing	UK	UK Dairy
	Ireland	IRL Brewery
	The Netherlands	NL Brewery
Sugar	UK	UK Brewery
	Denmark	DK Sugar 1
	Denmark	DK Sugar Corporation ¹⁷
	Ireland	IRL Sugar
Paper	The Netherlands	NL Sugar
	Denmark	DK Paper Mill
	UK	UK Paper Mill 1
Plating	UK	UK Paper Mill 2
	Denmark	DK Plating
Total = 9 sectors	The Netherlands	NL Plating
	Total = 4 regions	Total = 31 case studies

- detailed examination of its managerial structures, product markets, industrial processes, technologies and practices, the environmental strategies and policies of the firm;
- information was collected on recent projects within the firm that affected its environmental performance (of which one was subjected to detailed study in phase 3).

For the specific project selected for in-depth study (phase 3) we traced the sequence of events through the life of the project. The interviews sought to explicate the detailed processes of managerial decision-making and the selection/design of technology and industrial processes. The key points included:

- The definition of the problem, and the approaches considered for resolving the problem. What factors led to the project being initiated and underpinned the general approach adopted by the firm? (These could include, for example, the adoption of end-of-pipe or cleaner responses to environmental concerns, or process enhancements adopted for other, eg commercial, reasons that improved environmental performance.)
- The identification of the objectives and decision-making criteria adopted (including financial, environmental and other assessments), the identification of outcomes, and the assessment of the extent to which the project objectives were achieved.
- The managerial division of labour and knowledge and its effects on choice and implementation of technologies and practices, the extent to which different technological solutions (with different environmental implications) were available within the industry, and the reasons for their adoption or rejection, and the sources of knowledge, ideas and expertise and of technical solutions, within the firm and beyond.

The (phase 4) study of the context of the firm involved a parallel series of semi-structured interviews with a range of relevant actors, including officials from national and local government, regulatory agencies, and trade associations and industry research bodies, which documented the external milieu of each case and sector. The interview data was further supplemented by literature reviews and a search of databases and other sources of information on relevant technological and commercial developments.

ANALYSIS

Empirical research continued until 1996. The fieldwork was followed by a detailed process of comparative analysis, which drew also upon a broader review of the array of industrial activities, product markets, competitive dynamics, patterns of innovation and environmental response in the sector, and the range of cleaner technologies available. These sectoral studies form the main empirical basis of the book, and are included as Chapters 3–11.

There were important variations between cases, even in the same sector. These could be related both to differences in the internal context and traditions of the firm and to its broader socio-economic and regulatory setting. The empirical findings were then subjected to an overall analysis, both comparing the broad patterns that had been identified in the different sectors and comparing the overall patterns of cleaner innovation across all 31 cases as a whole.

Different types of environmental response

An important aspect of the study was to distinguish between rhetoric and industrial reality, by examining the range of types and sources of cleaner innovation, rather than restricting the scope of enquiry to some pre-defined archetype, or to those projects that were explicitly recognized as cleaner technology. A key analytical task was therefore to categorize different types of response. Thus, in responding to a given environmental challenge, a firm might choose:

- to ignore the problem and resist all pressure to change;
- to implement an end-of-pipe solution, typically based on a set of well-established control technologies for physical separation and/or neutralization of contaminant – for example a waste water treatment plant;
- to adopt cleaner innovations in its processes and practices geared (or otherwise leading) to waste minimization and increasing resource efficiency.

The range of possible cleaner responses can be classified as follows:

The range of cleaner responses

- To improve operating techniques and *working practices* and upgrade house-keeping.
- To implement *internal recycling* mechanisms to reintroduce waste materials into production processes.
- To implement *external recycling* systems to recover and sell waste materials on to another party.
- To introduce *incremental improvements* in the process technology aimed at reducing waste.
- To introduce *radical changes* in the process technology aimed at reducing waste.
- To *develop new products* or services.
- To become involved in a wider process of *product chain management*, where environmentally oriented change takes place across a number of producing and consuming firms in a supply chain.

The study then focused on two key issues affecting these choices: the process of *decision-making in the firm*, and the processes of *technological innovation* and related changes that gave rise to cleaner technologies and approaches.

114. Chhatrapati Singh, Legal Policy for Environmental Protection in P. Leelakrishnan (Ed.) *Law and Environment* (1992) Lucknow. pp. 40-45
115. *Supra* note 37 at 48
116. Schedule - III, (i) and (xi), *the Environmental Clearance Notification*, 1993 [The Gazette of India Extraordinary, Part-II Sec. ii, 28 January 1988 : *Environmental Audit Notification*, 1992] The Gazette of India Extraordinary, Part - II, sec. 3 (i) March 13, 1992.
117. In *Siera Club Purchase* case, Justice Douglas in minority judgement favoured the idea that inanimate objects like hills, waterfalls, roots, vegetation are as good as human beings in the eyes of the law. Therefore the court should take cognizance of the rights of all including inanimate objects while dealing with the cases of environment and ecology.

HOW EFFECTIVE ARE THE AIR AND WATER POLLUTION CONTROL ACTS

PROF. ROBATI C. DAS*

Introduction

During recent days there is world-wide concern for the deterioration of human environment as a result of impact of science and technology, fast industrialisation and urbanisation and population growth on the global landscape. In response to this, there is new emphasis by environmentalists and decision-makers on the role of law, both national and international, for the protection of human environment and for ensuring the right to life. Environmental law is, therefore, the branch of law which pertains to maintenance of wholesome human environments.

The problem of environmental degradation has arisen as a result of lack of discipline in man. There is no respect for laws of

* Chairman, Orissa State Pollution Control Board and former Vice-Chancellor, Berhampur University. A part of this paper was published in the *Journal Law and Business* 1. 74 (1994), jointly by Dr. R.C. Das, Dr. M.A. K. Baig, Dr. J. Mohapatra & Dr. L. N. Patnaik.

nature. Growing emphasis on mass consumption and mass disposal of waste has created problems of pollution. Therefore, it is essential to create new attitudes and lifestyles and develop new laws to protect environment. The perspective has been stated most explicitly in the United Nation Declaration on Human Environment at Stockholm in 1972 which states at the outset that :

“Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth. In the long and tortuous evolution of the human race on this planet, a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. Both aspects of man's environment, the natural and the man-made, are essential to this well-being and to the enjoyment of basic human rights even the right to life itself.”

In this paper, attempt has been made to discuss some emerging problems of law and environment and find out the obstacles that are coming on the way of implementation of the legislations with regard to air and water to control pollution in India.

Aims and Objectives

The main aim of air pollution control policy was initially to improve the ambient air quality in densely industrialised and urbanised areas where pollution was most serious. To achieve these objectives the Government introduced legislations essentially aimed at cutting particulate emissions and ensuring adequate diffusion of noxious pollution. The water legislations so far enacted clearly confirm the legislator's ambition to consider water as a source for the economy, an element in the population's life-style, a living environment and a part of the country's natural heritage.

Constitutional Provisions

The Constitution of India requires the State to take steps to protect and improve the environment and to safeguard the forest and wild life of the country. Relying upon the above provisions of the Constitution the Supreme Court of India in *M.C. Mehta v. Union of India* case, gave directions to the Central and the State Governments and various local bodies and Boards under the various statutes to take appropriate steps for the prevention and control of pollution of water. The Constitution of India imposes duties upon the States for the improvement of public health. Purity of the air we breath in and the water we drink is absolutely essential

for good health. Equally important is the environment in which we live and work. In view of this, Article 51-A (g) of the Constitution also introduced by the 42nd amendment lays down the following :

“It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creature.”

This is one of the fundamental duties of every citizen of India.

The Indian Judiciary in some of the cases has taken upon the task of expanding the ambit of Article 21 of the Constitution by interpreting the right to life to include the right to live in healthy environment. In the historic judgement in *M.C. Mehta v. Union of India* case, popularly known as *Shriram Food and Fertiliser* case, the Supreme Court laid down a revolutionary new principle. In the instant case the petitioner had alleged the infringement of right to life of several thousand people due to severe pollution and hazardous activity of Shriram Food and Fertiliser Ltd., manufacturing oleum and chlorine situated in the heart of the city of Delhi. The Supreme Court directed the company to take all necessary safety measures before reopening of the plant. There was a leakage of chlorine gas from the plant resulting in death of one person and causing hardships to workers and residents of the locality. This was due to the negligence of the management in maintenance and operation of the caustic chlorine plant of the company. The matter was brought before the court through a public interest litigation. The management was directed to deposit a sum of Rs. 20 lakh by way of security for payment of compensation claims of the victims of Oleum gas leak with the Registrar of the Court. In addition, a bank guarantee for a sum of Rs. 15 lakh was also directed to be deposited which shall be encashed in case of any escape of chlorine gas within a period of three years from the date of the judgement resulting in death or injury to any workman or any person living in the vicinity. Subject to these conditions the court allowed partial reopening of the plant.

Legislative Measures

Environmental legislations are vast, undefined, exciting and glamorous. They are vast because of the various subjects and projects that lie within their ambit. They are mostly undefined in the sense of their rules. They are exciting in the newness of some of the techniques. They are glamorous in the media publicity which they often receive.

Prior to 1974 the only recourse available to citizens against pollution of any nature was under the provisions of the Indian Penal Code, the Criminal Procedure Code and the Civil Procedure Code. Suits claiming damages for tortious liability were also possible. However, there were nothing in the nature of regulatory or preventive enactments as far as environmental pollution was concerned. All that the law provided for was to proceed under civil or criminal law after the damage to environment took place.

The procedural requirement of a regular civil court made relief very difficult. Very often cases were lost on account of mere procedural and technical irregularities. It was only in the year 1974 that the Water (Prevention and Control of Pollution) Act, 1974 was enacted. Then the Water (Prevention and Control of Pollution) Cess Act, 1977 and the Air (Prevention and Control of Pollution) Act, 1981 was passed.

Until 1981, the legislation with regard to environmental pollution was drawn up piecemeal. Moreover, even these legislations were mostly punitive in nature and not very much preventive. Whatever little regulatory measures were provided for in the laws were never implemented. There was no clear demarcation of powers of the various authorities under the Acts and this often led to confusion.

The Environment (Protection) Act, 1986 was the first comprehensive legislation with regard to environmental pollution. It evoked encouraging response and support from all environmental groups. It was widely acclaimed as the first legislation to tackle all aspects of problems of pollution. But the Act itself was a major disappointment as it was not very comprehensive in its scope and was not provided with sufficient powers to effectively bring to book offenders and control environmental pollution.

The main laws and regulations on environmental pollution which are presently being administered by the State and Union Governments and the State and Central Pollution Control Boards are :

- i) The Water (Prevention and Control of Pollution) Act, 1974 (amended in 1978 and 1988).
- ii) The Water (Prevention and Control of Pollution Cess Act, 1977 (amended in 1991).
- iii) The Air (Prevention and Control of Pollution) Act, 1981 (amended in 1987).

iv) The Environmental (Protection) Act, 1986.

v) The Public Liability Insurance Act, 1991.

The Water Act and the Air Act

Water being a State subject, the Water Act, 1974 was passed by the Parliament under Article 252(1) of the Constitution of India. This Act was initially applicable to those States which had passed enabling resolution under the above Article authorising Parliament to enact on a State subject.

The Water Act is said to be a comprehensive Act providing for prevention and control of water pollution and for maintaining and restoring of wholesomeness of water streams and wells. The definition of 'stream' includes rivers, water course (flowing or for time being dry), inland water, subterranean water, sea or tidal waters to such extent notified by the State Government.

The Air Act is a Central legislation passed by the Parliament under Article 253 of the Constitution of India in pursuance of the decision taken at the Stockholm Conference on human environment held in June, 1972 where India actively participated. It was first enacted in 1981 and subsequently amended in 1988. Air being a subject under the Union list of the 7th Schedule of the Constitution, the Air Act automatically becomes the law of the land.

The Central and the State Pollution Control Boards are the creations of the two Acts whose functions are also defined under the Acts. These Boards enforce the two Acts within their territorial jurisdictions. The State Boards enforce them within the geographical boundaries of the State. The Central Board, not only enforces the Acts inside the Union territories, it has some overriding powers over the State Boards. The State Boards function under the overall guidance and direction of the Central Board.

The main provision of the two Acts is the provision of grant of 'Consent' by the respective Boards. Consent of the State/Central Board is necessary under the Water Act for an industry or local body to discharge effluent (or sewage) to any stream, well or on land (Sections 25, 26 and 27). Similarly consent under the Air Act is necessary to establish or operate an industrial plant in an 'air pollution control area' declared by the Government (Section 21). After receipt of Consent application, the respective Board lays down conditions of discharge of effluent/emission including prescription of quantity of discharge of effluent/emission their treatment methods and standards for their quality. The Board can also give directions where consent does not exist.

The Pollution Control Boards have also powers to move a Court for restriction/restraint for apprehended pollution as preventive measures (Section 33 of the Water Act and Section 22A of the Air Act). In an extreme case, a Pollution Control Board can give directions to any person, officer or authority in the interest of pollution control, which include powers to direct (a) closure, prohibition or regulation, (b) stoppage or regulation of supply of electricity, water or any other service (section 33A of the Water Act and Section 31A of the Air Act).

Failure to take consent and violation consent conditions makes the occupier liable for severe punishment under both the Acts. The punishment prescribed is imprisonment of one and half years to six years with unlimited fine. For minor violations of the Acts, such as failure to provide information, obstructing personnel of the Board from discharging their duties etc, the penalty prescribed is imprisonment upto 3 months or fine of Rs. 10,000 or both. Very severe punishments are provided under both the Acts for continued violation after first conviction (Sec. 41 to 45A of the Water Act and Sec 37 to 39 of the Air Act.)

In the latest amendments of both the Acts, public has been given right of access to certain information relating to Consent conditions imposed by a Board (Sec 49 (2) Water Act and Sec 43(2) Air Act) and a citizen can file a complaint to the court against any polluter after giving a notice of 60 days to the prescribed authorities (Sec 49(1) (b) of the Water Act and Sec 43 (1) (b) of the Air Act).

The Water (Prevention and Control of Pollution) Cess Act, 1977 and the Public Insurance Liability Act, 1991

The Water Cess Act, 1977 (amended in 1991) was enacted to augment the resources of the various Pollution Control Boards through cess for water used. Incentives for establishment of proper pollution control set-ups in industries were provided in the way of rebate.

The Public Insurance Liability Act, 1991 provides for immediate relief to sufferers of pollution to some extent in emergent cases through a compulsory insurance policy.

To keep the paper under manageable limit, the above two Acts have not been discussed.

The Environment Protection Act

As already mentioned, there are a large number of Central and State legislations having direct or indirect provisions for environmental protection enforced by different departments/agencies of the Government (the Ministry of Environment and Forests has prepared an illustrative, not exhaustive, list of such Acts numbering 88). In order to clearly define the roles of different authorities in matters of environmental protection, entrust additional overriding powers to the Central Government for overall planning of environmental protection, enforce various other aspects of safeguard of environment like handling and management of hazardous substances which are not included in the Water and the Air Acts, a Central umbrella Act, called the Environment (Protection) Act, was passed by the Parliament in 1986 under Article 253 of the Constitution of India.

The various overriding powers acquired by the Central Government under this Act include (i) laying down standards for emission or discharge of pollutants from various sources whatsoever or laying down standards for quality of environment in its various aspects (Sec. 3(2) (iii) and 3(2) (iv) ; (ii) restricting areas in which industries, operations and processes may not be carried out subject to certain safeguards (Sec. 3(2) (v); (iii) laying down safeguards for prevention of accidents and remedial measures (Sec. 3(2) (vi) in case of such accidents; (iv) laying down procedures and safeguards for handling hazardous substances (Sec 3(2) (viii); (v) issuing of directions to any person, officer or authority including the power to direct closure, prohibition or regulation of supply of electricity, water or any other services (Sec. 5). Taking powers under this Act (Sec 6 & 25), the Central Government has identified the authorities to enforce protection of different aspects of the environment. These include the Central and State Pollution Control Boards, State Governments, Factory Inspectorates, Port Authorities, Collectors of revenue districts etc. Similarly as per provisions in Sections 6, 8 & 25, it has also formulated rules for proper import, transport and storage of hazardous substances and handling and disposal of hazardous wastes.

This Act, like the amended Water and Air Acts, confers powers on persons to complain to the Courts for violation of provisions of the Act, after giving notice of 60 days to the prescribed authorities (Section 19b):

Penal provisions for violation of the Environment Protection Act are very stringent. A violator can face imprisonment upto 5

years and a fine upto Rs. 1,00,000. For continued violation the imprisonment can extend upto 7 years and additional fine upto Rs. 5,000 per day can be imposed.

EFFECTIVENESS

Difficulties of Enforcement Under the Present Legal System

Violations of the Water (Prevention and Control of Pollution) Act, the Air (Prevention and Control of Pollution) Act and the Environment (Protection) Act are cognizable offences having very stiff penalties of imprisonment with (*not* or) fine. Indian Jails are yet to see a polluter (although the first of the three Acts was enacted as early as 1974). Nor the environment has become substantially cleaner.

The respective Pollution Control Boards and the Central Government (or agent authorised by it) who are the enforcing authorities can file cases against the offenders of the Water and the Air Acts and the Environment Protection Act respectively in a lower court not below that of the rank of First Class Judicial Magistrate. These cases are tried as ordinary criminal cases. As such, the onus of proof of offence (pollution) beyond any iota of doubt lies with the prosecution. Often witnesses are required to be produced. In such a situation, to secure conviction of the offender becomes difficult. This situation is also true with all criminal cases in India with respect to other Acts.

The procedure of legal action is such that, more often than not, it takes a very long time for disposal. It is known that thousands of cases, major and minor, remain pending at any moment of time in any court of Judicial Magistrate. Water, Air and Environment Acts have no provision indicating priority disposal of cases. Further, if punished in a lower court, the defendant has right to appeal to a higher Court. This delays administration of law and in the process, pollution continues. The Supreme Court of India in a recent judgement advised for speedy disposal in pollution control cases. It will take some time for the wisdom of the Supreme Court to trickle down to lower courts.

It is again realised that in many cases, the lack of technical knowledge in the trying judges makes them unable to appreciate fully the scientific and technical evidences of pollution of environment and related matters.

To add to the above difficulties of regulating agencies in securing conviction of pollution offenders, a company manager can always afford to pay for an efficient and competent lawyer for

his defence, whereas a regulating agency like the Pollution Control Board, restricted by rules and financial constraints, cannot do so.

It is not to say that the officials of regulating agencies are free of their weaknesses and frailties. Corruption in public life and public service is a malady widespread in many countries including India. Regulating agencies/departments are particularly susceptible.

It is quite well-known by now that in India (as probably in other developing countries as well) domestic and city sewage constitute the bulk (about 80%) of the total waste water generation. In India, only 8 out of total 142 Class I cities and 5 out of 192 Class II cities have fullfledged sewage treatment facilities. Actually in practice, they are not properly operated most of the time. Thus, large volumes of untreated domestic sewage ultimately find refuge in rivers and other water bodies. It is almost an established fact that in a large number of cases, this is the only cause of river water pollution in India. Despite such deplorable situation, the urban local bodies, whose responsibility is to discharge domestic sewage after treatment, have not shaken off their inaction and indifference. They are, in any case, incapacitated by financial insolvency, corruption and inefficiency. With this clause of offenders may be bracketed a number of public sector undertakings whose affairs are governed by the Central and the State Governments. For obvious reasons, the Pollution Control Boards (a substantial number of whose members are government officials) find it difficult to bring these polluters to task. The Pollution Control Boards, as will be discussed later, are in fact not as independent as they are thought to be.

The sweeping powers given to the Pollution Control Boards and the Central/State Governments to order closure or stoppage or regulating of electricity, water supply etc. under the Water Act (Sec. 33A), the Air Act (Sec. 31A) and the Environment Protection Act (Sec 5—this power is vested with the Central Government but has been delegated to some State Governments) are in fact difficult to implement. When this hard decision is required to be taken, various other considerations like employment, law and order, economic factors etc come in, particularly with respect to large industries. It becomes a difficult choice between two evils environmental degradation versus large scale unemployment and starvation. To cite a few examples, most of the thermal power plants belonging to the State Electricity Boards, all integrated steel plants belonging to the Steel Authority of India Limited (SAIL) still

continue to be polluting in nature as many of their effluents and emissions do not meet the required standards. Is it practicable to close down such industries that employ several thousand persons? It is not surprising that in most cases where industries have closed down because of such orders, belong to the small scale sector. Even in these cases, if the orders of the Pollution Control Boards are not executed, the Boards have no option but to go to the Court of Law for prosecution of the person responsible for noncompliance of Board's orders to be tried again as a criminal case. Besides the person or authority against whom such order is served, can go for a writ petition in the High Court and thus the legal merry-go-round continues, defeating the original objective. Moreover, such closure orders have no relevance or meaning in case of urban local bodies, who are the greatest water polluters.

The non-point sources of pollution of streams and lakes like run-offs from agricultural fields containing fertilisers, pesticides etc., bathing and defecating on river banks are very significant in India. The Water Act, or in that matter, any other law, cannot address to this problem unless the various practices and cultural habits of people change.

As regards prosecution for air and water pollution offences, the Environment Protection Act, 1986 is ineffective. Section 24(2) of the Act reads as follows :

"Where any act or omission constitutes an offence punishable under this Act and also under any other Act, then the offender found guilty of such offence shall be liable to be punished under the other Act and *not* under this Act."

The water and air pollutions are covered in the Water and the Air Acts respectively. The enforcing agencies for the same have been identified and punishments for offences under those Acts have been clearly spelt out. One can, therefore, interpret that where Water and Air Acts are applicable, Environment Protection Act cannot be applicable or at least, the enforcing agency of the two Acts, namely the Pollution Control Board, cannot enforce the Environment Protection Act. Offences of 'causing nuisance', 'fouling water' etc which include pollution, are covered in the Indian Penal Code (IPC) and the Criminal Procedure Code (Cr PC). Therefore, one may be tempted to go a step further, albeit with caution, to interpret section 24(2) of the Environment Protection Act to exclude the operation of this Act against such offences.

Other Acts that Can be Made Better Use Of

So much so about the difficulties of the Pollution Control Boards to penalise offenders under the existing judicial system. It should be borne in mind that the duties of the Boards are not confined to only prosecution against polluters. Nor the pollution control laws have been enacted only to provide stiffer penalties, for the same could have been achieved by amending the appropriate sections of the IPC and the CrPC. Some sections of the IPC relating to public nuisance found in Chapter XIV can be applicable to environmental degradation, in general and air and water pollution, in particular. They are Sections 268 (public nuisance), 269 (negligent act likely to spread infection of disease dangerous to life), 277 (fouling of water of public springs and reservoirs), 278 (making atmosphere noxious to health), 285 (negligent conduct with respect to fire or combustible matters), 286 (negligent conduct with respect to machinery) etc. The term public nuisance, in which pollution can be included, has been dealt in Chapter X of the Cr PC, 1873. Section 133 of the Cr PC provides a list of public nuisance persons empowered to deal with such cases, the manner of passing conditional orders etc. This Section is very handy and convenient to handle nuisance because it empowers the District Magistrate or Sub-divisional Magistrate or any other Executive Magistrate, specially empowered, to initiate proceedings on receiving report from police or from any other source, take evidence as thought fit or necessary and make conditional order for removal of nuisance within a time limit. In spite of this it is found that the district administrations often refer all cases of pollution nuisance to the Pollution Control Boards, shying away from their statutory powers and responsibilities.

The aforesaid pollution control legislations such as Water Act, Air Act and Environment Protection Act are not as comprehensive as thought to be.

Take the example of noise pollution. The Air Act and the Environment Protection Act cannot be effective to prevent and control noise pollution. The only mention of the word 'noise' in the Air Act is at Sec 2(a) giving definition of the term 'air pollutant'. It is defined as :

"any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment."

It is known from elementary physics that noise is not a material substance but a type of vibration with a certain amount of

energy and information associated. Noise pollution caused by an industry is in most cases confined to the work environment and not felt in the general environment outside. The pollution in the work environment affects the workers and its prevention and control is covered in the labour laws. Noise pollution in a locality is often mainly caused by the use of loudspeakers during special functions, religious ceremonies, election campaigns etc. Most States have local laws for the regulation of the use of loudspeakers, fire crackers etc. but they are very rarely enforced. Control of noise caused by motor vehicles (e.g., use of silencers etc.) is covered in the Motor Vehicles Act. The source of a community noise causing nuisance can easily be removed by the Executive Magistrate through Section 133, CrPC. The Air Act and the Environment Protection Act cannot be effective for the prevention and control of noise pollution. In any case, this has not been court-tested.

Under most Municipality Acts, the municipal council owns all public drains and is vested with responsibilities of construction and maintenance of drainage system within the municipal area. The municipal council has also control over private latrines and connection from private latrines to the municipal drains. Thus it appears, for the purpose of enforcing the Water Act, that the total municipal area should be taken as a single unit. It is the responsibility of the municipal council to ensure that the total waste water discharged to outside the municipal limits to any water body or on land should meet the prescribed standards of the Pollution Control Board and consent should be taken under the Water Act for such discharge. Any discharge to the municipal drain within the municipal limits should be controlled through the Municipality Acts. If the present provisions in the Municipality Acts are inadequate for the purpose, necessary amendments should be made.

Another area where the Air Act may not be very effective to enforce pollution control is the dust pollution in mining areas. In a large number of mining areas, the dust is fugitive and does not emanate from any chimney or duct. Any legal action a Board might take against a mining industry will therefore be for violation of the ambient air quality standard. The dust in the ambient air comes from many sources including the mining process, vehicular traffic on unmetalled road etc. It is very difficult to pinpoint the source without any doubt in criminal cases. The Mines and Mineral (Development and Regulation) Act, 1957, for which the enforcing authorities are the State and the Central Governments, will be very effective to prevent and control environmental degradation, including air and water pollution, in

a mining industry. Sections 4a(1), 4a(2), 18(1) and 18(2) of the Act empower the Central and the State Governments respectively to cancel the mining licence where serious environmental degradation occurs. It may be mentioned here that the main environmental degradation caused by mining activities is land degradation. Air and water pollution are comparatively lesser evils.

The vehicular pollution is recognised as the main cause of air pollution in many urban metropolitan areas. India has the distinction of having three of the ten worst polluted cities of the world. The Air Act only provides for the fixation of standards for vehicular emission by the Pollution Control Boards (Sec 17 (1) (g) and Sec. 20). Most of the State Boards have already done so and the standards have been notified. The various Motor Vehicles Acts have by now incorporated provisions for enforcements of the standards. The Central and the State Governments, and not the Pollution Control Boards, are the authorities for enforcement of provisions of the Motor Vehicles Acts. This is carried out through the officers of the Transport Departments like the Motor Vehicle Inspectors (MVI's), Regional Transport Officers (RTO's) etc. However, apart from fixing the standards, the Pollution Control Boards extend helping hands to transport authorities by way of monitoring vehicular pollutions, providing necessary training to officials etc.

It is clear from the preceding discussions that the four pollution control legislations, viz., Water Act, Air Act, Water Cess Act and Environment Protection Act are not effective to prevent and control all types of pollutions. Provisions of other Acts are more effective in specific types of pollutions. Unfortunately, it is observed that such provisions are rarely used. The general public is not aware of them

Government's Interference in Affairs of Pollution Control Boards

The State Pollution Control Boards are entrusted with multifarious activities connected with pollution control like enforcement, research, training, information dissemination, policy making, planning etc. The legislative intent is that the Boards are autonomous organisations having functional powers, although the term 'Board' has no definite legal connotation. The concept of the term 'Board' varies from the nature of the user of the phrase and context in which it is used. The term 'Corporation' has a legal juristic entity, distinct and apart from the members constituting it. It is a corporate sole having perpetual succession. A Pollution Control Board, created under the Water Act and the Air Act, can be considered as a corporation. The Sub section 3 of Section

4 of the Water Act reads as "Every State Board shall be a body corporate..... by said name". It is seen that often the State Governments give direction to the State Pollution Control Boards in day-to-day functions by the way of approval for creation of posts, financial control etc and the State Boards meekly submit to such directions. Going through the different provisions of the Water and Air Acts it can be seen that, except for Section 18(b) of the Water Act, as well as the Air Act, the powers of the State Government over the State Board are limited to the following: (a) make notification constituting the Board (Section 4 of the Water Act and Section 5 of the Air Act). (b) removal of membership with limits specified thereunder (Section 5(3) of the Water Act and Section 6(2) of the Air Act), (c) supersession of the Board (Section 62 of the Water Act and Section 47 of the Air Act), (d) power to make rules (Section 64 of the Water Act and Section 54 of the Air Act) and (e) power to revise the order of the Board under Sections 25, 26 and 27 of the Water Act (Section 29 of the Water Act—such power does not exist under the Air Act). Section 18(b) provides that 'in performance of the functions under the Act', every State Board shall be bound to such directions of the Central Board and the State government and when such directions of the Central Board and the State Government are different, the matter will be referred to the Central Government and the decision of the Central Government will be final. Thus the direction under this Section can only extend to matters of importance and such order must ex-facie purport to be in exercise of the statutory powers. If this provision is construed widely, it will amount to conferring powers to the State Government to meddle with the Corporation in its day-to-day functions which is opposed to the very concept of Corporation.

Appointment of Chairperson and Members

It is the chairpersons who are to a large extent responsible for surrendering the autonomy of the Pollution Control Boards before the Government. In the absence of any guidelines for the selection of a Chairperson, it is seen that the posts of Chairpersons are more and more filled by bureaucrats from the State Governments. The Boards in the process have become extension of State Government administration. The Water Act has laid down the qualification of the Chairman as "being a person having special knowledge or practical experience in respect of matters relating to environmental protection or a person having knowledge and experience in administering institutions dealing with matters aforesaid" vide Section 4(2) (a). The same qualification mentioned in the Air Act is that the Chairman shall be a person "having special knowledge or

practical experience in respect of matters relating to environmental protection" vide Section 5(2) (a). While the wording of the qualification gives a wide scope to the State Government for selecting a Chairperson, the legislative intention is to nominate an environmentally knowledgeable person, if not a specialist, but not a generalist, in the position. While this is not intended to *per se* object to the nominations of a person belonging to any Central or State Government service—in fact, some Boards headed by IAS officers have performed very well—it should not be considered as a mere 'posting' for any cadre of service. There should be clearcut guidelines for the selection process of both the Chairperson and the Member-Secretary.

The composition of the State Pollution Control Boards is not conducive for bold and independent functioning. Apart from the Chairperson and the Member-Secretary, who are appointed by the Government, the State Board consists of officials of Government (not exceeding five in number), members of local authorities nominated by the Government (not exceeding five in number), two persons representing companies and corporations owned by the Government and non-officials (not exceeding three in number) representing interests of agriculture, fisheries and industry (Section 4(2) of the Water Act and Section 5(2) of the Air Act). Thus the Board is dominated by officials of the Government and Government undertakings. Public representation is only limited to 3 out of the total of 17 (representation of urban local bodies may not be considered as public representation; any way, very often they remain superseded and are under Government's direct control). No non-Governmental organisation (NGO) is represented. It is true that there are a large number of NGO's large and small—concerned with environment but bonafides of many are not completely overboard and therefore, the choice of NGO for the Pollution Control Board is difficult. There are also NGO's like the INTACH whose bonafides and knowledge cannot be questioned. All over the world, the NGOs have played a vital role in generating environmental consciousness.

Involvement of Individuals and NGO's

As already mentioned the Water and the Air Acts in their amended forms and the Environment Protection Act have provided for individuals to make complaints in a court of law against a polluter subject to giving 60 days' notice to the appropriate authority. These provisions have been incorporated in the Acts to ensure that

not taken advantage by the Polluters. Not many individuals or organisations have come forward to prosecute polluters under the above provisions. It may be because individuals also face the same difficulties as the Pollution Control Boards and other regulations agencies to achieve conviction of polluters. In fact, their difficulties may be more because of relatively much less resources available at their disposals.

It is, however, heartening to note that over the last few years, committed individuals and citizen groups have been combating bureaucratic and managerial apathy to environmental degradation by invoking Article 21 of the Constitution through writ petitions in various High Courts and the Supreme Court. The higher Courts of the country generally adopt a liberal attitude towards such petitions. These individuals and organisations have fought and are still fighting a number of public interest litigations and have been spearheading some major ecological movements of the country. It is common experience that the court proceedings in such matters attract considerable media coverage and hence general interest of the lay public, leading to greater social awareness and mass education. So far, most of the actions by the citizens' groups have been in the area of ecology in general and public interest litigations in a more technical matter of environmental pollution have been relatively less. Most of the landmark judgements giving directions to the Governments for specific actions for the protection of the environment have been through public interest litigations.

Conclusion

Notwithstanding the success of some important public interest litigations and ecological mass movements, it has become necessary to take some measures to make the pollution control laws more effective and more visible. An obvious remedy is to remove the limitations of Pollution Control Boards, as outlined earlier, by suitably amending the procedural technicalities to make them simpler and workable.

Litigation involving matters related to environment are different from conventional litigation. It warrants expertise from diverse disciplines. The nature of relief and redressals sought from Courts are usually different from those in civil and criminal cases. Effective adjudication in these matters requires a true interaction among science, law and societal needs. One answer to

this complex problem may be to establish multi-disciplinary Courts with judges drawn from judiciary, scientists and public men. They should enjoy some freedom with regard to procedure and dispensation of justice should be quick or, at least, should not be delayed as is experienced now.

State support (more than what is available at present) in terms of providing necessary legal aid to all public interest litigation involving environmental pollution, in principle, should go a long way in encouraging individuals and non-Government organisations to bring to the Courts many more offenders who have not been taken to task by the Pollution Control Boards willfully or otherwise. But such measures, however, are fraught with danger of being misused by overzealous activists or vested interest groups. With all our concern for the environmental protection, it must be admitted that during the last one decade or so, there have been a phenomenal growth of amateur arm-chair 'environmentalists' who tend to bring such highly technical matter of environmental pollution to an emotive level.

Without meaning to cast any aspersion, it must be stated that the judiciary, particularly the lower judiciary, who at present have the onerous responsibility of adjudicating alleged violation of the pollution control laws should be environmentally more enlightened and educated. They should not hesitate or consider it demeaning to learn new things like some technical aspects or pollution, deforestation etc. After all, at present, there is no dearth of laws in the Indian statute books. What we need is their effective enforcement and undisputedly the judiciary plays the most crucial role in this.

Doubts have come in the minds of some environment conscious people on the wisdom of trying offenders of various Pollution Control Acts, like any other ordinary criminal of theft, rape or murder. More than a decade of experience has shown that this has not delivered the desired results. It is perhaps not fair to equate a polluter, like the manager of an industry, with an ordinary criminal. This observation is made on two grounds. First, a polluter like a factory manager does not normally commit such offences for his personal gain and his offence is more an act of omission or negligence than commission. Secondly, in fixing of corporate responsibility in respect of culpability of a statutory offence, is it fair to hold an administrative functionary like the

manager responsible for the offence, when in effect, a horde of other people also have a say (sometimes more decisive) in the affairs of the factory? This is, of course, a debatable point and quite a good number of people hold the contrary viewpoint.

In the ultimate analysis, any stringent law, however good it may be, will not be effectively enforced without strong political will and sufficient administrative and financial back up. The obvious choice between a strict law with slack enforcement and a slack law with strict enforcement, is the latter.

ENVIRONMENTAL LAW : SOME REFLECTIONS

DR. BHARAT DESAI*

The diagnosis of environmental problems at the historic first U.N. Conference on the Human Environment¹ unleashed a spate of administrative and legislative measures in both developed as well as developing countries. The smouldering ecological crisis has provided an impetus to the centralization² of law-making process at international level, as increasing number of international environmental agreements have taken shape. The volume of 'soft law', through standard-setting process by states, has also gone up manifold.

The regulatory mechanism evolved by the international community to address environmental problems has heralded a sound body of international environmental law. Several regional organizations³ have also set in motion environmental regulations

* Assistant Professor, International Legal Studies Division, School of International Studies, Jawaharlal Nehru University.

Industrial Pollution : A Case for Developing Countries

*Dr. Clement M.P. Oniango**

Introduction

As the quest for modernization through industrialisation reaches the climax, industrial pollution which is a sad state of environmental degradation becomes a concomitant reality of the said process. This process is what the author of this article with refer to as the *inappropriate paradigm of development with destruction*—a paradigm not geared towards a holistic, sustainable process of development by the population of developing countries. In this paper, it will be argued that populations of developing countries *must* develop a new and appropriate paradigm of development *without* destruction (industrialise without industrial pollution). This is a paradigm geared towards a holistic, sustainable, self-reliant, equitable and participatory process of development for all developing countries in the world for the survival of their species on earth. But one might ask : how can this be achieved ?

*Dean, Faculty of Social Science, University of Nairobi, Kenya.

The first step is that while we are industrialising now, we must look at ourselves now and not beyond the present generations. Second, we must learn to look within our national boundaries as we seek for meaningful sustainable industries of development. At the same time, we must keep cognisance of the dire need for feasible solutions to the pressing global environmental concerns of today. We shall call this collective responsibility is shaping our common destiny. Much of this collective responsibility will hinge upon our success in radically transforming the existing consumption patterns, life-styles, production as well as distribution schemes, individual actions and attitudes, as well as changing our present socio-economic and political structures of power and decision making.

While we are acting locally in our development plants of industries we must invoke the maxim of thinking globally. Why? Because while we struggle with environmental problems, we must remember that the said problems respect no national or geographical barriers. The unavoidable dilemma that developing countries must grapple with is that the process of industrialization has built in mechanism rendering the population of these countries "endangered species." If they do not industrialize, they starve but if they industrialize *without care*, they suffocate themselves with industrial pollution. The only solution to this problem is to industrialize *with care*. The existence and destiny of the endangered species of the developing countries will be charted by our own individual and collective actions as well as inactions. In other words our future lies in our own hands and in particular it will be dictated by the seriousness of purpose we shall put our participatory sustainable development by industrialising without destructions.

Factors for Implimentation

The Temporal Factor

It is quite tempting for the members of developing countries to feel that we are behind in pollution by same degree

that we are lagging behind the developed world in terms of industrialization. This may be so in relative terms but does not suggest that we do not suffer from industrial pollution.

It would be bad reasoning to argue that because the developing countries were late in industrialising, they can, therefore, take their sweet time in grappling for solutions to the pressing global environmental concerns of today. In this context, there is simply no point in procrastination with regard to solution to the problem under references—the time to act is now or else we run the risk of self-extinction.

The Right to Life Factor

While it is true that the right to life is the basic right from which all other rights emanate, our duty of guarding and guaranteeing this fundamental right to life for ourselves as well as for the future generations must be seen as our paramount responsibility then we do not deserve the right to life. We must win this right to life through our demonstrated responsibility as custodians or else we forfeit the right to life. This responsibility calls for care and all the life-support systems.

The Numerical Factor

It is noteworthy that the most "endangered species on earth" ... population of the developing countries constitutes more than three fifth of the entire human race ... more than three billion people.¹ This so-called *Third World* should not be taken for granted since a numerical factor of this magnitude, will of necessity, (in the absence of care) have corresponding pressure of demand on earth, such as, the pressure of fulfilment of basic needs. This pressure will continue to build up as these numbers swell, thereby increasing environmental strain and tension. While, in response to these pressures, various industrial kinds of "development" are coming up, millions of destitute people in the developing countries to live in abject poverty. In the name of "progress" or "development", industrial pollution in the developing countries worsen the spiral of poverty and impoverishment

afflicting the millions of the numbers of the developing countries.

According to the UNEP information², the socio-economic and ecological ills, inequalities and imbalances that plague the earth is staggering, both in frequency and in severity both in industrialised and Third World countries as tabulated hereunder :

—Asia has over 50% of the world's farming families, but only 70% of the world's farming families, but only 25% of the world's arable land and over 65% of the world's poor and hungry.

FAO estimates that without effective long-term conservation measures, soil erosion threatens some 544 million hectares of cropland in Third world countries.

In 1988—more than eight years into the UN-initiated "International Water Decade"—nearly 50% of the population in Third world countries were still drinking contaminated water.

With only 25% of the world's population, industrialised countries consume 80% of its natural resources and generated 75% of the estimated 2.5 million trillion metric tons of municipal and industrial wasted produced worldwide annually.

Third world countries account for only 20% of global pesticide use, but account for 50% of the world's pesticide poisonings and 90% of the world's pesticide-related death.

The Third World's external debt crisis is currently estimated at US \$ 1.3 million. By the year 2010, Africa's external debt is estimated to be more than 28% of its total export income. This explains why the developing countries are in dire need and hurry to

industrialise at any cost, even at the expense of industrial pollution.

Of an estimated total area of 2 billion hectares of tropical rain forest worldwide (this is what is known as The Third World (Belt), some 11 to 15 million hectares are estimated to be lost each year—an area equivalent to Austria. In other an area of tropical rain forest equivalent to 20 football pitches is lost from developing countries every single minute. Global deforestation occurs in Brazil, Colombia, Peru, Mexico, Venezuela, Ecuador, Ivory Coast, Nigeria, Zaire, Indonesia, Thailand, Malaysia, India and the Philippines. It is not by coincidence that these 14 countries command 50% of the Third World debt. The charcoal industry in developing countries worsens this situation.

Due to deforestation, 20% of the five to ten million species known to science now are likely to be extinct by the year 2000. If the present trend of species extinction is not curbed, more than 50% of species will disappear in another 50 years. It is in this desperate understanding that the Kenya Government fighting for the survival of special species of our fauna, such as, the *rhino*, *cheetah*, *elephant*, etc. The poaching activities are a menace to this state of affairs.

Given that on the average, each person in an industrialised country consumes eight times as much energy as a person living in the sub-Sahara Africa, the African will be worse off in the near future when the source of energy in Africa will diminish (e.g. fire wood) and become too expensive to be afforded by an ordinary African in the sub-Sahara. Essentially, the constituents of the sub-Sahara Africa will continue to be poorer and poorer with time unless the deteriorating ecosystem is improved.

Industrial pollution affecting natural resources like land, water and forests in developing countries will be a *serious threat* to the constituents of the Third World countries. Why? Because the poorest of the poor in the Third World countries are most dependent directly on natural resources, such as, land water and forests. As stated above, it is this same resource base that is witnessing rapid deforestation, water pollution, soil erosion and extinction of natural species whose extinction will result in imbalance of ecosystem. In addition to all these deteriorations, the Third World countries have geometric population increases which put stress on proportionally decreasing acreage of land which is simultaneously deteriorating.

In pursuit of foreign currency, the developing countries have sought for and received financing for large-scale projects, such as the Mumias Sugar Company,³ the Webuye Paper Mill to name but a few.

The artificial chemical fertilizers, and pesticides in the sugar cane belt in the Mumias area have far-reaching polluting effect on the drinking water, The Webuye Paper Mill in Bungoma has and abominable stench covering 3 to 5 km from the plant; All this is industrial pollution going on without conservation measures. While these large-scale projects are appropriate to the needs of alleviating the standard of living of the Kenyans as well as earning foreign currency as cash crop industries, they pose serious industrial pollution problems which call for arrest.

Other areas of concern that are aggravating environmental degradation are: Slaughter houses which have open trenches leaving blood to flow, again, with abominable stench; Saw mills whose saw dust is dangerous for safe breathing air, open sewage leading to rivers, such as the Nairobi River in the city of Nairobi.

APPROACHES TO SOLUTION

The Education Approach

(Environmental Awareness)

People in the developing countries of the world in Africa, Asia and Latin America should be made aware that millions of poor people in these countries go hungry not necessarily because the world lacks food, but because they lack the means to grow or purchase it. An obsession with industrialization is not the answer to our problem. We need to address ourselves to the factors contributing to their problem, such as, landlessness, Third World foreign debt from industrialised countries.

We need to alert our policy makers that several options could be explored to mitigate our problem of development. For example: better terms of trade between industrialised countries and the developing countries. These terms should be aimed at encouraging farmers in developing countries to grow more food and especially traditional food to satisfy the needs of their own countries. This should be spelled out priority while the export of cash crop is maintained as secondary.

The reallocation of land to the landless poor with priority for food crops for domestic consumption should also be emphasized. There should also be an effort to an end the burden of foreign debt, and a curb of the drain of natural and other resources from developing countries to industrialised countries.⁴

It is common knowledge that the Booker London running the Mumias Sugar Industry in Kenya want their sugar rapidly and cheaply. Their business shares their interest in maximum quick returns. But the rural poor who are indigenous Kenyans who constitute the bulk of the population who sacrifice their land will bear the long-term costs arising from this industry such as, exhaustion of the natural land fertility due to strong

chemical fertilizers, loss of their traditional pattern of agriculture of food crops which is now replaced by luxurious cash crops, pollution of their drinking water due to chemical fertilizers, extended periods of hunger in the year since it takes minimum of 18 months for the cane to be ready and another six months for harvesting.

Participatory Action and Accountability

All groups of people must be seen to participate in the protection of the biosphere: air, water, and earth; we must minimize and safely dispose hazardous wastes common people should dutifully reject their back-yards being used as disposal areas of hazardous wastes by industrialised countries even when their leaders have received kickbacks. Where this has happened "The People" should demand for damage compensation. We should all carry the responsibility of managing our environment.

Ethical Concern For the Environment

Developing countries should take cognisance of ethical considerations for the environment when formulating their national policies for development. They should make sure they are getting a fair deal for their poor nationals when making industrial deals with developed nations, making sure that the following are satisfied:

- : that in quest for industrialization, the health of their nationals is not endangered.
- : that these industries do not cause damage to the environment during manufacture, use or disposal.
- : that they avoid for their industries, materials derived from threatened species or from threatened environments e.g. ivory industries, skin industries etc.
- : that they avoid promoting industries dependent on use or generation of toxic chemicals and hazardous

substances,

- : that they do not hide information to communities concerned about the potential hazards associated with high-risk industries for instance, bodies such as the Kenya Bureau of Standards maintain their integrity in checking and enforcing regulations relating to health and safety of consumers as well as quality of the environment.

Implementation

There is dire need of implimenting all the above suggestions through a fostering and institutionalising body. For the time being, a department or Institute at the University of Nairobi would suffice.

In the Department of Philosophy and Religious Studies, University of Nairobi, we teach Environmental Ethics apart from other Applied Philosophy subjects like Medical Ethics, Business Ethics, etc. We would therefore, like to link with Centre for Environmental Management and Planning with a view of fostering research, dissemination of knowledge on environmental issues to the public as well as Policy Makers, organising symposia on these issues and above all participating in activities nation wide regarding Environmental Management and Planning. This suggestion will, if accepted and endorsed, will go a long way in implimenting the ideals Environmental Management and Planning in Kenya which, like many developing countries *must* industrialise. We want Kenya to industrialise without destroying itself. It is only through such an Institute that Kenya will be guided to avoid the mistakes the North made in their process of industrialization. Kenya needs a *New Vision*; a vision to industrialise with a *conscience*. This Institute will work hand-in-hand with Kenya government which is against bribery and corruption.

The Institute will, for example, formulate theoretical and practical models around questions, such as:

- (a) "Are our industries ethical?"
- (d) "Do the manufacturing companies engage in business practices which take advantage of lenient legal, social and environmental regulations in our host country as compared to the strict regulations existing in the companies' home country?"
- (c) Do the companies engage in malpractices like bribery and corruption?"⁵
- (b) "Is the production ecological does the production process care for the environment?"
- (e) Do the business enterprises qualify to be judged for their social responsibility by the following criteria;
- (i) that they respect the environment?
 - (ii) that they are mindful of and sensitive to the Kenya cultural diversity? If it is a cash crop industry will it undermine the traditional food crops?
 - (iii) that they will be accountable through disclosure of information?
 - (iv) that they will be relevant to the needs of the local community?
There have been cases of large-scale projects which have proved inappropriate to both the needs and the local conditions of developing countries...thus aggravating environmental degradation, natural resource depletion and socio-economic disparity.
 - (v) that they will enforce employment policies and fairness to workers including health and safety standards in the workplace.

- (vi) We shall propagate a prescriptive philosophy alerting the policy-makers to make laws to guide business enterprises to conduct themselves socially and ecologically responsible in producing and marketing their products.
- (vii) We shall high-light for the full implementation of the United Nations "Guidelines on Consumer Protection" and adoption of the "UN Code on Transnational Corporations."

Conclusions

In this paper an attempt has been made to show that industrial Pollution is a reality especially in any society where man is constantly searching hungrily for new profits. It has happened in the industrialised North. But we *must* minimise it in the industrialising South. Unless we take up this responsibility, we are threatened of extinction. We must act now if we expect to survive tomorrow. All of us must participate in this exercise. I have proposed that we institutionalise this process by establishing the Institute of Environmental Studies and Management at the University of Nairobi to be housed initially in the Department of Philosophy and Religious studies where we currently teach Environmental Ethics. This Institute, it is observed, will have objectives of Research, Action, Policy and Participatory orientation for the welfare of the earth, man, and constructive industrialization.

References

1. The New Universal Library, Volume III, International Learning Systems Corporation Ltd., London, 1969.
2. See UNEP/WHO *Agricultural Residues; Environmental Pollution Control*, WHO Offset Publication 30, ISBN 92 4 1700300 65 pp 1976.
3. See Oniang'O.C.M.P. (et al) *The Socio-Economic Profile of the Mumlas Sugar Scheme*, 1987, Nairobi, Kenya.

4. See H. Knop (ed) *Environmental Management* UNEP/II UNEP/II ASA (1975) and also V. Ranganathan (1977) *Environmental Policies and their Implication for Trade and Development: A Case for India*, UNCTAD FP/0404-78-03. Both authors discuss definitions of Environmental Management, the strategy of environmental management in relation to the countries affected: criteria for assessment and evaluation of impact.
5. Daniel T. arap Moi, *Kenya African Nationalism Nyayo Philosophy and Principles*, Macmillan Publishers, 1986.

Environment and Sustainable Development

Radhamohan*

It seems to be a fraternal conflict. The words ecology and economics although owe their origin to the same Greek word 'OIKOs', i.e. habitat or household are at loggerheads for a long time. Contradictions between the two arose due primarily to the market orientation and myopic considerations. 'Economic development appeared to go hand in hand with ecological destruction'.¹

Hence for a long time economic development and conservation of environment were considered incompatible. Only recently it is realised more and more that environment and development are only two sides of the same coin and development efforts cannot be sustained without a deep concern for conservation of natural resources. It is also increasingly acknowledged that humans constitute only a part of the great web of life and the well-being of the human beings and well-

* Senior Scientist, Department of Science and Technology, Govt. of Orissa, Bhubaneswar.

Air Pollution in Agra

Many cities in India have crossed the limits of suspended particulate matter, sulphur dioxide and other pollutants due to vehicular and industrial emissions. Agra, the city with three World Heritage monuments, has also its share in such mis-happenings. The monument lovers through public interest petitions have achieved a breakthrough in the Apex Court which has given judgements, decisions and even got inspection conducted to control the environmental pollution, encroachments and possible elements which are detrimental to preservation of Taj Mahal.

1. To create a green buffer zone, the tree plantation around Taj has been given priority to reduce pollution. Thousands of tree plantation exercises have been undertaken by the forest department, Archaeological Survey of India and Uttar Pradesh department of gardens.
2. Agra city has a population of 1.2 million and gets about 1.8 million tourists annually. Agra city and the surrounding area have about 5.5 million people and attracts about 7 million pilgrims & tourists annually. This entire area is called Taj Trapezium. With the court orders, all brick kilns which are coal based have been closed to control pollution. Though the brick cost has gone up by more than 2.5 times in the recent past, the exercise is worthwhile for better preservation of this wonder of the world.
3. Some of unauthorized structures and high structures are being dismantled around Taj as a result of the court order. Even the police station has not been spared.
4. The refinery, about 40 km from Taj, has been fined in first instance for delay of implementation of pollution measures but subsequently it has been ordered to build a hospital for pollution patients. The court has also ordered the refinery to reduce the emission of pollutants.
5. In a recent judgement, 292 coal-based industrial units have been asked to switch to gas-based fuel or close down by the 30th of April 1997.
6. Many industrial units have already faced closure of operation in the absence of installing the anti-pollution measures as ordered.
7. To protect the inlay work, railing barricades have been erected in the main mausoleum of Taj.
8. The general cleanliness of Agra city has been ordered.
9. The vehicles are being strictly checked for pollution.
10. The vehicular traffic around Taj has been banned. The parking is kept at a safe distance.
11. Battery operated buses are plying from Taj to take visitors to short distance to make their travel less tiring but without pollution.
12. Declaring Agra as a heritage city has been taken up in the court and the judgement in this respect is expected in the near future. [*]
13. Inspection for implementation of time bound programme for all above are being done by high-level teams sponsored by the Apex Court to assess the implementation of its judgements and observations.

Compiled by CHANDUR BHATIA, FELLOW OF INSTITUTION OF ENGINEERS(INDIA)

Lynn Garry Salmon <>{

Controlling Industrial Pollution

A New Paradigm

Shakeb Afsah

Benoît Laplante

David Wheeler

Conventional discussions of pollution regulation in developing countries have been too shallow — devoting inordinate attention to the choice of instrument while ignoring the preconditions for applying any instrument effectively. They have also been too narrow — focusing only on the interaction of state and factory, and ignoring the role of the market and the community.

The World Bank
Policy Research Department
Environment, Infrastructure, and Agriculture Division
October 1996



CONTROLLING INDUSTRIAL POLLUTION: A NEW PARADIGM

SHAKEB AFSAH
BENOIT LAPLANTE
DAVID WHEELER¹

¹ Shakeb Afsah and Benoit Laplante are Consultants and David Wheeler is Principal Economist in the Environment, Infrastructure and Agriculture Division of the World Bank's Policy Research Department. This paper could not have been written without the contribution of David Witzel and numerous inputs from our colleagues in PRDEI. Our thanks to Michael Bruno, Lyn Squire and Zmarak Shalizi for useful comments. In addition, we would like to express our gratitude to our many collaborators in the pollution control agencies of Brazil, China, India, Indonesia, Mexico and Philippines.

1. Introduction

Factories in developing countries exhibit great variety in environmental performance despite the widely acknowledged weaknesses of the regulatory framework. Even in the poorest countries, some plants would satisfy OECD emissions standards. Similarly, a great variety in environmental performance is observed in developed economies.

These facts create a problem for conventional thinking about controlling industrial pollution. Given the weaknesses of the regulatory framework in developing countries, plants should treat the environment as a 'free' input and undertake no effort to control emissions. On the other hand, factories in societies with stronger regulatory agencies should generally be in compliance with the standards. Since neither conclusion is consistent with the facts, we must question the premises and develop a new paradigm for understanding the performance of industrial polluters.

Our current research is addressing this problem in six large developing countries. By establishing partnerships with environmental agencies in those countries, we have been able to observe regulator-polluter relationships at first hand.² Our experience as 'participant-analysts' has revealed the limitations of the conventional regulatory model, and suggested a number of significant directions for revision. This paper summarizes our findings to date, along with the potential implications for regulatory policy.

First, it is clear that the basic assumptions which support the model of 'optimal regulation' -- full information and zero transactions costs -- are not met in practice. This undermines the implementation of both traditional command-and-control regulation and economic instruments. Secondly, we find that the regulator is not the sole source of pressure on plants to improve their environmental performance. Local communities and market agents also play important roles. As an alternative to the traditional view, we therefore propose a model of interactions linking four agents: plant, state, community and market. This model focuses on the *process* that leads to efficient levels of pollution, rather than on *a priori identification* of the optimum point by state regulators.

To illustrate the main features of our model, we present findings from two recent studies. Our analysis of China's non-compliance fee (or levy) for water polluters highlights the effect of local conditions on the actual enforcement practices of regulatory agencies. When viewed through a non-traditional lens, practices commonly criticized as symptoms of 'inefficient administration' appear closer to optimal behavior. In a second study, we

² The six countries are: Indonesia, Mexico, Brazil, China, Philippines and India. Our agency partners are **BAPEDAL** (National Pollution Control Agency), **Indonesia**; **INE** (Instituto Nacional de Ecologia), **Mexico**; **CETESB** (Pollution Control Agency of Sao Paulo State), **Brazil**; **FEEMA** (Pollution Control Agency of Rio de Janeiro State), **Brazil**; **NEPA** (National Environmental Protection Agency), **China**, Tianjin Environmental Protection Bureau, **China**; and **DENR** (Department of Environment and Natural Resources), **Philippines**. We are also collaborating with the Pollution Control Boards of eight Indian states in a nationwide survey of the environmental performance of Indian factories.

analyze Indonesia's recently-introduced program for public disclosure of environmental performance ratings for factories. There is no room for such a program in the traditional model, but we explain why it may strongly affect polluters in a world of multiple agents and multiple incentives.

Finally, we argue that the new paradigm has important implications for regulatory policy. Regulators lose their role as sole enforcers, but gain the potential for greater effectiveness through new policies which leverage the power of communities and markets. We suggest five key principles that can form the basis for structuring environmental agencies and their program design and implementation.

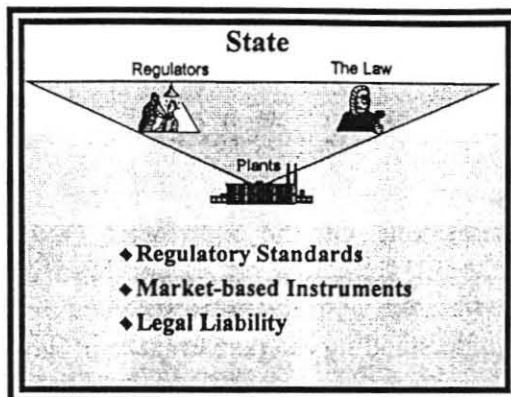


Figure 1a

2. The Traditional View of Regulation

Figure 1a presents the classic paradigm for analyzing pollution control issues. Here the State holds center stage, with two principal agents -- Regulators and The Law -- expected to set and enforce rules of environmental behavior. In keeping with this understanding of the problem, the policy analysis literature has focused on appropriate roles for 'ex ante' regulation (standards vs. market-based instruments) and 'ex post' liability claims by injured parties.

Figure 1b provides the conventional view from the perspective of environmental economics. Pollution (N) is measured on the horizontal axis and costs (\$) are measured on the vertical axis. In this textbook view of the problem, the regulator can quantify the increase in Marginal Social Damage (MSD) as the pollution level rises. There is also sufficient information to quantify increases in Marginal Abatement Cost (MAC) as polluters reduce their emissions. The regulator determines 'optimum pollution' at point N^* , where $MSD = MAC$.

The regulatory problem in this world is straightforward: Having determined N^* with full information, the regulator seeks to attain it by using command-and-control (mandating factories not to pollute above a determined level) or market-based instruments (setting a pollution charge P^* , or allowing factories to trade pollution permits within the limit N^*). Able to enforce at will because transactions costs are zero, the regulator simply dictates the terms and the factories respond appropriately. By assumption, the central regulator is and should be the sole

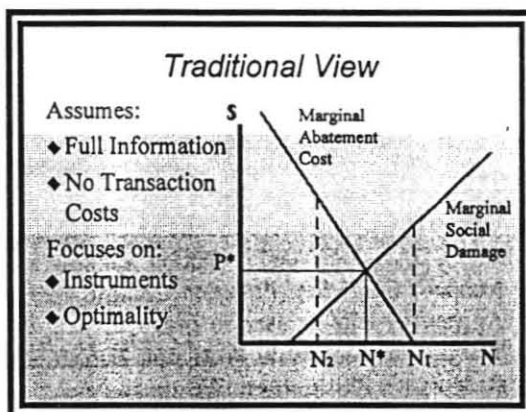


Figure 1b

decision agent in such a world.

As environmental economists, we support the view that optimum pollution is an appropriate concept for regulation. We also believe (and are working with our partner agencies to demonstrate) that pollution charges and tradable pollution permits can be effective regulatory instruments *under the right conditions*. However, our research and field experience have convinced us that the conventional regulatory approach does not pay sufficient attention to defining the right conditions.

3. Strengthening the Foundations

Indeed, it would be impossible for us to defend some basic tenets of the conventional model to our agency partners. They would not know what to make of assumptions like 'full information' and 'zero transactions costs.' These are not just 'approximations' under developing-country conditions; they are dangerous chimeras which can divert attention and scarce resources from real agency problems to grandiose programs which have no chance of working. Let us be more specific:

3.1 Information and Transactions Costs

Our partner agencies are plagued by problems with:

- **Information:** Monitoring quality is frequently so poor that compliance with regulations is difficult to assess. Fragmentary data on factory emissions and ambient quality are often non-computerized, and closely held by separate agency units charged with different responsibilities. Information on abatement costs is almost never available.
- **Bureaucracy:** The air and water quality monitoring units frequently don't talk to each other, nor do they share information with those monitoring air and water emissions.
- **Human and technical resources:** Agencies generally have little capacity for assessing the net benefits of alternative programs and using the results to establish priorities for allocation of scarce resources. Few trained inspectors are available, and it is impossible to monitor more than a modest fraction of polluting factories.
- **Political support:** Serious enforcement frequently encounters potent political resistance.

To summarize, life in our partner agencies is one long encounter with limited information and high transactions costs.

3.2 First Things First

Under such conditions it is extremely difficult to implement any pollution control program, including market-based instruments. Indeed it would be pointless, and ultimately counterproductive, to advocate large-scale implementation of pollution charges or tradable permits under conditions which practically guarantee their failure. Near-term policy problems are more pressing and should be addressed first:

- Identification of the small group of serious polluters which the agency can regulate effectively with existing resources;
- Mobilization of political and community support for meaningful action;
- First-stage development of an integrated information system with good quality control;
- Establishment of ambient quality targets for polluted air- and watersheds; linkage to pollution reduction measures applied to target polluters;
- Use of simple cost-effectiveness principles in the reform of licensing and inspection procedures;
- Development of internal capacity for priority-setting using integrated information systems;
- Small-scale pilot experimentation with new regulatory instruments (charges, permits, public disclosure, etc.)

If successfully implemented, these “simple” steps will lay the necessary foundations for more sophisticated pollution control strategies. Without them we are likely to witness a demoralizing series of failures, as fancy programs attempt to lift off with no launching pad.

4. Broadening the Vision

We have argued above that a regulatory approach based on inappropriate assumptions about information and transactions costs has distracted policy analysts from the real implementation issues in developing-country agencies. At a more general level, we would also argue that the traditional view of regulation is misguided because its focus is too narrow. Conventional policy discussion has focused almost exclusively on interactions between the **State** and the **Plant**. However, our research has suggested powerful roles for two additional ‘players’: the **Community** and the **Market**.

4.1 The Community

Recent evidence from Asia, Latin America and North America suggests that neighboring communities can have a powerful influence on factories' environmental performance. Communities which are richer, better educated, and more organized find many ways of enforcing environmental norms. Where formal regulators are present, communities use the political process to influence the tightness of enforcement. Where formal regulators are absent or ineffective, 'informal regulation' is implemented through community groups or NGOs.

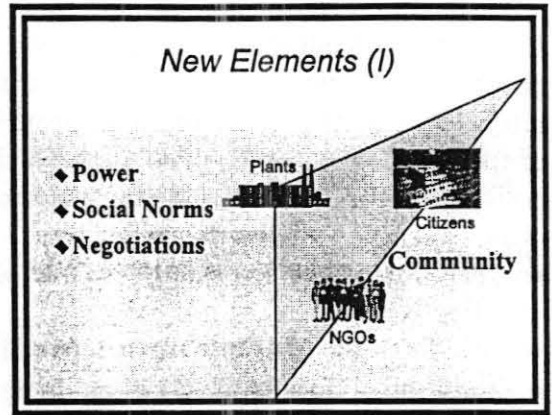


Figure 2

The agents of informal regulation vary from country to country -- local religious institutions, social organizations, community leaders, citizens' movements or politicians - - but the pattern is similar (Figure 2): Factories negotiate directly with local communities, responding to social norms and/or explicit or implicit threats of social, political or physical sanctions if they fail to reduce the damages caused by their emissions. In countries as different as China, Brazil, Indonesia and the US, much of the variation in factories' environmental performance is explained by inter-community variation in income, education and bargaining power.³

4.2 The Market

Factories operate in local, national and international markets, where many agents can affect revenues and costs (Figure 3). Environmental considerations now affect the decisions of many of these agents. In both industrial and developing countries, environmentalism in the middle and upper classes is a significant factor in consumer decisions. With the worldwide advent of environmental legislation, investors are also scrutinizing environmental performance. Among other factors, they have to weigh the potential for financial losses from regulatory penalties and liability settlements. In recent years, the importance of investor interest has been increased by the growth of new stock markets and the internationalization of investment. For similar reasons, international and

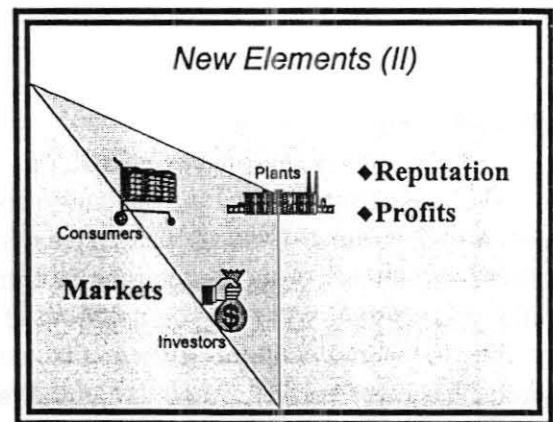


Figure 3

³ For evidence from Asia, see Pargal and Wheeler (1996), Hettige, Huq, Pargal and Wheeler (1996), Huq and Wheeler (1993), and Huq, Hartman and Wheeler (1996). Evidence from Brazil and Mexico can be found in Wheeler and Witzel (1995) and Hettige and Witzel (1996).

local suppliers of financing, industrial equipment, and engineering services are increasingly reluctant to do business with flagrant polluters.

Recent evidence from both the OECD and developing countries suggests that environmental reputation matters for firms whose expected costs or revenues are affected by judgments of environmental performance by customers, suppliers, and stockholders.⁴ Many factors can affect firms' evaluation of their environmental reputation, including company size, export orientation, and multinational ownership. For reputationally-sensitive companies, public certification of good or bad performance may translate to large expected gains or losses over time.

4.3. Multiple Agents, Multiple Incentives: A New View of Regulation

Once the Community and the Market are introduced, we have a much richer and more robust model for explaining the observable variations in factories' environmental performance. Clean factories are perfectly plausible in poor countries, and the survival of dirty factories in rich countries is not hard to understand. In place of the paired State/Factory model of regulation, we therefore propose the 'Regulatory Triangle' which is depicted in Figure 4.

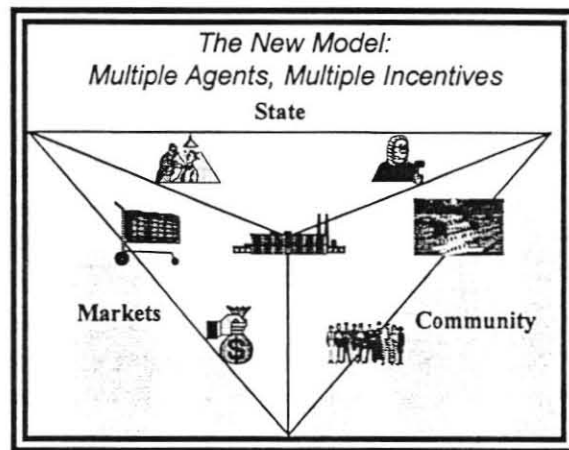


Figure 4

Once we introduce a world of multiple agents and multiple incentives, we must also rethink the regulator's appropriate role in pollution management. No longer is this role confined to producing, monitoring and enforcing rules and standards. Instead, the regulator can gain leverage through non-traditional programs which harness the power of communities and markets. Within the 'triangular' regulatory framework, for example, there is ample room for information-oriented approaches such as voluntary participation/compliance programs⁵ and public disclosure of factories' environmental performance. A broader implication is that one size no longer 'fits all' for regulatory policy design: Optimal combinations of regulatory tools will depend on country-specific social, economic and institutional conditions.

What does this expanded view of regulation mean in practice? To draw out some of the implications, we will summarize the results of recent collaborative projects with the National Environmental Protection Agency of China (NEPA) and the National Pollution Control Agency of Indonesia (BAPEDAL).

⁴ See Arora and Cason (1994), Hamilton (1995), Hettige, et. al. (1995) and Laplante and Lanoie (1994).

⁵ See Afsah, Laplante, and Makarim (1996) for a discussion of PROKASIH, Indonesia's river management program.

Case 1: China's Pollution Levy

China's pollution levy is one of the few economic instruments with a long, documented history of application in a developing country. Article 18 of China's Environmental Protection Law specifies that "in cases where the discharge of pollutants exceeds the limit set by the state, a compensation fee shall be charged according to the quantities and concentration of the pollutants released". At present, approximately 300,000 factories are monitored and potentially subject to levy collections by national, provincial and local regulators.

Although the levy experience has not previously been analyzed systematically, a number of case studies have suggested that the system is poorly administered, that enforcement is largely arbitrary, and that the system is ineffective in controlling pollution. We recently tested this view of the levy system in a collaborative project with NEPA and the Bank's Country Department EA2, using a new database which records the experience of 29 Chinese provinces and urban regions during the period 1987-1993.⁶ We studied the water pollution levy because its implementation and impact were well-documented in the information available to us. Our econometric analysis focused on explaining variations in two province-level measures: Industrial emissions intensity (provincial emissions/output) for chemical oxygen demand (COD -- a common measure of organic water pollution) and the *effective* water pollution levy rate (provincial levy collections for above-standard wastewater discharge/total above-standard wastewater discharge). Differences in factory-level monitoring and enforcement can cause the *effective* levy rate to vary widely across provinces.

The official levy rate determined by the national government applies uniformly across China. However, Figure 5 shows that the *effective* levy rate varies significantly across provinces. More importantly, the pattern of variation is not random: Effective levies are much higher in urbanized/industrialized provinces of the country, particularly in the eastern coastal regions.

Large increases in the official levy since 1987 and significant variations in enforcement have also created a strongly-differentiated pattern of pollution intensities across provinces and over time. We have estimated that from 1987 to 1993, provincial COD intensities fell at a median rate of 50% and total COD discharges declined at a median rate of 22%.

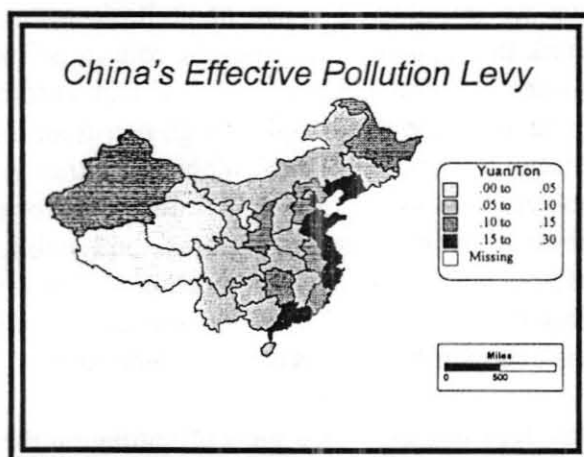


Figure 5

⁶ Wang and Wheeler (1996)

Hence, contrary to the conventional wisdom, our results suggest that the water pollution levy has been neither arbitrarily administered nor ineffective in China. As shown in Figure 6, two sets of local factors make significant contributions to explaining variations in the effective levy. The first, reflecting the principles of environmental economics, is local valuation of pollution damage. This has three components: total pollution load; size of exposed population; and local income. The second is community capacity to understand and act on local environmental problems, indexed by measures of information, education and bargaining power.⁷



Figure 6

Our results are consistent with the multiple-agent model. Lacking the appropriate information for determining optimal pollution levels in each province, the national government sets the official pollution levy at a 'reference level' and lets officials in each province trade off the costs and benefits of *effective implementation*. The implications of this result are very clear: The uniform implementation of uniform standards and/or levy rates is not optimal; local conditions determine what these should be.⁸ Thus, while enabling national environmental authorities in developing countries is an important objective, institutional strengthening programs should also recognize that much of the action takes place (and rightly so) at local levels.

Case 2: Indonesia's Public Disclosure Program

Enforcement of formal regulation in Indonesia is currently weak, and the modest size of the regulatory budget assures that this weakness will persist in the near future. However, manufacturing is growing at over 10% annually, and the Indonesian Government recognizes the mounting risk of severe pollution damage. Faced with this dilemma, Indonesia's National Pollution Control Agency (BAPEDAL) has decided to initiate a program for rating and publicly disclosing the environmental performance of Indonesian factories. BAPEDAL hopes that pressure on factories from public disclosure will provide a low-cost substitute for formal enforcement of the regulations, and create incentives for the adoption of cleaner technologies.

⁷ Results of a similar nature have also been observed in Canada and the United States. For more details, see Deily and Gray (1991), and Dion, Lanoie and Laplante (1996).

⁸ Our results do not imply that current effective levies are optimal. Provincial regulators do not have all the requisite information, nor do they have the capacity for a full assessment of this information. In addition, constraints imposed by low levels of community education or organization may reduce the pressure on local regulators to enforce at optimal levels. However, our results do suggest that provincial effective levies reflect significant elements of self-interest, and are closer to optimum arrangements than has commonly been supposed.

In late 1994, BAPEDAL invited us to participate in the design, implementation and analysis of the public disclosure program. The Bank's Policy Research Department and Country Department EA3 agreed to support the project. After six months of intensive work by the BAPEDAL/PRD team, Indonesia's Vice President Tri Sutrisno introduced the program to the public in June, 1995. It is called PROPER -- Program for Pollution Control, Evaluation and Rating (or PROPER).⁹

In PROPER, a polluter is assigned a color rating based on BAPEDAL's evaluation of its environmental performance (Figure 7). A Blue rating is given to factories which are in compliance with national regulatory standards; Gold is reserved for world-class performers, and Black for factories which have made no attempt to control pollution and are causing serious damage. Intermediate ratings are Red, for factories which have some pollution control but fall short of compliance; and Green, for factories whose emissions control and housekeeping procedures significantly exceed those needed for compliance.

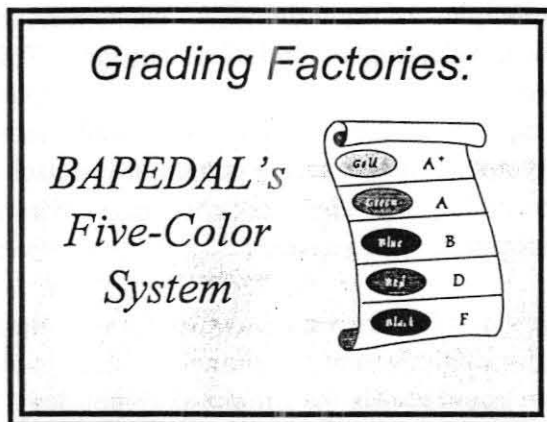


Figure 7

Why might PROPER be expected to have a significant impact on pollution? We turn to the regulatory triangle model (Figure 8) for an explanation. First, while we have noted a pervasive pattern of 'informal regulation,' or **community** influence on polluters' behavior, our findings also suggest that information problems may distort communities' perceptions of their pollution problems. For example, it is often easy to see (and/or smell) the impact of organic water pollution or sulphur oxide air pollution. However, emissions of bioaccumulative metals and toxins are likely to escape notice. Even where pollutants are clearly visible, local communities frequently cannot gauge the severity of their long-run impact. In addition, communities downstream from polluting industrial complexes often have difficulty identifying individual culprits.

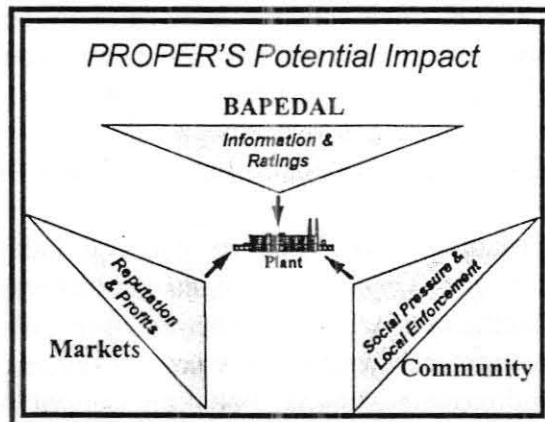


Figure 8

Public disclosure offers significant empowerment to local communities in this context. Armed with government-certified performance ratings, they are in a much stronger position to negotiate pollution control agreements with neighboring factories.

⁹ For more details, see Wheeler and Afsah (1996).

Secondly, from the **market** perspective, PROPER provides a novel application of 'incentive regulation' principles. Traditional regulation has been plagued by an important principal-agent problem: Regulators need good data about firms' performance, but firms have clear incentives to withhold such information. Incentive regulation follows traditional practice by penalizing non-compliance with regulatory standards. However, it also addresses the agency problem by rewarding superior performance. This improves the regulators' information by encouraging good performers to identify themselves. It also provides competitive incentives for superior performers to help the regulators identify poor performers, since the latter will be penalized by disclosure.

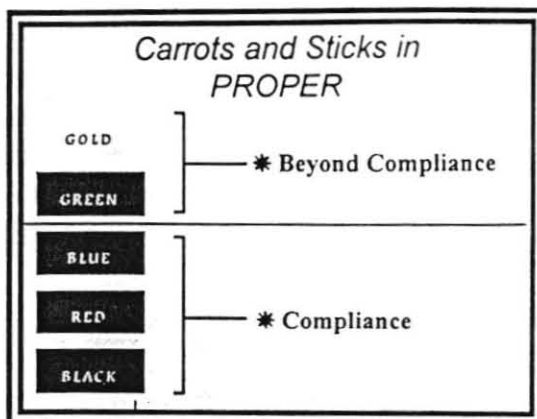


Figure 9

PROPER is expected to work in a similar manner. For non-compliant firms, BAPEDAL expects that the program will provide an enforcement 'stick' which costs less than conventional procedures. The program also offers important 'carrots' in the form of Green and Gold ratings. BAPEDAL hopes many firms will conclude that the reputational value of Green or Gold status will warrant the costs associated with cleaner production. Moreover, it is important to note that because of PROPER, the Agency subjects itself to scrutiny and creates incentives to improve its performance through transparency. Hence, while an information release program may create incentives for polluters to improve on their environmental performance, it also creates incentives for the Agency to improve on its ability and capacity to collect and process information.

In the pilot phase of PROPER, 187 plants were rated. When the program was officially launched in June 1995, only the names of the five Green plants were publicly announced. The 121 plants rated as Red or Black were privately notified, and given until December 1995 to improve their performance. Full disclosure was implemented on December 29; the pilot-phase results are displayed in Figure 10. They suggest that PROPER's short-term impact as a 'stick' has been substantial. Before full disclosure in December, half the Black plants made successful efforts to upgrade their status, along with a substantial number of Red plants.

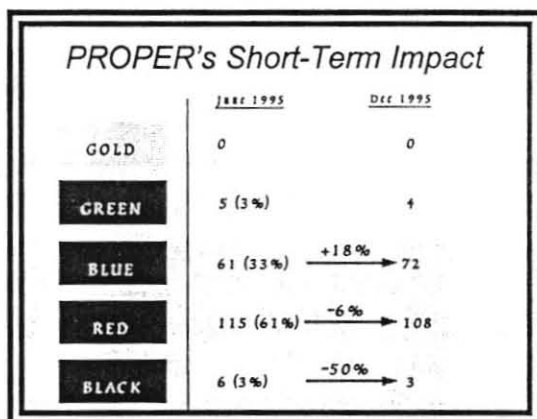


Figure 10

No short-term impact is observable in the 'carrot' range, but this is not surprising. Attaining Green or Gold status will require longer-term investments, while rapid

installation of basic abatement equipment can be sufficient to promote escape from a Black rating.

Though preliminary, these results from PROPER suggest that industrial polluters respond to the incentives created by multiple agents. Since the state is not the sole actor, it is important for regulators to recognize that their role is not strictly limited to that of enforcer. In fact, they have access to a much larger set of instruments. Further research will be needed to determine the conditions under which these instruments will reinforce or substitute for one another.

5. Toward a New Paradigm

In this paper, we have emphasized two points of departure for a revised model of regulation. First, we think that the traditional emphasis on 'appropriate instruments,' while ultimately correct, is premature because most developing-country agencies have too many information and transactions cost problems to implement any instruments in a comprehensive manner.

First things first: Once regulators have higher-quality information, more integrated information systems, more internal capacity for priority-setting, and a stronger public mandate, it will not be difficult for them to manage pollution more cost-effectively. Overly-hasty introduction of market-based instruments will not work, and is likely to discredit these potentially-powerful regulatory tools.

Secondly, the new model of regulation should relegate the regulators to their proper place in the larger scheme of things. The environmental performance of factories is determined by the interactions of multiple agents, with multiple incentives. Although the **State** can and should have a continuing role in the regulation of pollution externalities, the importance of the **Community** and the **Market** must also be recognized.

When these two sets of factors are taken into account, a different model of regulation emerges. In our view, appropriate regulation for developing countries should incorporate five key features:

- **Information Intensity:** Effective pollution management by the **State** is impossible unless regulators have reliable data, integrated information systems and the capacity to set priorities which reflect comparative benefits and costs. **Markets** and **Communities** need timely, accurate, public information to make appropriate assessments of factories' environmental performance. An effective regulatory

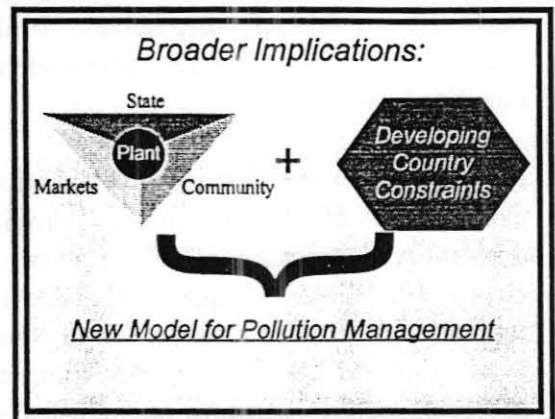


Figure 11

agency will therefore allocate fewer resources at the margin to conventional enforcement and more to the generation and distribution of appropriate information products.

- **Orchestration, not Dictation:** A pollution control agency is only one player in the environmental performance game. Agency activities which influence polluters *indirectly*, through other agents, may be as important as direct enforcement. Potentially high-leverage programs include community environmental education; public disclosure of factory performance ratings; voluntary, public agreements for pollution reduction by industry groups in environmentally-degraded regions; and technical training programs for environmental personnel in polluting factories.
- **Community Control:** This should be accepted as a current reality, not as the goal of future programs. And in fact, a substantial role for local communities is appropriate from the perspective of environmental economics. Regardless of the state of formal regulation, local 'informal regulation' is stronger in areas with higher pollution loads, larger affected populations and higher incomes. We also find independent effects for local education and bargaining strength. Taken together, our findings have three implications.
 1. Strengthening central regulatory agencies should not empower them to impose uniform standards on heterogeneous communities under the guise of 'administrative efficiency.' Much local variation in regulation is legitimate, and should be recognized as such.
 2. Regulatory agencies can play a key role in facilitating negotiations between local communities and neighboring factories. This role includes provision of reliable information on emissions and local ambient quality; technical advice on abatement alternatives; and the transfer of experience from other locations.
 3. Central regulators can use their authority to 'level the playing field' for communities which are excessively polluted because their lack of education, organization and bargaining power prevents them from negotiating effectively with local factories.

We hope that these ideas will help promote a richer policy dialogue with our partner countries, better project opportunities and, ultimately, better pollution management.

References

- Afsah, S., B. Laplante and N. Makarim, 1996, "Program-Based Pollution Control Management: The Indonesian PROKASIH Program", Policy Research Working Paper 1602, World Bank.
- Afsah, S., and D. Wheeler, 1996, "Indonesia's New Pollution Control Program: Using Public Pressure to Get Compliance", **East Asian Executive Reports**, 18, 6, 9-12.
- Arora, S., and T. N. Cason, 1994, "A Voluntary Approach to Environmental Regulation: The 33/50 Program", **Resources**, Resources for the Future, Summer 1994.
- Deily, M.E., and W.B. Gray, 1991, "Enforcement of Pollution Regulations in a Declining Industry", **Journal of Environmental Economics and Management**, 21, 260-274.
- Dion, C., P. Lanoie and B. Laplante, 1996, "Monitoring of Pollution Regulation: Do Local Conditions Matter?" World Bank, Policy Research Department (mimeo).
- Hamilton J. T., 1995, "Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data", **Journal of Environmental Economics and Management**, 27, 1, 38-48.
- Hettige M., M. Huq, S. Pargal and D. Wheeler, 1996, "Determinants of Pollution Abatement in Developing Countries: Evidence from South and Southeast Asia", **World Development** (forthcoming).
- Hettige M., M. Singh, S. Pargal and D. Wheeler, 1995, "Patterns in Pollution Intensity: Formal and Informal Regulation of Industrial Pollution in the U.S. and Indonesia," presented at the Annual Meetings, American Economic Association, Washington, D.C., January 1995.
- Hettige, M. and D. Witzel, 1996, "Pollution Control Priorities for Mexico", World Bank, Policy Research Department (mimeo).
- Huq, M., and D. Wheeler, 1993, "Pollution Reduction Without Formal Regulation: Evidence from Bangladesh," World Bank, Environment Department Working Paper 1993.
- Huq, M., R. Hartman and D. Wheeler, 1996, "Why Paper Mills Clean Up: Survey Evidence From Four Asian Countries," World Bank, Policy Research Department Working Paper (forthcoming).
- Laplante, B. and P. Lanoie, 1994, "The Market Response to Environmental Incidents in Canada: A Theoretical and Empirical Analysis," **Southern Economic Journal**, 60, 3, 657-672.

Pargal, S., and D. Wheeler, 1996, "Informal Regulation in Developing Countries: Evidence from Indonesia," **Journal of Political Economy** (forthcoming).

Wang, H., and D. Wheeler, 1996, "Pricing Industrial Pollution in China: An Econometric Analysis of the Levy System," World Bank, Policy Research Department Working Paper (forthcoming).

Wheeler, D. and D. Witzel, 1996, "Development, Regulation and the Fate of Sepetiba Bay," World Bank, Policy Research Department (mimeo).

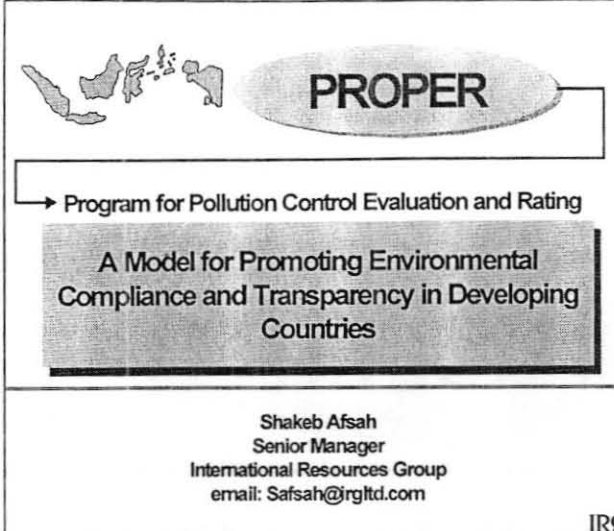


PROPER

→ **Program for Pollution Control Evaluation and Rating**

**A Model for Promoting Environmental Compliance
and Strengthening Transparency and Community
Participation in Developing Countries**

**Shakeb Afsah
International Resources Group Ltd.
Washington DC**



PROPER

→ Program for Pollution Control Evaluation and Rating

A Model for Promoting Environmental Compliance and Transparency in Developing Countries

Shakeb Afsah
Senior Manager
International Resources Group
email: Safsah@irg ltd.com

IRG

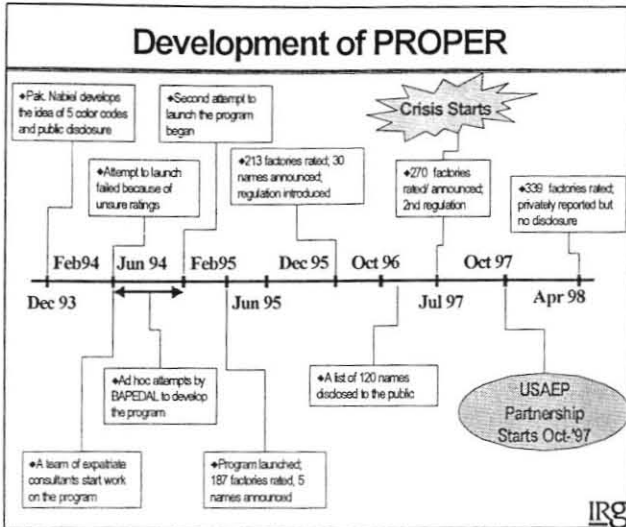
In June 1995, Indonesia became the first developing country to introduce a public environmental reporting initiative, the Program for Pollution Control, Evaluation, and Rating (PROPER). Under PROPER, industrial enterprises are evaluated by the Environmental Impact and Management Agency (BAPEDAL), Government of Indonesia, for their environmental performance. The results, in the form of a five-color rating scheme, are reported to the public through press conferences and the Internet. The five colors—gold, green, blue, red and black—reflect performance ranging from excellent to poor.

This presentation first describes PROPER's policy framework, a simple but powerful concept. The second section describes the design and implementation issues, highlighting the need for accuracy and data quality control. The third section presents the impact of PROPER on improvements in compliance and environmental impacts from pollution reduction. Next, PROPER comes into perspective by comparing it with command-and-control (CAC) approach and ISO 14000. In conclusion the key features of PROPER are summarized.

Presentation Outline

- Policy Framework
- Design Issues and Implementation
- Results
- Comparative Analysis of PROPER
- Conclusion

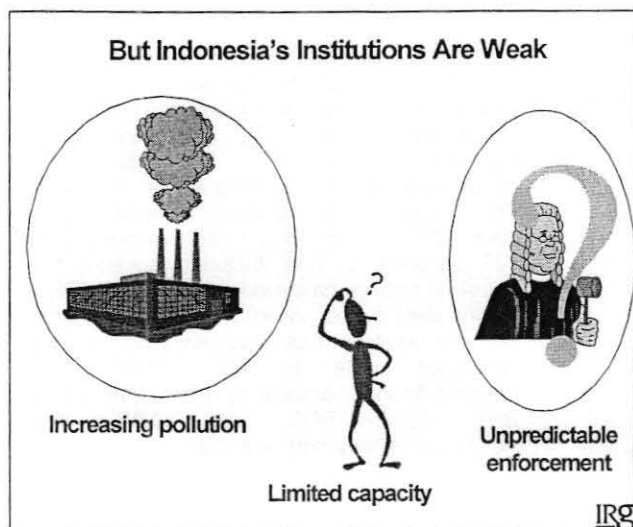
IRG



PROPER was conceived by Mr. Nabel Makarim in 1993, then Deputy for Pollution Control at the Environmental Impact and Management Agency (BAPEDAL). It was first attempted to be launched in June 1994, but data quality concerns postponed the program for one year. The program was successfully introduced in June 1995, and by 1998, it had expanded from 187 factories to 350 factories covering 27 industrial sectors nationwide. Initially, PROPER ratings were based primarily on water pollution, but the system has expanded to include hazardous waste, as well. PROPER has received financial assistance through the World Bank, USAEP/USAID, and Canadian and Australian development agencies.

Since the 1980s, Indonesia has had a CAC system for environmental management. Even after the revision of environmental standards in the late 1980s, there was little improvement in compliance. Around 1993, Mr. Makarim was keen to reform the existing environmental management system. He had two options - further strengthen the CAC system or adopt a market-based instrument like pollution charge. But, he had doubts about the success of these instruments in Indonesia.





Because BAPEDAL had limited financial and technical capacity, there were doubts about whether or not compliance standards could be successfully implemented. This problem was further exacerbated by a weak judicial system at the provincial level. Further, there was problem of governance.

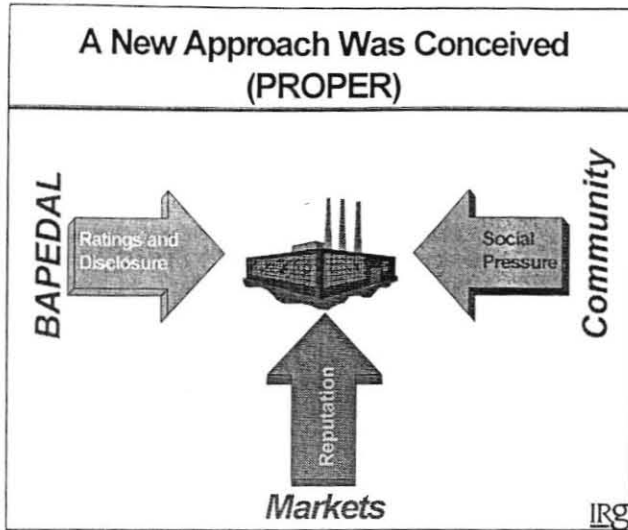
A careful analysis of the CAC and Market - Based Incentives (MBIs) revealed four key requirements for successful implementation: 1) environmental regulations must be good, 2) the overall legal system should facilitate enforcement, 3) judiciary and public agencies should have the political will to undertake credible enforcement, and 4) environmental agencies must have adequate financial and technical capacity. CAC programs in OECD countries were successful because they were strong on all the four requirements. But, in Indonesia, the overall legal system, public accountability and governance were weak. Since CAC and MBIs cannot fix these problems, Indonesia clearly needed a new approach.

Concerns about Command & Control and MBIs

Key Components	US, Europe- pre 1970	US, Europe- 70s/80s	Indonesia- Current	India, Philippines
Environment Specific Regulations	Weak or didn't exist	Strong	Moderate	Strong
National Legal System	Strong	Strong	Weak	Strong
Public Accountability	Strong	Strong	Weak	Weak
Technical & Financial Capacity	Inadequate	Adequate	Inadequate-Moderate	More or less adequate
Readiness for CAC and MBIs	Required environ. laws, tech. & fin. capacity	Ready to enforce effectively	Requires broader legal reform & political will	Requires stronger political will

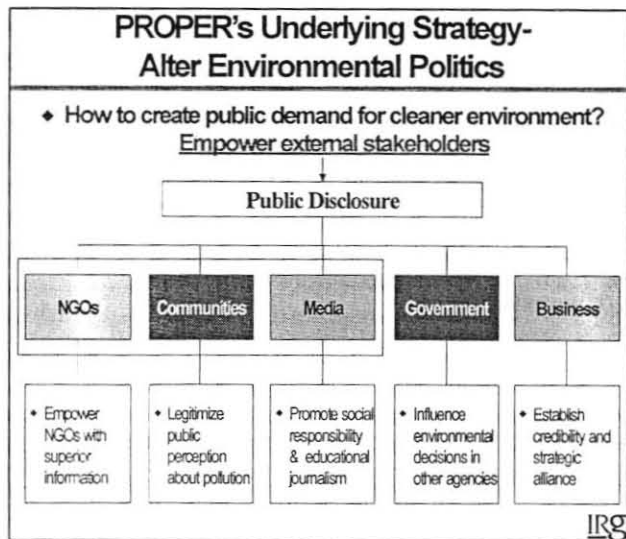
Requires long time to fix

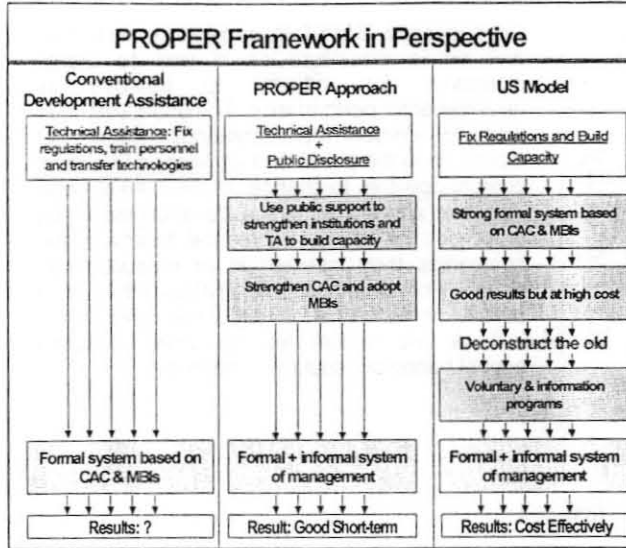
IRG



Consequently, BAPEDAL decided to use ratings and public disclosure as a way to create incentives for industry to improve its environmental performance. The underlying idea was to disclose environmental ratings of industries to the public and let honor and shame compel polluters to change. In the marketplace, investors and consumers were expected to be influenced by the environmental quality of the companies they invested in or products they bought. For communities and NGOs, information on environmental performance strengthened the informal mechanism through which pollution control behaviour could be influenced.

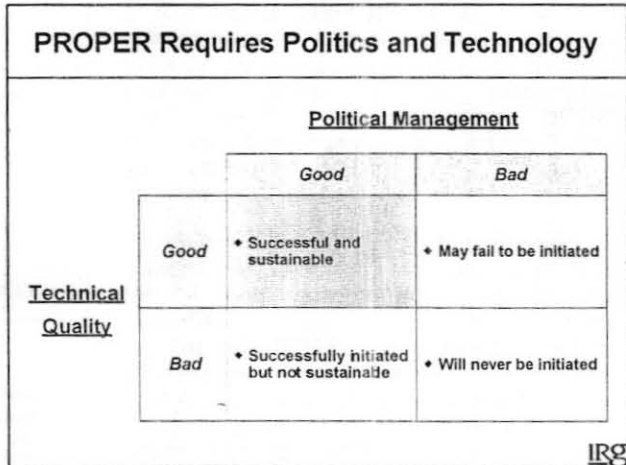
A closer look at PROPER shows that it embodies a powerful strategy for strengthening relationships with three important external stakeholders: non-governmental institutions (NGOs), communities, and the press. These three groups are empowered by the environmental information provided by regulators. Armed with credible information on environmental performance, NGOs, communities, and the media now can effectively exert pressure on polluters to improve performance. In the process, these interest groups become important allies of BAPEDAL, thereby strengthening BAPEDAL as an institution. Such public support then provides strong political incentive for BAPEDAL to take bold enforcement actions. By recognizing the businesses that out-performed their peers, PROPER also generated private sector support.

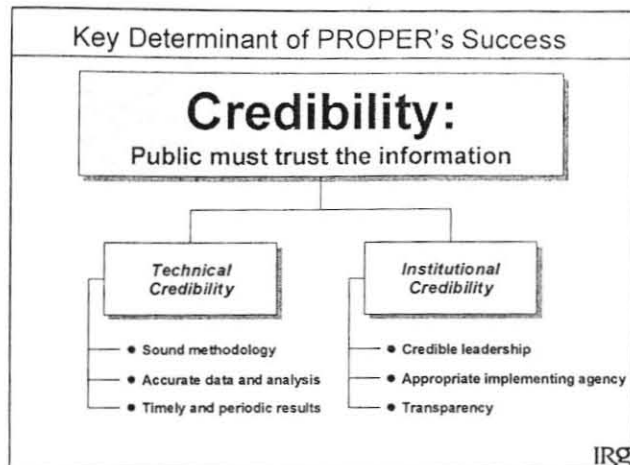




PROPER's approach clearly encourages environmental agencies to have both formal and informal strategies for creating incentives for polluters to improve their environmental behavior. Interestingly, the development of this type of an environmental agency resembles the changes underway in the US environmental system. However, changes in the U.S. have resulted from shedding some of the formal characteristics acquired over the last 20 years of environmental institution building. In contrast, the conventional technical assistance approach used by most development agencies still promotes the creation of highly formal structures. Thus, PROPER offers a new way to build environmental institutions in developing countries.

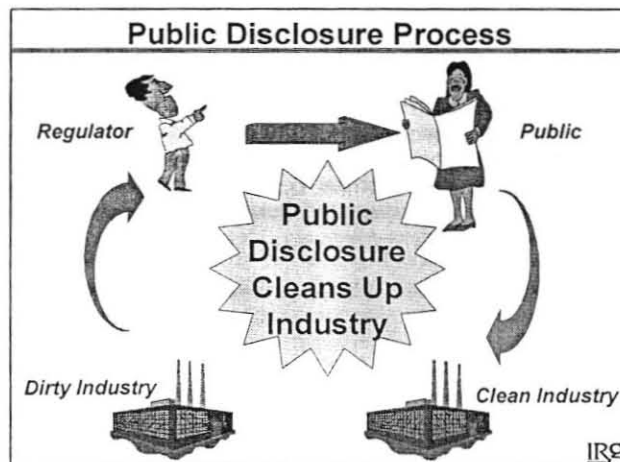
PROPER's success requires both technical competency and the creative management of external stakeholders. In fact, NGOs, communities, and the media collaborate with regulators only when they believe that the information supplied is credible. If either political management or technical quality fails to meet quality standards, the PROPER type of environmental program will not be sustainable. Many environmental programs have failed for such reasons.

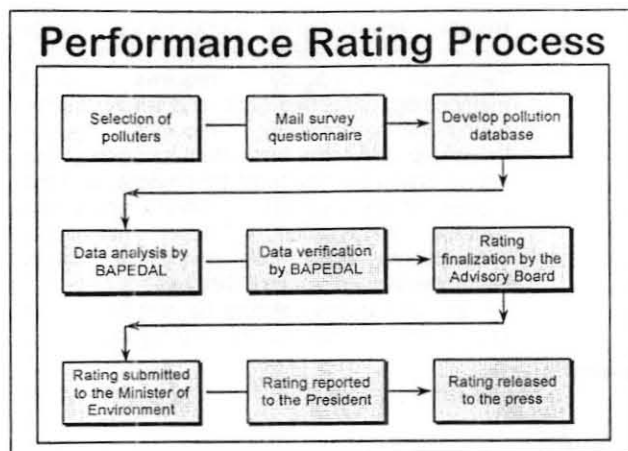




Reliable environmental performance ratings require both technical and institutional credibility. Technical credibility requires sound methodology, accurate data, and timely results. Institutional credibility requires trusted leadership within the implementing agency; the implementing agency must be credible, and the process of rating should incorporate inputs from external stakeholders. These institutional requirements imply that neither a corrupt leadership nor an inappropriate agency (e.g., the Ministry of Industry) should be responsible for environmental public disclosure programs.

The disclosure process under PROPER consists of three simple steps: 1) data collection from industries and its verification, 2) analysis of ratings, and 3) disclosure to the public. Typically, BAPEDAL releases the ratings through a formal press conference and also posts the ratings on its website (www.Bapedal.go.id). Once the ratings are released, the media selects only a handful to print. Among Indonesia's newspapers, *Kompas* is the one most actively involved regarding the publication of PROPER ratings. Also, local newspapers publish the ratings of factories selectively. So far, about 5 percent of the names are reported in the press.





When PROPER ratings were released the first time, they went through a rigorous screening process. First, an advisory body, including members from NGOs, public figures, businesses, and other government agencies, scrutinized the ratings. This process promoted transparency and incorporated inputs from external stakeholders. Second, the Minister of Environment reviewed the ratings. Finally, the President cleared the ratings before public disclosure. Thus, PROPER received endorsement at the highest levels, signaling the government's commitment to the program. A similar process was followed in the Philippines when EcoWatch, the environmental rating program modeled after PROPER, was introduced in 1997.

The first step in the design of PROPER was to articulate the objectives clearly. PROPER was designed to promote multiple objectives ranging from regulatory compliance to the adoption of clean technology and an environmental management system. The key challenge was to construct the performance categories that would distinctively convey the idea of relative performance covering the complete spectrum from compliance to clean technology.

Objectives of PROPER

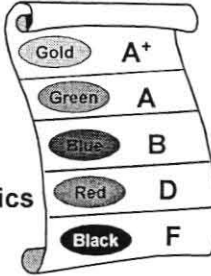
- ◆ Promote compliance with regulations
- ◆ Encourage pollution reduction beyond compliance
- ◆ Create incentives for environmental management system
- ◆ Eco-labeling and green marketing
- ◆ Develop foundations for ISO 14000

IRG

Performance Grading System

- * **Easy to Communicate**
- * **Manageable Number of Categories**
- * **Category Symbols Reflect Socio-cultural Characteristics**
- * **Technically Consistent**

Indonesia's System



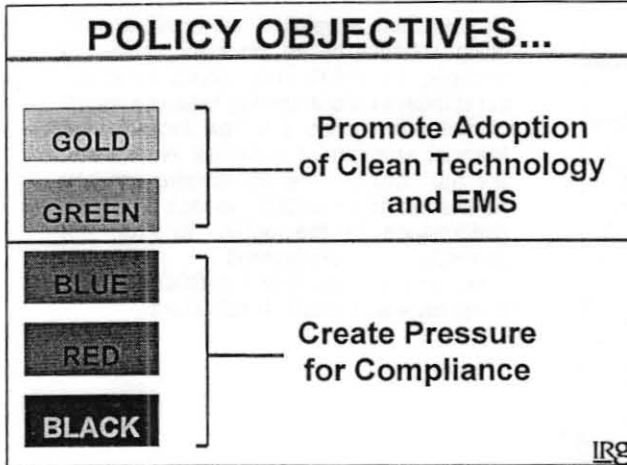
IRG

Mr. Makarim developed an environmental rating scheme based on color codes. In principle, PROPER color codes resemble the standard indices used to measure capital market performance, like Dow Jones, or the financial strength of individual enterprises, like S&P ratings. The colors were carefully selected to communicate the idea of relative performance to the public, who do not generally understand technical environmental indicators like BOD or COD. Simplicity was a crucial requirement.

Under the conventional CAC approach, environmental performance ratings are restricted to "in compliance" or "in violation." This limited approach cannot incorporate modern environmental performance concepts based on resource efficiency and management systems. After rigorous analysis of alternative performance concepts, it was decided that five categories were optimal for rating environmental performance of industrial enterprises. Four categories were not enough and six appeared to be confusing.

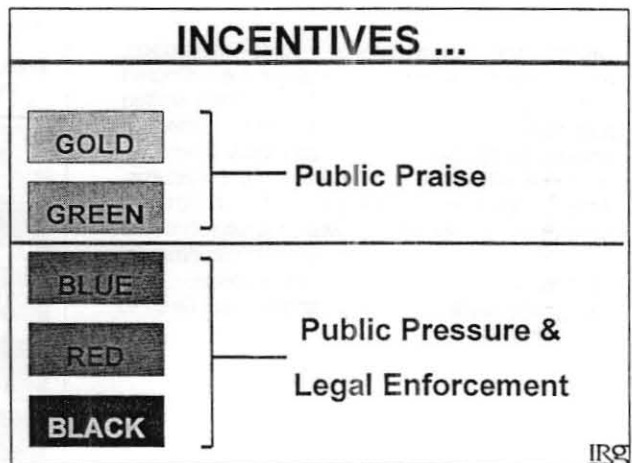
PERFORMANCE LEVELS	PERFORMANCE CRITERIA
GOLD	•Clean technology, waste minimization, pollution prevention, conservation, etc.
GREEN	•Above standards & good maintenance, housekeeping, sludge management, etc.
BLUE	•Efforts meet minimum standards
RED	•Efforts don't meet standards
BLACK	•No pollution control effort, •Serious environmental damages

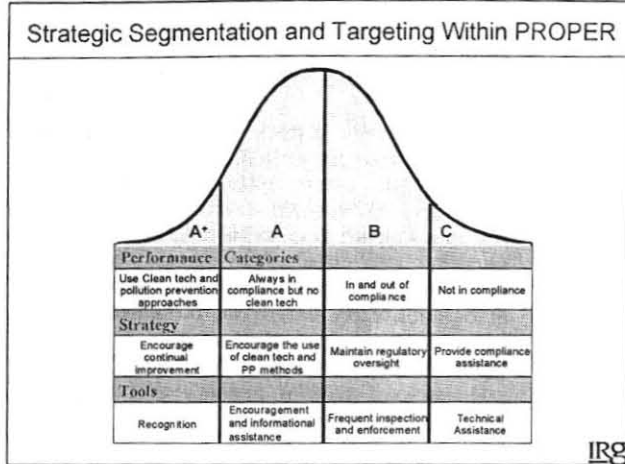
IRG



Gold and green categories were reserved for enterprises that use clean technology and advanced environmental management systems. Blue, red, and black ratings were based strictly on the degree of deviation from the compliance requirements of environmental regulations. This method, demonstrated clean technology objectives in addition to the compliance goals or requirements of a single environmental program.

It is almost impossible to set regulatory standards for clean technology and EMS, and the CAC approach proved inadequate to encourage them. However, public praise and recognition were identified as viable incentives for promoting the adoption of clean technology and EMS. Maintaining a good reputation also offered potential effectiveness for creating compliance incentives. Therefore, blue, red and black categories were developed.





Existing empirical analysis on environmental performance of industrial enterprises in developing countries shows considerable variation in environmental performance across facilities. CAC is appropriate primarily for facilities that are in violation or are likely to be in violation. For industry leaders that follow international environmental standards as part of their corporate policy, compliance is a redundant goal. However, through PROPER this group can be identified and differentially recognized for their performance. Thus, PROPER offers a sophisticated way to define enterprise segments so that precision environmental strategy can be applied.

Once the basic rationale for the five color codes was established, the next steps included the identification of performance indicators for each color, development of a data quality control system, and computerization of the rating evaluation.

Design Issues

- Rating Methodology
- Data Quality Control
- Implementation System

IRG

Definition of Performance

Two Necessary Requirements

- Some notion of ideal performance
 - Optimal pollution
 - Steady state pollution
 - No pollution
- Degree of deviation from ideal performance determines individual ratings

◆ Requires pollution load, pollution intensity and rate of improvement

IRG

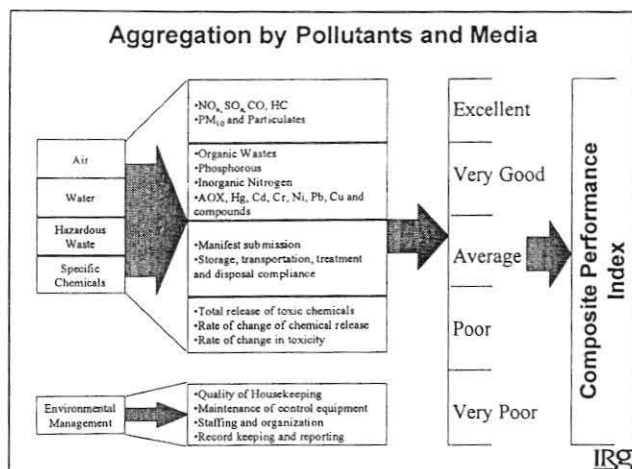
The first step in identifying performance indicators requires some notion of ideal performance. These three performance concepts—optimal pollution, steady state pollution, and zero pollution—can comprehensively convey the concept of ideal environmental performance. Optimal pollution implies that some pollution is acceptable because of benefit–cost trade–off. Steady state pollution implies that some natural assimilative capacity can neutralize certain type and quantities of pollution. And finally, zero pollution is ideal for highly dangerous pollutants that are best completely eliminated. A simple mathematical formulation is used to show pollution load, pollution intensity, and the rate of change in pollution intensity.

By unpacking the broad indicators of environmental performance, it can be reduced to a set of measurable variables. In the case of PROPER, these variables included pollution released, resource efficiency, indicators of management's commitment to environment, public complaints as proxy for damage, and finally ambient quality.

Rating Indicators

- ◆ Emission Level
- ◆ Resource Efficiency
- ◆ Behavioral Variables
 - Management Effort Level
- ◆ Public Complaints
- ◆ Ambient Quality

IRG

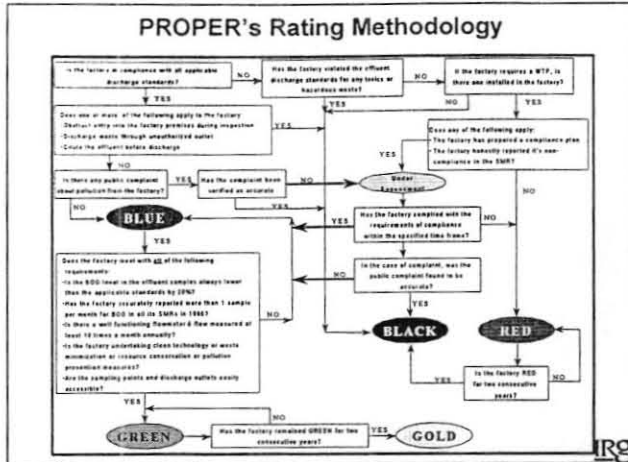


The next challenge in developing PROPER was to develop a viable rule for aggregation of multiple indicators to devise a composite index.

There are at least three methods for aggregating indicators. Under min-min rule, the worst value across all indicators has the maximum weight and ultimately determines the final rating. For example, even if a factory violates the effluent standard for just one parameter, it will receive a red rating. If the average value is used, the same factory may get a Blue rating. Finally, if a composite index is used, many options are possible, but the results are easily misinterpreted. After reviewing all the advantages and disadvantages, the min-min rule was chosen because it provides the safest aggregation rule—it is simple and least prone to misinterpretation.

Aggregation Approaches		
Alternative Concepts	Advantages	Disadvantages
• <u>Min-Min Rule</u>	Easy to communicate; conservative	Worst determines the final rating
• <u>Average</u>	Simple to compute	Can be misleading
• <u>Composite Index</u>	Easy to communicate	Hard to interpret

IRG



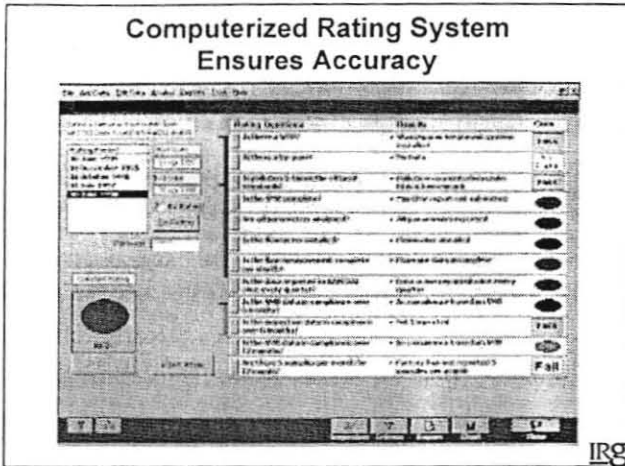
After combining all indicators and establishing the validation rules, a fairly complex decision flowchart emerged. This rating system was computerized to minimize errors.

Some indicators have continuous values and are prone to manipulation by polluters. In addition to the rating rules, it was necessary to ensure that these indicators were tested for accuracy before applying for rating analysis. This required statistical models, comparison against a benchmark pollution profile, and careful assessment of historical profiles.

Data Analysis Methodology

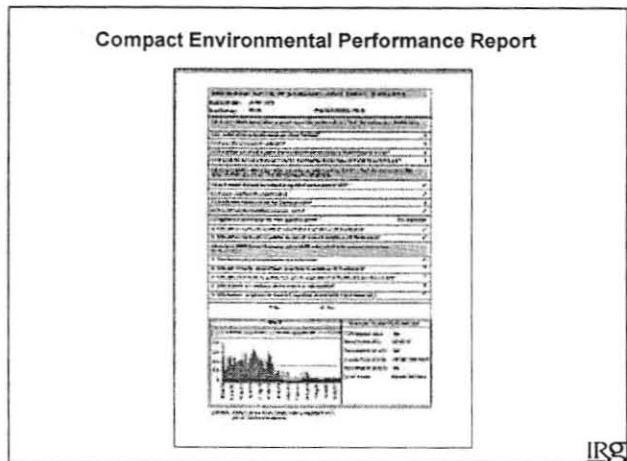
- Combines data from self-monitoring reports and inspections
- Analysis based on a group of samples rather than just one sampling result
- Tests for accuracy based on correlation with treatment system and production process characteristics
- Uses historical pollution profile of factories

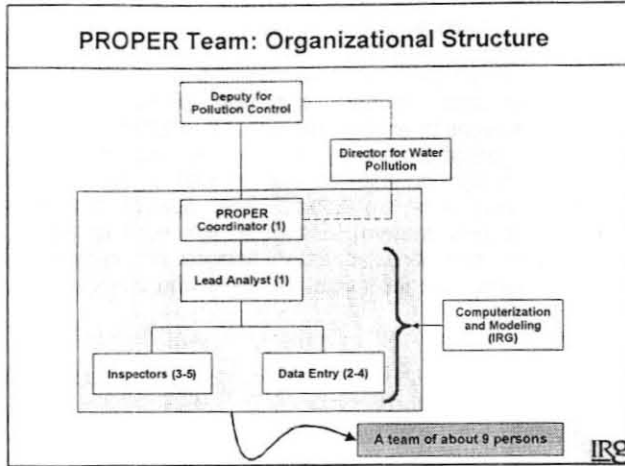
IRG



To evaluate ratings accurately, an expert system was developed. This computer model incorporates all the validation rules and statistical models, but with simple display screens to enable analysts at BAPEDAL to view aggregate results as well as the detailed background data so that no part of the rating analysis is like a black box. Special, built-in security systems ensure a high level of data integrity, and all data changes are archived along with the names of users who change the data.

A one-page rating report provides the basic ratings as well as the performance on all indicators in a simple format. This rating report is similar to the value line sheet used in the financial report of companies. This report serves as a simple information resource for senior management as well for environmental engineers.

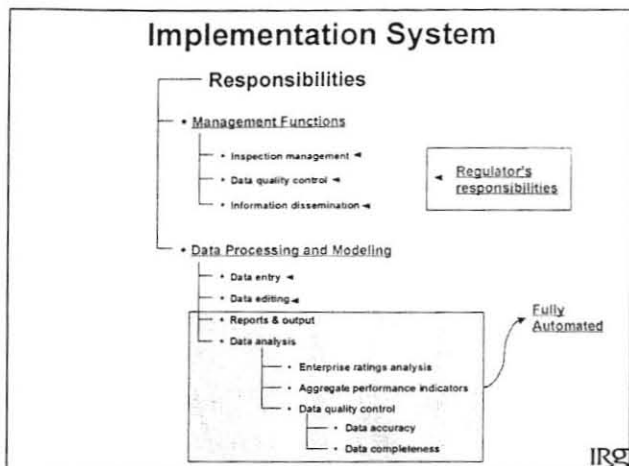




The PROPER team is small but highly efficient. Currently, the PROPER Team has eight to nine staff managed by a coordinator. (This coordinator reported directly Mr. Makarim when he was the Deputy for Pollution Control.) All staff members are well-trained on the use of computer models, and they perform multiple functions, including inspections, rating analysis, and data quality checks. Most have undergraduate degrees in environmental engineering.

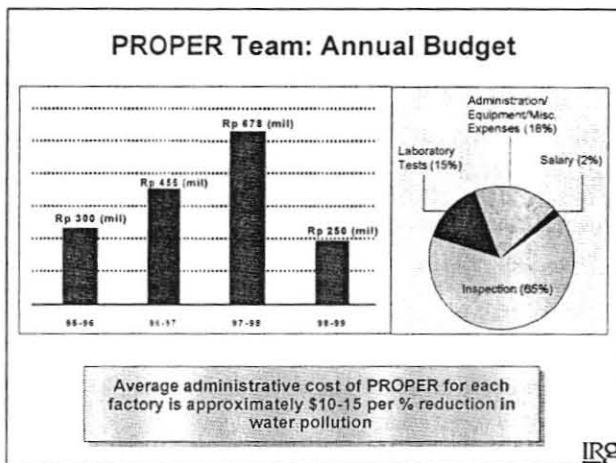
The main responsibilities of the team coordinator include strategic alliance with other divisions within BAPEDAL, management of external stakeholders, and management of PROPER to ensure continuous flow of funds and to continue program expansion. The analyst oversees data quality control, rating analysis, preparation of communication materials, and training.

PROPER Team: Responsibilities	
PROPER Coordinator	<ul style="list-style-type: none"> ✦ Intra-agency communication and management ✦ External stakeholders management ✦ Develop strategies for program expansion
Lead Analyst	<ul style="list-style-type: none"> ✦ Data quality control ✦ Training, conduct surveys and engage with business to improve self-monitoring and reporting ✦ Plan and execute inspections
Inspectors	<ul style="list-style-type: none"> ✦ Conduct inspections ✦ Provide feedback on how to improve inspections
Data Entry	<ul style="list-style-type: none"> ✦ Enter data collected through surveys, inspections and self-monitoring reports
Computerization and Modeling (IRG)	<ul style="list-style-type: none"> ✦ Work with analysts and data entry staff to improve the design of computer model ✦ Assist with strategic analysis of program's performance ✦ Conduct research

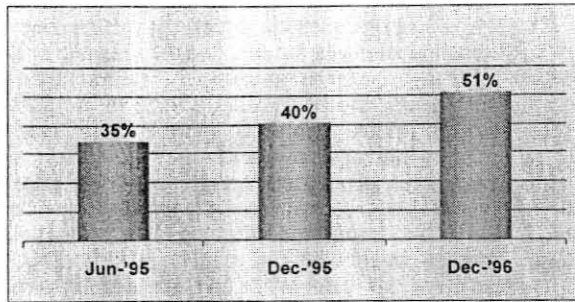


Because of the highly computerized management system, the PROPER team has full confidence in the information they generate. Automation also enables staff to focus most of their effort on functions directly associated with creating incentives for industries to maintain and improve environmental performance. Accordingly, the small team of nine to ten staff can do more than 250 inspections a year, conduct surveys to identify new factories to include in the program, and frequently, prepare information reports for companies, senior BAPEDAL managers, and the press. On the average, every staff can manage around 40-50 factories per year. The computerized system has the rating capacity of about 2,000 factories per eight-hour day.

PROPER's operational budget steadily increased for two consecutive years since 1995-1996. To ensure a high level of accuracy and to maintain regulatory oversight without direct enforcement, inspections were the top priority for PROPER. However, in the last year a sharp fall in the annual budget reduced the number of inspections significantly. Based on the results until 1997, the average administrative cost per factory starts at \$10 to 15 for each percent point reduction in water pollution. This indicates a very high level of administrative efficiency.



Impact of PROPER on Compliance Level

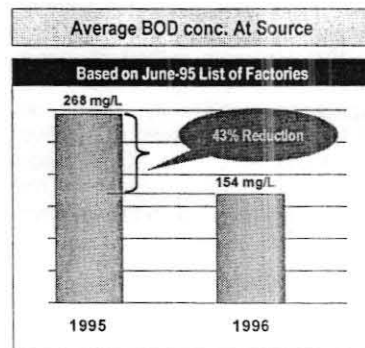


IRG

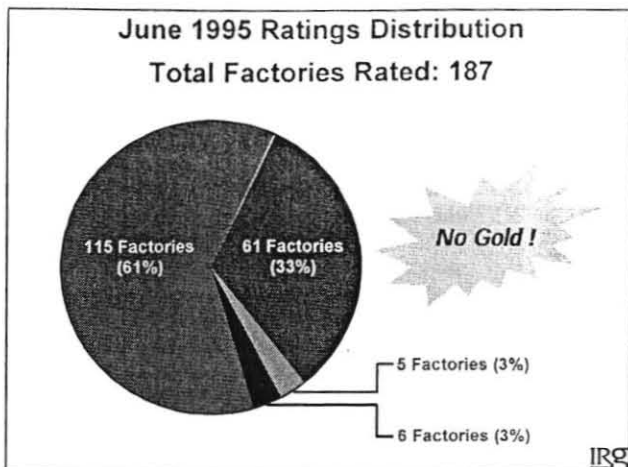
In terms of compliance with regulations, within a period of less than two years the compliance level increased from 35 percent to 51 percent. Considering that there had been formal legal enforcement during this period, these results demonstrated a remarkable improvement in regulatory performance.

Improvements in ratings and compliance level are meaningful only when backed by real reductions in pollution released into the environment. Based on the key indicator of water pollution, BOD, the average concentration per factory in the effluent stream declined by 43 percent between 1995 and 1996.

Impact of PROPER on Pollution Levels

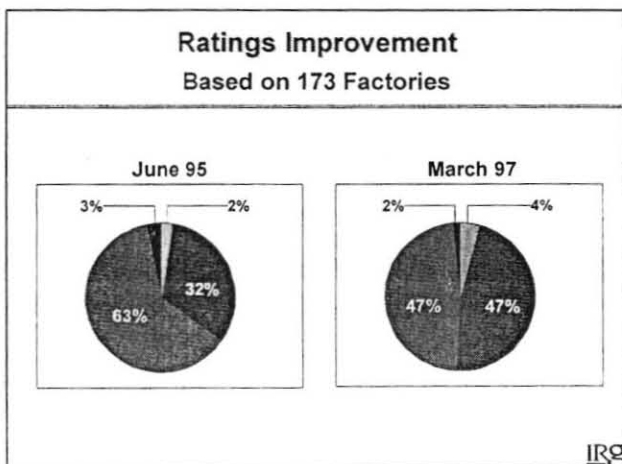


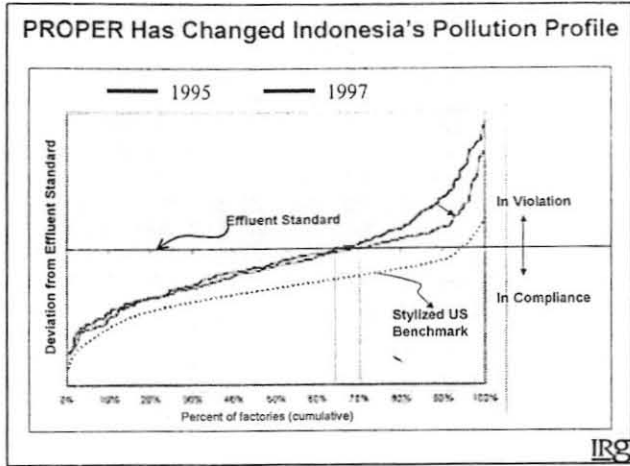
IRG



When the program was introduced in June 1995, nearly 65 percent of the 187 rated factories were non-compliant. Five factories received a green rating, six black, and no gold ratings were awarded. This distribution of ratings clearly indicated that the regulatory system was only partially effective. However, it came as a big surprise that even 35 percent of the factories were in full compliance. It indicated that non-regulatory factors were helping to drive the environmental behavior of industries in Indonesia.

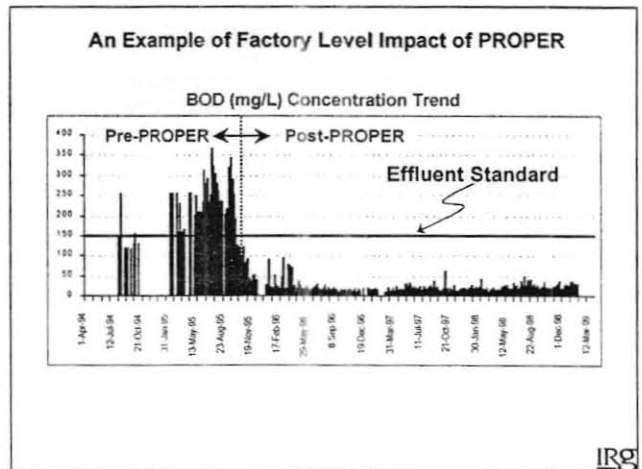
By March 1997, from the original list of 187 factories, 173 factories continued to be rated in the program. Fourteen factories dropped out of the program either because they closed down or were considered insignificant polluters. Among the 173 factories ratings improved to 47 percent blue and 4 percent green.

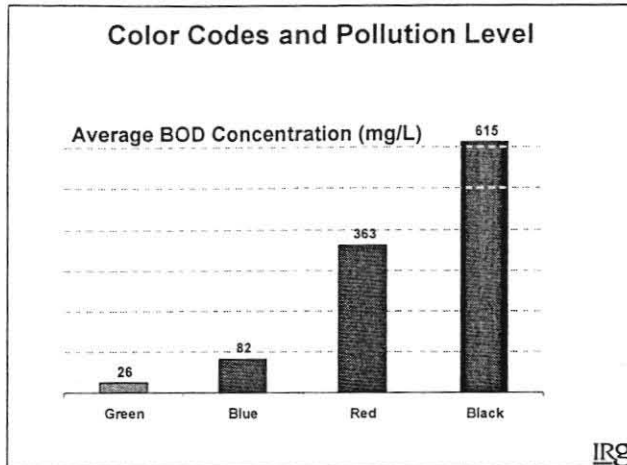




The reduction in the average pollution is further substantiated when comparing the pollution profile of 1995 and 1997. One easy way to compare pollution profiles is to evaluate the degree of deviation for every factory from the effluent standard in the two periods and to arrange it in ascending order. All data points less than or equal to zero imply that the pollution value is in compliance with the effluent standards. As the share of pollution data below the zero value increases over time, it implies a declining trend in the pollution level. The chart clearly shows that a significant rightward shift occurred between 1995 and 1997 among the factories that were rated in PROPER. This strongly indicates that PROPER has started to change the pollution profile in Indonesia.

One example of a factory that improved its rating from black to blue clearly shows a sharp decline in pollution since December 1995. The chart also shows that this factory has sustained a low level of pollution even until the first quarter in 1999. The pollution levels detected through several inspections were conducted with self-reported pollution data. Similar pollution profiles are observed in other factories that also improved from red or black to blue.



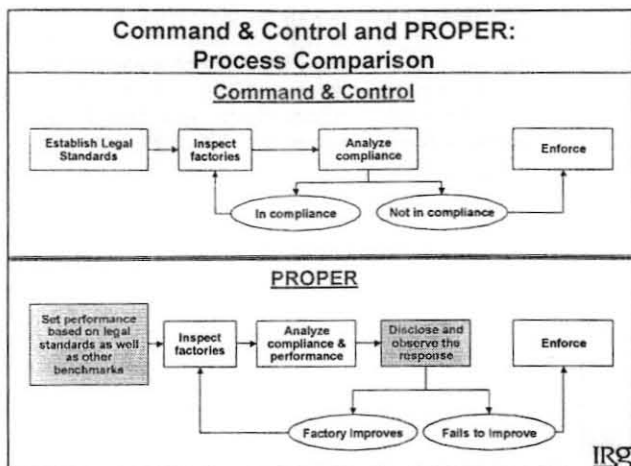


The rating methodology is consistent with the expected impact on pollution level. As shown in the chart, the average BOD concentration level for green factories is around 26 mg/l and for blue it is 82 mg/l. Comparatively, red and black factories have, on average, 365 mg/l, and 615 mg/l respectively.

PROPER has produced remarkable improvement in environmental performance. However, the precise channel through which PROPER creates incentives is not well understood. Since only 5 percent of the names are reported in newspapers, most of the red factories do not receive adequate publicity. It is somewhat mysterious that so many factories have improved their performance. Based on a survey of 250 factories that participate in PROPER, it appears that informational incentive and community pressure may be the dominant factors. However, other factors like enforcement incentive, financial markets considerations, and even direct pressure from NGOs may not emerge as the main factors as initially perceived. A forthcoming paper will shed more light on this issue.

Q.No.	How PROPER Creates Incentives	No of Factories	Share	Cumulative Response Rate
2	PROPER ratings make owners and senior managers aware of the environmental performance of the factory	81	24.4%	63.20%
1	PROPER ratings provide clear information about how to improve environmental performance	58	22.8%	
3	Bad PROPER ratings increase pressure from communities living around the factories to improve	42	16.8%	
16	Good PROPER will make it easier to comply with future regulations which will be more strict than the existing regulations	16	6.4%	
9	Good PROPER ratings increase public recognition of the company through the news media	12	4.8%	
18	Red or Black PROPER rating increase the chances of court action by the government	8	3.2%	36.80%
12	Good PROPER ratings will help in obtaining ISO 14000 certification	7	2.8%	
7	Bad PROPER ratings increase pressure from the news media	5	2.0%	
8	Bad PROPER ratings increase pressure from the shareholders	5	2.0%	
6	Bad PROPER ratings increase pressure from NGOs	5	2.0%	
10	Bad PROPER ratings make our firm less competitive in international markets	5	2.0%	
17	Good PROPER ratings help to differentiate our product from our competitors	5	2.0%	
14	Bad PROPER ratings make it difficult to obtain credit from banks	5	2.0%	
15	Bad PROPER ratings reduce the market value of the company	5	2.0%	
13	Good PROPER rating improves our firm's relationship with BAPEDAL	4	1.6%	
11	Bad PROPER ratings make our firm less competitive in the domestic markets	4	1.6%	
4	Bad PROPER ratings increase pressure from our firm's employees to improve environmental performance	3	1.2%	
5	Bad PROPER ratings increase pressure from Industry Association(s)	-	-	
19	Bad PROPER ratings make it harder to get capital from the International Finance Corporation	-	-	
	Total	210	100%	

Please do not cite. This is work in progress; paper expected by Sep-'93



PROPER and CAC are complementary policy tools, and PROPER can add value to a CAC system in two ways. First, it can enhance the compliance-based performance to include clean technology and EMS. Second, PROPER can increase the cost-effectiveness of a CAC approach by promoting compliance through reputational and informational incentives. A simple example can explain the logic: let there be 100 non-compliant factories and \$100 be the agency's enforcement budget. Let the cost of each enforcement effort be \$5. Then the probability of enforcement is 20 percent. Let there be 50 factories that will comply through disclosure, then the probability of enforcement increases to 40 percent. With increased enforcement probability at no extra cost, the compliance level will improve.

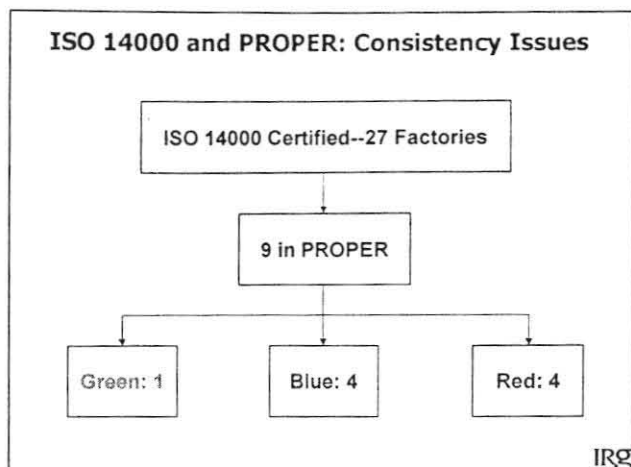
ISO 14000 promotes a management structure that is expected to improve environmental performance. PROPER, however, is primarily an output-based performance evaluation system. A company with an ISO certificate could fail to get a blue rating, signaling that the management structure has failed to improve performance. Conclusively a facility with a blue or better rating may not have ISO. This would imply that alternative management structures could result in good environmental performance. Thus, the link between PROPER and ISO may not be fully consistent.

Comparison of PROPER and ISO14000

		Output Based Performance	
		Gold/Green/Blue	Red/Black
Management Process Quality	ISO 14000 Certified	<ul style="list-style-type: none"> • Good Performance and consistent with ISO 14000 	<ul style="list-style-type: none"> • Poor performance but ISO based processes in place ⇒ Easier to get ISO than to comply
	ISO 14000 Not Certified	<ul style="list-style-type: none"> • Good performance but no ISO 14000 ⇒ Either not interested in ISO or weak relationship between ISO requirements and performance 	<ul style="list-style-type: none"> • Performance and ISO are consistent

Implications:

- PROPER can provide vital information for ISO
- ISO alone can be incomplete



The inconsistency between PROPER and ISO is illustrated through the analysis of PROPER ratings for nine Indonesian companies that are also in PORPER. Of these, four factories have a red rating. This raises some questions about how much improvement in performance is possible through ISO. It also raises questions about the certification agencies, and in some cases, may show that it is cheaper for firms to get ISO than to comply with environmental standards.

PROPER has generated considerable interest in developing countries. Within two years of its introduction, the Philippines introduced a PROPER-type program called EcoWatch. The results of EcoWatch are also positive. Colombia, Mexico, Thailand and Bangladesh have also expressed strong interest in PROPER. In India, the Andhra Pradesh Pollution Control Board has shown interest, and a preliminary proposal for introducing PROPER is underway in Pakistan. In our informal discussions, China has shown interest also. At various stages, Brazil, Venezuela and Bolivia have also considered adopting PROPER.



Applications of PROPER Concept

- ◆ Benchmarking and rating for energy efficiency improvements and GHG management
- ◆ SO_x, NO_x, and ozone emissions rating and performance for power generators
- ◆ Performance audit of water supply and sanitation services
- ◆ Performance rating of rivers and other water bodies
- ◆ Forest certification

IRG

PROPER is basically a performance evaluation system. Its design has several fundamental features that make it appropriate for cross-sectoral applications. Moreover, the underlying mathematical algorithm and programming codes are designed so that the ratings can easily be customized for other applications. Consequently, PROPER's rating concept has rapidly expanded for performance evaluation regarding energy efficiency, greenhouse gas management, forestry certification, hydro-electric projects, water supply and sanitation, and river quality management.

The information presented here unambiguously shows that PROPER has had remarkable results in a short period of time. It has improved environmental behavior of polluters, established a credible regulatory and environmental management system at BAPEDAL, and improved BAPEDAL's reputation by establishing credibility with the external stakeholders. The financial crisis in Indonesia has adversely affected PROPER's performance but far less than expected. This offers important evidence of the robust management system that PROPER program has successfully established. In conclusion, PROPER is a viable model for environmental policy reform aimed at improving environmental performance and promoting transparency.

Concluding Remarks

- PROPER offers a viable model for policy modernization in developing countries
- Informational incentives are important motivators of environmental improvements
- PROPER combined with CAC and MBIs can produce superior results compared to CAC or MBI alone

IRG

International Environmental Law:
Essential Elements

UN Charter, Art 2(7): 'Nothing contained in the present Charter shall authorise the United Nations to intervene in matters which are essentially within the domestic jurisdiction of any state . . .'

Declaration on Permanent Sovereignty over Natural Resources (UN GA Res 1803; 1962), Art 1: 'The rights of peoples and nations to permanent sovereignty over their natural wealth and resources must be exercised in the interest of their national development and of the well-being of the people of the State concerned . . .'

Trail Smelter Arbitration (1938): 'no state has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another'.

Corfu Channel (1949): it is 'every state's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other states'.

Stockholm Declaration on the Human Environment (1972), Principle 21: 'States have . . . the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.'

Stockholm Declaration (1972), Principle 22: 'States shall co-operate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction'.

UN Conv on Law of the Sea (1982), Art 118: 'States shall co-operate with each other in the conservation and management of living resources in the areas of the high seas. . . .'

Stockholm Declaration (1972), Principle 1: 'man has the fundamental right to freedom, equality and adequate conditions of life in an environment of a quality that permits a life of dignity and well-being.'

Rio Declaration (1992), Principle 1: 'Human beings are at the centre of concerns for sustainable development. They are entitled to healthy and productive life in harmony with nature.'

African Charter on Human & Peoples' Rights, Art 24: 'All peoples shall have the right to a general satisfactory environment favourable to their development.'

Stockholm Declaration (1972) Principle 12: 'Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards . . .'

Rio Declaration on Environment and Development

Preamble

The United Nations Conference on Environment and Development, Having met at Rio de Janeiro from 3 to 14 June 1992,

Reaffirming the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and seeking to build upon it,

With the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people,

Working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system,

Recognizing the integral and interdependent nature of the Earth, our home,

Proclaims that:

Principle 1

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 2

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 3

The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

Principle 4

In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5

All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

Principle 6

The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Principle 7

States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem.

In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Principle 8

To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9

States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10

Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

Principle 11

States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries.

Principle 12

States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13

States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14

States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

Principle 15

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.

Principle 16

National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

Principle 18

States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted.

Principle 19

States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.

Principle 20

Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development.

Principle 21

The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22

Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

Principle 23

The environment and natural resources of people under oppression, domination and occupation shall be protected.

Principle 24

Warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Principle 25

Peace, development and environmental protection are interdependent and indivisible.

Principle 26

States shall resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27

States and people shall cooperate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

Environmental Impact Assessment in International Law
Selected Key Texts

1. **UN Convention on the Law of the Sea, 1982, Article 206:** When States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments in the manner provided in article 205.

2. **Rio Declaration, 1992, Principle 17:** Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

3. **Framework Convention on Climate Change, 1992, Art 4(1)(f):** [States shall] take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated and determined nationally, with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change;

4. **UN Convention on Biological Diversity, 1992, Art 14(1)(a):** [Each state shall] introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

5. **Convention on Nuclear Safety, 1994, Art 17:** [States shall implement procedures]:
 - (ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

 - (iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

6. **Agenda 21, 1992:** The document calls for environmental impact assessment in the following paragraphs:
- 7.41(b): "ensure that relevant decisions are preceded by environmental impact assessments" [with respect to sustainable human settlements]
 - 8.4: incorporating environmental factors into decision-making, but no direct reference to impact assessment
 - 8.5: "To support a more integrated approach to decision-making, the data systems and analytical methods used to support such decision-making processes may need to be improved. . . . [the following activities should be developed]:
 - (b) Adopting comprehensive analytical procedures for prior and simultaneous assessment of the impacts of decisions, including the impacts within and among the economic, social and environmental spheres: these procedures should extend beyond the project level to policies and programmes; analysis should also include assessment of costs, benefits and risks;
 - 9.12(b): EIA in protection of the atmosphere
 - 10.8: EIA in land management
 - 11.24(a): EIA in combating deforestation
 - 13.17(a): EIA in fragile mountain ecosystems
 - 15.5(k): EIA for projects likely to affect biological diversity
 - 17.5(d): EIA in management of coastal zones & marine areas
 - 18.12(c): EIA in management of freshwater resources
 - 19.21(d): EIA in managing toxic chemicals
 - 22.4(d): EIA in management of radioactive wastes
 - 23.2: "One of the fundamental prerequisites for the achievement of sustainable development is broad public participation in decision-making. Furthermore, in the more specific context of environment and development, the need for new forms of participation has emerged. This includes the need of individuals, groups and organizations to participate in environmental impact assessment procedures and to know about and participate in decisions, particularly those which potentially affect the communities in which they live and work.

Let them eat pollution

LAWRENCE SUMMERS, chief economist of the World Bank, sent a memorandum to some colleagues on December 12th. *The Economist* has a copy. Some of the memo has caused a fuss within the Bank:

Just between you and me, shouldn't the World Bank be encouraging more migration of the dirty industries to the LDCs? I can think of three reasons:

(1) The measurement of the costs of health-impairing pollution depends on the forgone earnings from increased morbidity and mortality. From this point of view a given amount of health-impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that.

(2) The costs of pollution are likely to be non-linear as the initial increments of pollution probably have very low cost. I've al-



ways thought that under-populated countries in Africa are vastly under-polluted; their air quality is probably vastly inefficiently low [sic] compared to Los Angeles or Mexico City. Only the lamentable facts that so much pollution is generated by non-tradable industries (transport, electrical generation) and that the unit transport costs of solid waste are so high prevent world-welfare-enhancing trade in air pollution and waste.

(3) The demand for a clean environment for aesthetic and health reasons is likely to have very high income-elasticity. The concern over an agent that causes a one-in-a-million change in the odds of prostate cancer is obviously going to be much higher in a country where people survive to get prostate cancer than in a country where under-5 mortality is 200 per thousand. Also, much of the concern over industrial atmospheric discharge is about visibility-impairing particulates. These discharges may have very little direct health impact. Clearly trade in goods that embody aesthetic pollution concerns could be welfare-enhancing. While production is mobile the consumption of pretty air is a non-tradable.

The problem with the arguments against all of these proposals for more pollution in LDCs (intrinsic rights to certain goods, moral reasons, social concerns, lack of adequate markets, etc) could be turned around and used more or less effectively against every Bank proposal for liberalisation.

The language is crass, even for an internal memo. But look at it another way: Mr Summers is asking questions that the World Bank would rather ignore—and, on the economics, his points are hard to answer. The Bank should make this debate public.

The Economist, 7 February 1992

'Send pollution to the Third World'

A TOP official of the World Bank has advocated the export of polluting industries from developed countries to the Third World.

An internal memo by the Bank's chief economist, Lawrence Summers, a former adviser to the US Democratic Party, appears to favour dumping toxic waste in low-wage countries. It argues that underpopulated countries in Africa are "vastly under-polluted" and says demand for a clean environment on aesthetic grounds is closely related to income.

By Peter Torday
Economics Correspondent

The World Bank, whose main job is to encourage the economic and social development of the Third World, stated yesterday that the memo in no way represented its views. It said Mr Summers "deeply regretted" the memo, which had been written in a deliberately ironic fashion to provoke internal debate. It was intended to demonstrate that arguments

against his proposals — on the grounds of moral, social and human rights — could be used against every proposal made by the World Bank to promote freer trade and more open markets throughout the world.

The Bank said that the copy of the Summers memo published in today's edition of *The Economist* was a "cut and paste" job, taking Mr Summers's arguments out of context. The official's language is indeed likely to provoke debate. In the memo he says: "I think the

economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that."

Referring to Africa, he said: "Air quality [there] is probably vastly inefficient compared to Los Angeles and Mexico City... Only the lamentable facts that so much pollution is by non-tradeable industries [transport, electrical generation] and that the unit transport costs of solid waste are so high prevent world-welfare-enhancing trade in air pollution."

The Independent, 7 February 1992

Save Planet Earth from economists

Mr Lawrence Summers, the World Bank's chief economist, has a fine mind. As a young Harvard professor in the 1980s he gained a reputation for brilliance. He sympathises with many liberal causes and served as economic adviser in Governor Michael Dukakis's ill-fated presidential campaign in 1988. But he appears to have one blind spot: the environment.

This matters because the World Bank is emerging as a key player in the global environmental debate. Will the bank back efforts to impose effective controls on carbon emissions? Will it make development loans conditional on strict environmental controls? Will it support trade sanctions against countries which refuse to clean up their dirty industries?

Mr Summers is well placed to mould opinion within the bank on such controversial issues. Perhaps more importantly, he is responsible for this year's World Development Report, always a powerful pedagogical tool. This year's report - which will be devoted to the economics of the environment - is being published ahead of schedule in an effort to influence debate at the United Nations conference on the environment in Rio this June. The "Earth Summit" could help set global environmental policy for this decade.

In January, at the American Economics Association meeting in New Orleans, Mr Summers made little effort to hide his feelings. He listened in exasperation to papers arguing that global warming could prove a more serious economic threat than hitherto realised. His own view was that it was a grossly overrated problem. Even on the most pessimistic assumptions, it would cause damage equivalent to only half a year's growth of gross national product (GNP) over the next half century. The implication was that efforts to curb carbon emissions should not be a priority.

The leaking of a confidential bank memorandum last week provided further insight into Mr Summers's thinking. "Just between you and me, shouldn't the World Bank be encourag-



MICHAEL PROWSE
on America

ing more migration of the dirty industries to the LDC [less developed countries]?" he wrote in a memo to senior staff dated December 12. He listed three reasons:

- The economic cost of pollution depends on the loss of earnings from increased illness and death. These costs are lowest in the lowest wage countries. "I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that."

- Pollution costs start low but rise more than proportionately with the output of toxic substances. It thus makes sense to shift dirty production to places where environments are still clean. "I've always thought under-populated countries in Africa are vastly under-polluted; their air quality is probably vastly inefficiently low compared to Los Angeles or Mexico City."

- The value attached to clean and healthy environments increases as living standards rise. The poor, in effect, cannot afford to have scruples. "The concern over an agent that causes a one in a million change in the odds of prostate cancer is obviously going to be much higher in a country where people survive to get prostate cancer than in a country where under-five mortality is 200 per thousand."

Mr Summers subsequently said these comments were an "ironic" attempt to stimulate debate rather than serious policy proposals. The bank apologised on behalf of Mr Summers and said that protection of the environment was one of its main objectives. It did not condone the dumping of waste in

other countries.

The memo's purpose is unimportant; it is the tone of the remarks that is revealing. It is hard to believe that anybody who cared deeply about the environment would write that way, even in a confidential memo. If you cared, you would not describe clean air as inefficient; you would not refer to an argument for dumping toxic waste in poor countries as "impeccable".

For Mr Summers, the environment seems to be just a pile of raw material: something you use up in creating GNP. It is not an uncommon attitude in America. In dashing for growth over two centuries, the US, after all, has despoiled its own continent. The air quality in the Blue Ridge mountains near Washington, once a natural paradise, is now sometimes so poor that people are advised not to leave their cars. Many rivers are poisonous. Urban landscapes are often indescribably ugly. But, hell, most Americans are happy enough. Why should the developing world not follow suit?

Viewed through the distorting prism of market economics, Mr Summers's arguments may appear logical. But should decisions on the location of factories really be determined by estimates of where human life is cheapest? And if the answer is yes, why stop there? Environmental controls are costly. Why should the bank - or anybody else - try to impose any environmental restraints in the third world? Let it enjoy dirty growth. Let the factories smoke. If the globe warms up a few degrees, so much the better: we'll all get a suntan. If the outside world becomes totally inhospitable, we can always live in pressurised plastic bubbles.

This is a recipe for ruin. The challenge is to find an equitable way of financing clean growth everywhere. Rather than figuring out ways to export dirty industries, we should be trying to prevent poor countries from repeating our own awful environmental mistakes. This requires vision from institutions such as the World Bank, not mean-spirited utilitarianism of the kind Charles Dickens satirised in *Hard Times*.

Public Interest Perspectives on the Bhopal Case: Tort, Crime or Violation of Human Rights?

Michael R Anderson¹

David Robinson & John Dunlavy, (eds) Public Interest
Perspectives in Environmental Law (London: Wiley Chancery,
1995)

I. Introduction

Public interest litigation, whether environmental or otherwise, persistently faces the criticism that it is not conducted in the genuine interest of a broad public.² Detractors delight in pointing to a hidden private interest masquerading under the public guise. While it seems that such criticisms are only occasionally well-founded, they do raise the difficult question of the relationship between the activist lawyer and those whose interests are putatively represented. In law, the problem is usually reduced to the rather vexed issue of *locus standi*, depending upon whether the party has sufficient interest in the case. However, legal constructions of standing over-simplify important ethical issues. First, does counsel represent the views and interests of affected parties accurately in the timing and content of legal argument? Secondly, when lawyers frame social and environmental conflicts in a vocabulary acceptable to the courts, are the original complaints distorted or marginalised? Finally, when such conflicts may be resolved through either legal or political means, are there hidden costs involved in pressing for specifically legal resolutions?

At an ethical level, the central question is one of best professional practice and whether lawyers involved in public interest litigation represent the views of client groups in an accurate and responsible manner. This is particularly difficult where litigation is conducted under the banner of "empowerment".

¹Michael R Anderson is a lecturer with the School of Oriental and African Studies, University of London with interests in environmental law and human rights law, particularly in India.

²Lecturer in Law, SOAS, Thornhaugh St, London WC1H 0XG, UK. The author is grateful to Emma Favata for research assistance and to David Robinson for useful comments upon an earlier draft.

³This is an updated and substantially revised version of a paper which first appeared as "Litigation and Activism: The Bhopal Case" *Third World Legal Studies*.

The disadvantaged or injured parties may be active participants in the legal process, or they may remain alienated, disempowered "victims" at the mercy of an ambivalent altruism. The very notion of empowerment houses a deep and pervasive ambiguity arising from its inherent paternalism. Is power the kind of thing that can simply be bestowed, or must it be seized actively? Who is empowered to empower, and what is their interest in doing so? On whose terms and for what ends? There is also a deeper problem: is the traditional client-lawyer relationship adequate to represent the broader interests which are the real subject-matter of public interest litigation? These questions may arise wherever public interest litigation occurs, but for the purposes of this chapter, they will be explored in the context of the litigation following the 1984 gas leak in Bhopal, India. The case is a reminder that legal categories and procedures place serious constraints upon the possibilities for popular participation in environmental public interest litigation, and yet it usefully demonstrates that political activism may be used to question and even breach those constraints.

II. Legal marginalisation

A graffito on the wall of the Union Carbide pesticide plant in Bhopal declares: "Killer Carbide must be Punished". It is emblematic of the frustration experienced by many people in Bhopal following years of litigation.³ To local understandings, the injustice seems obvious. The leak of methyl isocyanate (MIC) gas from the Union Carbide⁴ pesticide factory on 3 December 1984 resulted in at least 3,828 immediate and subsequent deaths,⁵ an undetermined number of injuries and disabilities reflected in over 639,000 individual claims for compensation, and widespread loss of livelihood. Although it is known to

⁴The history of the litigation is recounted in a variety of sources. For the essential legal documentation with commentary, see Baxi U and Paul T, eds, *Mass Disasters and Multinational Liability: The Bhopal Case*, Bombay, Tripathi, 1985; Baxi U, ed, *Inconvenient Forum and Convenient Catastrophe: The Bhopal Case*, Bombay, Tripathi, 1986; and Baxi U and Dhanda A, eds, *Valiant Victims and Lethal Litigation: The Bhopal Case*, Bombay, Tripathi, 1990. See also Muchlinski PT, "The Bhopal Case: Controlling Ultrahazardous Industrial Activities Undertaken by Foreign Investors" (1987) 50 *Modern Law Review* 545; Anderson MR, "State Obligations in a Transnational Dispute: The Bhopal Case" in WE Butler, ed, *Control Over Compliance with International Law*, London, Martinus Nijhoff, 1991; Abraham CM and Abraham S, "The Bhopal Case and the Development of Environmental Law in India" (1991) 40 *ICLQ* 334; and Cassels J, *The Uncertain Promise of Law*, Toronto, University of Toronto Press, 1993.

⁵The factory was owned and operated by Union Carbide India Limited (UCIL), a subsidiary of the US parent company, Union Carbide Corporation (UCC), which owned 50.9% of UCIL stock through its wholly owned Hong Kong subsidiary, Union Carbide Eastern.

⁶This was the government figure as of 8 April 1993 (quoted in charge sheet, Sessions Trial No 257/92, Bhopal Court of Sessions, 8 April 1993), but many observers contend that the actual number is higher, with many gas-related deaths having gone uncounted both in the mass cremations following the gas leak and in subsequent years. As with much relating to the Bhopal litigation, reliable figures are not available due to a lack of comprehensive epidemiological data.

be carcinogenic and mutagenic, like many toxic substances, MIC has long-term health effects which are poorly understood, idiosyncratic, and still unpredictable, so that the 521,262 residents who are estimated to have been exposed⁶ to the gas live in uncertainty regarding potential future effects. Where identified health effects include chronic fatigue, muscular pains, higher abortion rates, progressive pulmonary disability, and immune system deficiencies, it is not surprising that present symptoms and uncertain prognosis contribute to anxiety neuroses and neurotic depression.⁷ While this host of hardships descended upon residents through no fault of their own, the simple fact that the leak occurred suggests that the plant's safety features were inadequate, while ample evidence indicates that the leak was directly attributable to faulty plant design and management errors. However, after over nine years of litigation, the patent injustice of the situation has failed to produce either a determination of liability or very much in the way of effective compensation for the survivors.

Moreover, right from the outset, people in Bhopal were largely excluded from the litigation process. Their distance from the putative mechanisms of accountability may be traced in three aspects of the litigation. First, the survivors of the leak are predominantly Hindi-speaking, many are illiterate, and most have little previous experience with litigation in India – much less with US lawyers who arrived to sign up claimants on contingency fee arrangements in the first week following the disaster. Many of the worst-affected areas were effectively slums whose inhabitants possessed neither the institutional skills nor the financial resources required to proceed against the corporation. These factors were compounded by the widespread occurrence of debilitating injuries following exposure to the gas. Until early 1987, court hearings on the question of appropriate forum took place in US courts – well beyond the participation or even observation of groups in Bhopal. When the hearings on forum were finally concluded in Union Carbide's favour, thus shifting proceedings from US to Indian courts on the grounds of *forum non conveniens*, neither individuals nor the many non-governmental organisations (NGOs) in Bhopal were consulted on the matter, even though the

⁶Dwivedi MP, et al, *Long-Term Epidemiological Study on the Health Effects of Toxic Gas Exposure*, Bhopal, Indian Council of Medical Research, 1991.

⁷An introduction to the literature on the health effects of MIC in Bhopal can be found in the following: Andersson N, et al, "Exposure and Response to Methyl Isocyanate – Results of a Community Based Survey of Bhopal" (1988) 45 *British Journal of Industrial Medicine* 469; Andersson N, "Long-Term Effects of Methyl Isocyanate" *The Lancet*, 3 June 1989 at 1259; and Lochan R, "Health Damage Due to Bhopal Gas Disaster – Review of Medical Research" (1991) 26 *Economic and Political Weekly* 1322.

opinion of the District Court relied heavily upon arguments regarding the aims and concerns of Indian citizens in the case.⁸

The second exclusion arrived in the form of the Bhopal Gas Disaster (Processing of Claims) Act 1985⁹ by which the Central Government of India assumed a *parens patriae* role, arrogating to itself the exclusive right to represent and act in place of every claimant in the Bhopal litigation. Although section 4 of the Act permits the claimant to retain a legal practitioner at his or her own expense, it has left little room for the participation of independent counsel. The formulation of the complaints, the assessment of damages, and the decision to place a higher priority upon civil rather than criminal proceedings all originated in government offices without consultation of claimants in Bhopal.

Thirdly, section 3(2)(b) of the Act also accorded to the Central Government the power to enter into a compromise with Union Carbide. Between early 1985 and February 1989, the government intermittently conducted negotiations with Carbide in the matter of an out of court settlement. Again, representatives of Bhopal groups were neither present at the negotiations nor consulted as to their content. The full effects of this policy were felt on 14 February 1989 when Chief Justice Pathak announced,¹⁰ in the form of a Supreme Court Order, the results of a settlement that had clearly been reached in negotiations between Carbide and the Government. The Union Carbide Corporation agreed to pay \$470 million to settle all past, present, and future claims arising in relation to the Bhopal case.¹¹ The agreed order was announced in the midst of arguments before the court regarding interim compensation, in circumstances where the merits of the case had not yet been addressed, even in the Bhopal District Court. There were strong indications that the Government's motives in reaching the settlement were complicated

⁸*In re Union Carbide Corp Gas Plant Disaster at Bhopal, India in December 1984*, 634 F.Supp.842 (S.D.N.Y. 1986), reproduced in (1986) 25 ILM 771; 809 F.2d 195 (2d Cir. 1987), reproduced in 27 (1987) ILM 62, *cert denied* 108 S.Ct. 199 (1987). For commentary, see Nanda VP, "For Whom the Bell Tolls in The Aftermath of the Bhopal Tragedy: Reflections on *Forum Non Conveniens* and Alternative Methods of Resolving the Bhopal Dispute" (1987) 15 *Denver Journal of International Law and Policy* 235; Darmody SJ, "An Economic Approach to *Forum Non Conveniens* Dismissals requested by US Multinational Corporations – The Bhopal Case" (1988) 22 *George Washington Journal of International Law and Economics* 215; and Yakpo EKM, "Application of *Forum Non Conveniens* in the United States – Bhopal and its Lessons for Developing Countries" (1989) 1 *African JICL* 139. ⁹(1986) 25 ILM 884.

¹⁰Article 142(1) of the Constitution enables the Supreme Court to "pass any such decree or make such order as is necessary for doing complete justice in any cause or matter pending before it".

¹¹*UCC v Union of India* (1989) 1 SCC 674. The settlement was announced as a judicial order, but there is little doubt that it was arrived at in negotiations between Carbide and the central government of India. This was affirmed by the Union Carbide India Limited spokesperson, S. Mitra: "Lawyers for both sides were there, and decided on \$470 million. . . . This amount was agreed by the lawyers and the Government of India. Then it was announced in Court. If you look at the settlement you can tell this from the wording" (Personal Interview, 27 November 1989).

by short-term political considerations,¹² particularly since none of the Bhopal groups were consulted as to the timing or content of the settlement.

III. The dialectic of litigation and activism

The marginalisation of activists and NGOs before the courts stands in sharp contrast to the centrality of their work within Bhopal itself. Immediately following the gas leak, a number of survivors combined, frequently with support from activists outside Bhopal, to form NGOs to co-ordinate local relief work. In the absence of adequate medical care and economic relief, the self-help organisations in Bhopal have been the most effective vehicles for coping with the medical, social and economic effects of the gas leak. They assumed a variety of forms, with diverse purposes and approaches. As concerns and tactics changed, some groups declined while fresh initiatives grew. In the first three to four years following the leak, five types¹³ of activist groups were prevalent: apolitical relief and rehabilitation groups; groups which collected and disseminated technical, legal, medical, and political information; trade union organisations which mobilised support around workers' issues; international solidarity and support groups; and, finally, the explicitly political groups which have co-ordinated local relief, organised political demonstrations, and actively participated in the litigation. It is the last category, of political groups, which endured and became the most important to the trajectory of litigation. One group in particular, the Bhopal Gas Peedit Mahila Udyog Sangathan (BGPMS) – the Organization of Bhopal Women Worker Victims – has played a key role in challenging court decisions and demanding adequate compensation.¹⁴

Although largely peripheral to the actual process of litigation, peoples' organisations in Bhopal have followed the litigation closely and responded with forms of social and political action. It is difficult to overstate the influence of legal proceedings upon local political action. Particularly prior to 1989, when the prospect of an extended tort case seemed inevitable, the main issues of "relief, medical aid and rehabilitation grew to be viewed through the litigatory lens".¹⁵ Just as technical legal terms have been incorporated into the vernacular, so too the timing of public demonstrations and the content of demands made upon the central and state governments have been influenced

by proceedings in court. The most important activist groups in Bhopal, including the BGPMS, found that the agendas and idioms of their activism were increasingly influenced by legal forms.

In turn, political activism affected litigation. The best example of this may be seen in the events following the settlement of 14 February 1989. Immediately following the announcement of the settlement, groups in Bhopal exhibited several reactions. Some accepted it, others rejected it outright, and still others kept counsel in uncertainty. By March, a large number of demonstrations and letters to the press codified the emerging consensus that the settlement was unacceptable on several counts: first, the quantum of relief was too low either to provide adequate compensation or punish Union Carbide and its subsidiary for gross negligence; secondly, the groups in Bhopal were given no opportunity to participate in the decision-making process regarding the nature of the settlement or its impending distribution; thirdly, there was insufficient medical evidence to assess the scale of injury, thus precluding any final judgment; and, finally, Union Carbide had escaped the judicial process without ever facing the question of its legal liability for the gas leak. A number of groups filed both review¹⁶ and writ¹⁷ petitions seeking a reconsideration of the judicially announced settlement. While \$465 million collected interest in a government bank account, the Supreme Court failed to act on the petitions.

Meanwhile, political action denouncing the settlement continued in Bhopal and New Delhi. The BGPMS in particular opposed the settlement with consistent and tireless campaigning. Immediately following the announcement of the settlement, over 1,000 women from Bhopal travelled to New Delhi where they sat in protest on the steps of the Supreme Court. National and international media attention was widespread, with statements of solidarity arriving from Dublin, Amsterdam, London and New York. As the protest gathered pace, others registered their disapproval of the court's action, including leading academics and scientists,¹⁸ as well as the former Chief Justice of the Supreme Court, PN Bhagwati, who condemned the settlement in an article prominently featured in the influential magazine *India Today*.¹⁹

Meanwhile, the BGPMS and its allies continued to rally in opposition to the settlement – pointing to its shortcomings, but also using it as an emblem of their more quotidian struggle to cope with the continuing effects of methyl isocyanate. Meeting every Saturday in a Bhopal public park for several years, as many as 1,200 women gathered to discuss the practical and political matters involved in seeking medical relief, coping with accelerating illness, securing work, and supporting the legal campaign against the settlement. Their demonstrations kept the issue of the settlement in the news while statements

¹²See, further, Jaising I, "Bhopal: Settlement or Sellout?" *The Lawyers* (March 1989), and Anderson MR, "Bhopal" (1989) 8 *Commonwealth Judicial Journal* 62.

¹³This typology draws upon Ravi Rajan S, "Rehabilitation and Voluntarism in Bhopal" 6 *Lokayan Bulletin* 3 (Jan-April 1988).

¹⁴The BGPMS was founded in 1986 to protest the closure of a government-supported work scheme, but due to the commitment and discipline of its members it quickly became the most effective focus for political and legal agitation. It is supported by the Bhopal Group for Information and Action, and the Delhi-based Bhopal Gas Peedit Sangharsh Sahyog Samiti.

¹⁵Kumar R, *The History of Doing*, London, Verso, 1993 at 188.

¹⁶Article 137 of the Constitution provides the apex court with the power to review its own orders or judgments.

¹⁷Under article 32 of the Constitution, relating to the enforcement of fundamental rights.

¹⁸See, e.g. the letters which appeared in the *Illustrated Weekly of India* (9 April 1989) at 34–35.

¹⁹*India Today* (15 March 1989) at 45.

of solidarity from groups in India and abroad put pressure on both the court and the Government to take some form of action.

Following the general elections of November 1989, activists sensed a new window of opportunity. The Rajiv Gandhi government had been replaced by a coalition of parties less eager to woo foreign investment and more inclined to sympathise with populist measures. A process of quiet lobbying began in Delhi. The effort was to persuade the new government to provide immediate relief to people in Bhopal and renounce the settlement of February 1989. In a letter sent to the new Prime Minister, VP Singh, two of the groups demanded: (i) an immediate hearing of the review petitions; (ii) the withdrawal of the criminal immunities granted in the February settlement; (iii) an announcement by the new government that the settlement was "morally wrong"; (iv) full public disclosure of information relating the Bhopal gas disaster and lifting of application of the Official Secrets Act; and (v) that Union Carbide be banned in all operations in India.²⁰ Subsequently, on 22 December 1989, the Supreme Court handed down a decision on three consolidated writ petitions regarding the validity of the 1985 Act granting *parens patriae* power.²¹ The court upheld the Act, but found that the government had a legal duty to provide interim relief to the affected people of Bhopal until such time as the litigation reached a conclusion. The quantity and nature of the interim relief were left to executive discretion. The court also noted that the people of Bhopal would have an opportunity to make representations to the court in the hearings on the three review petitions.

The lobbying efforts, supported by the Supreme Court decision, paid rich dividends on 12 January 1990. The new government announced that: (i) the quantum of settlement was insufficient to the needs of people in Bhopal; (ii) the affected people of Bhopal were entitled to interim relief and that the amount and modality of relief would be decided in consultation with the representatives of the victims groups; (iii) the claimants possessed inalienable rights to legal remedy which brought into question the conferment of criminal immunities; and (iv) that the government would support the contentions of the activist groups in the review petitions.

Following a meeting with the most prominent activists in Bhopal, the government decided to grant interim relief of Rs 200 per month to all residents of the 36 municipal wards most directly exposed to the gas. Despite the small sums involved, this represented an important victory for the Bhopal groups, particularly the BGPMS, which had argued for a universal entitlement to interim relief instead of relief based upon the merit of individual claims. This position was based on both pragmatic and principled grounds. The BGPMS argued that the process of evaluating individual claims would be time-consuming, subject to corruption, and inevitably biased in favour of

literate and document-collecting individuals. Perhaps more importantly, the group advocated a reversal of the classical onus of proof, so that for purposes of dispensing interim relief (a political rather than legal measure), a person living in the gas-affected wards should be presumed to be injured unless proven to the contrary. Even with such a straightforward disbursement scheme, the difficulties of administering individual payments meant that only 42,000 residents received payment in the first month, and only 66.1% of residents surveyed in November 1991 were receiving payments.²² Nevertheless, the victory marked a real improvement in the fortunes of Bhopal survivors, not least because the government had agreed to throw its support behind the review petitions seeking to overturn the 1989 settlement. Long suspicious of government actions, the activist groups in Bhopal had been able to turn the *parens patriae* power to their advantage, using political pressure to realign the arguments before the court on the pending review petitions. In short, sustained activism operating outside of the formal mechanisms of the law had made a decisive impact upon the course of litigation. What the events of 1989 and 1990 demonstrate is that where the mechanisms of tort law failed to deliver effective forms of accountability for ultrahazardous activity, the activist groups were able to mobilise political support, both informally and through parliamentary channels, to change the shape of litigation.

The political successes of activists had enduring effect, most notably in the continued payment of interim relief,²³ but when the government of VP Singh was voted out of power later in that year, the political advantage was lost. However, Singh's tenure had been long enough to allow his Attorney General, Soli Sorabjee, to argue that the settlement should be set aside. Thus, it was all the more disappointing when in October 1991 the Supreme Court finally upheld²⁴ the civil law provisions of the February 1989 Order. By this ruling, the possibility of a definitive determination of liability was closed forever.²⁵ However, the Bhopal groups scored a victory in the court's decision that the criminal proceedings quashed under the 1989 settlement should be restored. Also, the court finally directed the central government to set up at least 40 Claims Courts by February 1992 to begin processing individual claims under

²²Bhopal Group for Information and Action, *Compensation Disbursement Problems and Possibilities: A Report of a Survey Conducted in Three Gas Affected Areas of Bhopal*, Delhi, Centre for Education and Communication, 1992 at 7.

²³The interim relief scheme was due to operate for three years from 1 April 1990, but in March 1993 the BGPMS successfully argued that the scheme was still required since only 1,800 of the 639,000 claims had been processed. In May 1993, the interim relief payments were extended for an additional three years, although the value of Rs 200 monthly payments had declined to roughly £4.50.

²⁴*Union Carbide Corporation v Union of India* AIR 1992 SC 248. For commentary upon the decision, see Jaisingh I, "Bhopal: The Lost Opportunity for the Victims" *The Lawyers* (November 1991) at 4; and Sen J, "Can Defects of Natural Justice be Cured by Appeal? *Union Carbide v Union*" (1993) 42 ICLQ 369.

²⁵A later attempt to challenge the settlement in US courts failed at lower levels, and was finally denied *certiorari* by the US Supreme Court (*The Guardian*, 5 October 1993).

²⁰Cited in Baxi, *Valiant Victims*, *op cit* at n 3 lxii-lxiv.

²¹*Charan Lal Sabu v Union of India* AIR 1990 SC 1480.

the authority of the 1985 Act.²⁶ For activist groups in Bhopal, it became evident that only two types of legal action were now possible: first, to lend support to the government in bringing criminal prosecutions against UCC and UCIL managers and, secondly, to use writ petitions to challenge any improper findings or orders in the Claims Courts.

IV. Litigating strategies and the public interest

In a context where the aggrieved individuals were largely marginalised by prevailing legal structures, a small number of lawyers were decisive in determining litigating strategies and framing the issues. An early instance of this could be seen in the enormous influence of US personal injury lawyers whose arrival in Bhopal immediately focused attention upon the prospects of a remedy in tort against UCC in US courts. However sound this strategy may have been, it did cause a two-year delay while Carbide deployed the *forum non conveniens* defence; it also distracted attention from the other forms of legal redress which might be available.

Broadly speaking, lawyers for the Bhopal groups identified three main avenues of legal approach. The first, and perhaps most intuitively obvious; especially to North American lawyers, was through the law of tort or civil liability, in which the principal issues remained questions of causation, strict or fault liability, parent company control, and methods of appropriate compensation. A second approach was available under the substantive and procedural protections of fundamental rights provided in Part III of the Indian Constitution 1950. Pursuing this line of argument, the deaths and injuries which occurred in Bhopal could be treated as a violation of the right to life under article 21, thus opening the doors to a variety of legal remedies, including a range of prerogative writs and monetary compensation. The third avenue for legal redress could be found in the criminal law, with the possibility of government prosecution of Union Carbide or its managers under the Indian Penal Code provisions for culpable homicide. Faced with this range of legal options, it is legitimate to ask what factors determined the litigating strategies of the lawyers representing the individuals and NGOs in Bhopal.

While a private interest lawyer would answer that the case is a straightforward matter of civil liability, few of the people in Bhopal saw it that way, as we shall see. Moreover, once the action before the US courts was dismissed, and new litigation strategies had to be formulated in India, there were compelling factors which favoured an approach based upon criminal law or constitutional rights. To anticipate somewhat, it matters a great deal whether a

case like Bhopal is approached as a crime, a tort, or a violation of fundamental rights. At stake are not just different procedures and remedies, but also distinct vocabularies and ways of characterising the relationship between a polluter and society. If lawyers act essentially as strategists, choosing procedures and tactics most likely to succeed in court, then their legal strategies are also influenced by the prevailing legal culture and current fashion. Looking in turn to each of the three main legal principles – tort, constitutional right, and crime – it is instructive to seek what litigational incentives and disincentives were associated with each approach, as well as how it was viewed by activists in Bhopal.

A. Tort approaches

Leaving aside the complicating factors of parent company liability and the enforcement of foreign orders,²⁷ it was obvious from the first few days after the leak that the Bhopal case would be addressed in the United States principally through the law of torts, which is heavily favoured for personal injury cases. Even after the suit was dismissed by the US courts, the legal basis for all subsequent actions was a civil suit for \$3.3 billion, lodged in the Bhopal District Court in September 1986. For lawyers fashioning a strategy for the post-US phase of litigation, the Indian law of torts, based largely upon the English law, offered a number of obvious attractions: it has ready-made categories for injury, standards for establishing liability, methods for construing causation and protocols for assessing the quantum of damages. On the negative side, however, tort actions in India are notoriously slow, involving a highly technical set of procedures which enable defendants frequently to drag out proceedings for years and even decades.²⁸ It was partially in anticipation of delay that Justice Deo of the Bhopal District Court acted *suo moto* in asking the parties to present arguments in respect of interim relief. Since the question of interim relief occupied both plaintiff and defendant in appeal until the judicial settlement was announced in February 1989, the merits of the case in civil liability were never argued before any Indian court.

Nevertheless, the vocabulary and presumptions of civil liability which were implicit in the legal proceedings provided ample opportunity for the activist groups in Bhopal to evolve criticisms. Some activist leaders operated from positions informed by Marxian theory, others drew upon populist anti-state and anti-industrial discourses, but most of the people involved in activist groups simply drew conclusions from their own experiences, built upon more demotic concepts of justice. A full description of these views, articulated

²⁷These matters are ably discussed in Muchlinski, *op cit* n 3.

²⁸The now classic statement of this point is made in "Affidavit of Marc S Galanter, 5 December 1985" reprinted in Baxi and Paul, *op cit* n 3.

²⁶The court also directed UCC to provide funds for the construction of an additional hospital in Bhopal. At the time of writing (January 1994), Union Carbide has not complied with this order.

over many years, is not possible here. Nevertheless, it is possible to highlight several illustrative ways in which the law of torts came in for criticism.

Some of the groups in Bhopal criticised the legal preoccupation with monetary compensation. They pointed out that monetary compensation was simply a way for Union Carbide to place a precise value on life and injury, so as to incorporate that value into its account books just as any other cost of production. It is not surprising that from 1985, Union Carbide pressed for an out of court settlement extinguishing all civil and criminal proceedings in return for a lump sum in line with its insurance cover. In contrast, members of the BGPUS emphasised, particularly during 1989 and 1990, that monetary compensation was relatively low on their list of demands, especially if it assumed the form of a one-off payment. Experience showed that an influx of cash into the community would prompt merchants simply to raise the local price of goods, while creating fresh opportunities for lawyers, doctors, and disaster entrepreneurs to profit from the compensation. Moreover, payment of damages would place a full stop at the end of the litigational narrative, fostering the illusion that with the payment of compensation, the legal system had restored an equilibrium, accounting for all future pecuniary and non-pecuniary loss. In fact, the women point out, the physical and social effects of the gas are likely to continue for decades, particularly where progressive disorders may give rise to unforeseen symptoms. In such circumstances, neither future pain and suffering nor loss of amenities of life could be predicted, much less evaluated, in a satisfactory manner. What the BGPUS demanded in place of compensation was a four-part package: (i) full legal determination of civil and especially criminal liability; (ii) accessible, appropriate, and comprehensive medical care provided on a community-wide basis; (iii) provision of employment schemes and entrepreneurial opportunities to encourage local self-sufficiency; and (iv) long-term monitoring of continuing health effects.²⁹ Thus, the concepts of tort law were not rejected entirely, since appropriate compensation remained important to the BGPUS and allied groups. However, they were not prepared to accept a lump-sum payment without recognition of their long-term needs for medical care and financial support. Moreover, it was stressed repeatedly that since monetary damages could never make good non-pecuniary loss, there was a need to supplement actions in tort with those based upon constitutional rights and criminal law.

B. Fundamental rights approaches

The ready relevance of constitutional rights to the Bhopal case stems from two factors. The first is that when the Central Government assumed the role of

parens patriae, it extinguished the rights of individuals to seek remedy in the law of tort, and created new rights against the state within the scheme of administrative compensation. Henceforth, grievances regarding findings of fact and law, including matters of compensation, could only be addressed within the framework of public law. For lawyers, this required that issues of liability, compensation and even complex matters of epidemiological evidence, be recast in a public law terminology.

The second factor which drew the Bhopal case within the ambit of constitutional law was the already vigorous jurisprudence on constitutional rights which informed the strategies of most activist lawyers. Since the early 1980s, certain judges in the Supreme Court and, more latterly, in the High Courts have placed liberal interpretations upon substantive rights, while activist lawyers have taken advantage of relaxed rules of standing and other procedural innovations to build a dynamic public interest litigation movement.³⁰ Because public interest writ petitions can go directly before the Supreme Court, and tend to receive priority treatment in a docket otherwise clogged with arrears, they offer an attractive alternative to the notoriously slow actions in civil liability. Since the drafting of writ petitions is a straightforward matter, unencumbered by the procedural requirements which apply under the Code of Civil Procedure 1908, advocates are understandably attracted to them as a vehicle for speedy relief.

In these circumstances, it was not surprising that activist lawyers pursued a strategy of "constitutionalising" the tort issues in the case.³¹ While a full account of the constitutional issues in the Bhopal case lies beyond the scope of this chapter, the essential innovation was simple: it lay in treating personal injury claims as alleged violations of the right to life. The Supreme Court has for some time recognised that the right to life under article 21 extends beyond the right to a mere animal existence, and includes an entitlement to "the finer graces of human civilization which make life worth living".³² Additionally, it has been willing to provide monetary compensation for unconstitutional

²⁹Apart from relaxed *locus standi* rules, the courts have also treated letters as writ petitions, adopted non-adversarial proceedings, acted *suo moto* on the basis of newspaper accounts, and retained a supervisory jurisdiction for purposes of implementing orders. For the most important decisions on appropriate procedure, see *Bandua Mukti Morcha v Union of India* AIR 1984 SC 802, and *Sheela Barse v Union of India* (1988) 4 SCC 226. There is much literature on public interest litigation in India. The most important analyses include: Baxi U, "Taking Suffering Seriously" in Dhavan R, Sudarshan R, and Khurshid S, eds, *Judges and the Judicial Power*, Bombay, Tripathi, 1985; Bhagwati PN, "Judicial Activism and Public Interest Litigation" (1985) 23 *Columbia Journal of Trans Law* 561; Peiris GL, "Public Interest Litigation in the Indian Subcontinent: Current Dimensions" (1991) 40 *ICLQ* 66; and Breman J, "From Cane Fields to Court Rooms" in Shah G, ed, *Capitalist Development: Critical Essays*, London, Sangam, 1990. For a recent overview, see Hurra S, *Public Interest Litigation: In Quest of Justice*, Ahmedabad, Mishra, 1993.

³⁰The term is adapted from Baxi U, "The Bhopal Victims in the Labyrinth of the Law: An Introduction" in Baxi and Dhandu *op cit* n 3 at xxiv.

³¹*Board of Trustees, Port of Bombay v DR Nadkarni* 1983 (1) SCC 124. The right to life has been interpreted to include, *inter alia*, a right to: livelihood (*Olga Tellis v Bombay Municipal Corp* AIR 1986 SC 180), legal aid (*Stak Das v Union Territory* AIR 1986 SC 991), and the enjoyment of clean air and water (*Subhash Kumar v State of UP* 1991 (1) SCC 598).

²⁹This summary is derived primarily from interviews conducted in November 1989.

deprivation of life or personal liberty.³⁵ Of course, these remedies are only available against the state, but "the state" has been interpreted very widely to include parastatals, quasi-governmental authorities, and any organisation receiving substantial government aid or performing public functions.³⁴

The relevance of these trends for the Bhopal case became evident in *MC Mehta v Union of India*³⁵ on an application for compensation following a leak of oleum gas from a factory in Delhi owned by the Sriram Food and Fertilizers company. It is worth noting that the case was brought by India's foremost environmental public interest lawyer, MC Mehta, and came before the court not as a suit for personal injury, but as an application for the enforcement of the right to life. In its judgment, the court took some steps to construe the Sriram company as an instrumentality of the state subject to the discipline of fundamental rights standards, but failed to make a definitive pronouncement on the matter. The five-judge bench went on, however, to evolve standards of liability which would apply to any enterprise engaged in hazardous or inherently dangerous activity. Developing a rule of liability based upon constitutional standards, the court discarded the principles of strict liability following *Rylands v Fletcher*, and pronounced a standard of *absolute liability* "not subject to any exceptions which operate *vis-à-vis* the tortious principle of strict liability".³⁶ Other aspects of the new principle, including its application to entire economic enterprises (such as a multinational enterprise) rather than individual corporations, and the pronouncement that the quantum of damages should increase proportionate to the size of the enterprise in order to provide a deterrent effect, suggest that it was tailor-made for the impending Bhopal litigation. Such jurisprudential innovation relied heavily upon the fundamental rights framework, because it would have been difficult to achieve within a construction of tort principles based on precedent. The relevance of absolute liability to Bhopal was never fully explored. Although the principle was applied to Carbide in the Madhya Pradesh High Court in its decision on interim compensation, the 1989 settlement precluded either a hearing on the merits or a definitive pronouncement by the Supreme Court.

The combination of the *Mehta* principle and the *parens patriae* power of the central government provided ample opportunities for challenging the settlement by way of constitutional writ petitions, as we have seen. A large number of petitions were filed challenging the settlement on a variety of fundamental rights grounds. In the end, these petitions failed to attain their objects, since the 1985 Act was declared constitutional and the civil side of the

³⁴*Rudul Sab v State of Bihar* 1983 (4) SCC 141; *Bhim Singh v State of J & K* 1985 (4) SCC 677; the recent decision in *Nilabati Behera v State of Orissa* 1993 (2) SCC 746 is important for the distinction it develops between a claim for compensation under public law and a remedy in tort for damages.

³⁵*Ajay Hasia v Khalid Mujib* AIR 1981 SC 481; *Tekraj v Union of India* AIR 1988 SC 469.

³⁶1987 (1) SCC 395.

³⁷*Ibid* at 421.

1989 settlement was upheld.³⁷ Nevertheless, the fundamental rights procedures provided the activist groups and their lawyers with a powerful set of tools for challenging government actions in what were essentially matters of tort litigation. This has permanently modified the landscape of tort jurisprudence in India, so that toxic torts and other environmental claims are now much more likely to be addressed through fundamental rights procedures.

The vocabulary of fundamental rights has been taken up by groups in Bhopal, no doubt because it has an intuitive appeal, but also because it has served as the basis for their court actions since 1989. Nevertheless, as an idiom of protest and local understandings of justice, it is not as popular as that of the criminal law. On balance, the rights violation approach has been largely lawyer-led rather than activist-led. A human rights approach to the Bhopal case was developed more fully by the Permanent Peoples' Tribunal, an NGO based in Rome which held hearings in Bhopal during October 1992. Although the Tribunal has no legal authority, the judgment is worth noting for the way it attempts to build a human rights understanding of the Bhopal case:³⁸

"Human rights standards have too often been narrowly interpreted to exclude from their purview the anti-humanitarian effects of industrialisation and environmental damage. . . . It is of little difference if the death which comes to the sleeping victim in the middle of the night is caused by a politically-motivated death squad or by a cloud of poisonous gas. In either case, the right to life of an innocent person is violated in an inexcusable manner. . . . [A]nd in either case the international community has a profound interest in taking steps to ameliorate the effects of the violation and to prevent its repetition."

It is not surprising that this view resonates with those of many local activists. Casting the Bhopal injuries in terms of human rights violations underscored the sense of irreparable harm. If the right to life is absolute and inalienable, it cannot be bought and sold on the open market of civil liability. This assertion assumes additional importance where the prospect of low tort damages encourages companies to risk accidents rather than investing in safety equipment. The human rights language also holds the appeal of universality, so that a human who is injured by industrial hazards should have the same rights to care and compensation no matter where the injury occurs. Within a human rights framework, a toxic death in India should carry the same legal consequences as a similar death in Germany or the United States. The claim to a universal standard of compensation runs directly counter to the tort principle of awarding damages according to pecuniary loss calculated in terms of local wages. Hence, the law of human rights, however blunt and ineffective a

³⁷*Charan Lal Sabu v Union of India* AIR 1990 SC 1480; *Union Carbide Corporation v Union of India* AIR 1992 SC 248.

³⁸Permanent Peoples' Tribunal (Third Session on Industrial and Environmental Hazards and Human Rights) *Findings and Judgements* at 14. The judgment of the Tribunal is available from: The Permanent Peoples' Tribunal, Via Della Dogana Vecchia 5, 00186 Roma, Italy.

tool in private litigation, offered a way to criticise the dominant discourse of tort law.

C. Criminal law approaches

Whatever the appeal of human rights concepts to lawyers and activists, there is no doubt that the most popular approach to the Bhopal case among BGPMUS members is through the categories of criminal law, particularly that of murder. Within the women's group, it is commonly pointed out that if the government could execute two men for the 1984 assassination of Prime Minister Indira Gandhi, then there is no reason why the former Chief Executive Officer of Union Carbide, Warren Anderson, should not be executed for his part in bringing about the deaths of over 3,000 innocent victims. The legal niceties of *mens rea* have no place in this demotic voice: the Bhopal gas leak is viewed as an inexcusable crime committed on a massive scale. Bhopal activists point out that the last time so many people died at once due to exposure to toxic chemicals was in the gas chambers of Nazi Germany. Bhopal is readily likened to genocide. Many argue that no amount of money, paid from the pockets of insurance companies and wealthy corporations, can begin to erase the personal guilt of the managers responsible for deaths on this scale. With an emphasis on manager liability, the notion of a corporation as a legal person has come under considerable attack in Bhopal. While there have been consistent demands to hold Union Carbide responsible for the gas leak, there has been a parallel movement focusing not on the corporation, but on the person of Warren Anderson. Whereas a corporation is by definition not a natural person, and is, therefore, impossible to confront in a personalised manner, Anderson is emblematic of the entire corporate structure employing over 100,000 people. Repeated calls to try Anderson for murder are partly rhetorical devices, but they are also efforts to reconceptualise the legal situation. There can be no doubt about the sincerity of these views, no matter how shocking they may seem to observers opposed to capital punishment.

For many activist lawyers, a criminal law approach has ideological appeal, but offers few practical opportunities. India's Criminal Procedure Code 1973 does not provide for private prosecutions, so the pursuit of criminal charges lies wholly in the hands of the state. Although Warren Anderson and a number of Indian managers were charged with a range of offences including culpable homicide shortly after the leak, prosecutions were not pursued while the issues of civil liability were before the courts. Rather, the threat of prosecution was used as a bargaining chip in the negotiation of the 1989 settlement. When the settlement order quashed all criminal proceedings, evidently in partial consideration for \$470 million, the prosecutions were withdrawn. However, this appeared to be in clear violation of the Criminal Procedure Code

provisions regarding non-compoundable offences,³⁹ so the illegality of the quashing became one of the central arguments of the review petitions.

When the Supreme Court issued its review judgment in October 1991,⁴⁰ the quashing of the criminal orders was set aside on the grounds that alleged offences of such gravity and magnitude should not be left uninvestigated. Criminal prosecution resumed shortly thereafter. In February 1992, Warren Anderson failed to appear before the Bhopal magistrate, and a warrant was issued for his arrest.⁴¹ After it became clear that the Government of India was not willing to pursue extradition, the criminal trial was split into two parallel trials: one for Anderson and three other executives outside of India, and another for UCIL and nine of its employees.⁴² In April 1993, formal charges were framed against UCIL and its employees under the Indian Penal Code provisions for: culpable homicide not amounting to murder (s 304); voluntarily causing hurt and grievous hurt (ss 324, 326); and mischief by killing cattle and other animals (s 429).⁴³ Under section 304, culpable homicide committed without any intention to cause death is punishable by fine and imprisonment extending up to 10 years.

While proceedings against the nine Indians are underway, the government has not yet initiated extradition proceedings against Anderson or the other non-Indian executives. Throughout 1993, the BGPMUS and other groups called repeatedly for extradition,⁴⁴ but officials have refused to act or comment. For the activist groups and their lawyers, the criminal proceedings are another example of their exclusion from the mechanisms of accountability. There is no procedural scope for public interest lawyers to initiate or support criminal prosecutions, even though criminal charges represent one of the most effective methods of deterring corporate negligence. If public interest lawyers in India and elsewhere are to represent the views of their client groups effectively, the substantive and procedural aspects of corporate crimes will require elaboration.⁴⁵ Above all, there is a need for better procedural vehicles to allow the expertise of public interest lawyers to influence criminal trials.

It is ironic that just as the criminal trials commenced, the BGPMUS and other groups became preoccupied with matters of monetary compensation. After the Supreme Court judgment of October 1991 opened the way to distribution of compensation under the 1985 Act, claimants in Bhopal were left scrambling to assemble evidence for the Claims Courts. In June 1992, the Supreme Court

³⁹Sections 320, 321, 482.

⁴⁰*Union Carbide Corporation v Union of India* AIR 1992 SC 248.

⁴¹*Financial Times*, 28 March 1992.

⁴²*Financial Times*, 12 November 1992.

⁴³Charge Sheet, Sessions Trial No 257/92, Bhopal Court of Sessions, 8 April 1993.

⁴⁴"Bhopal: The Tragedy Continues" 10 *Lokayan Bulletin* 29 (July-August 1993)

⁴⁵See the excellent study by David Bergman, *Disasters: Where the Law Fails - a new agenda for dealing with corporate violence*, London, Herald Families Association, 1993.

established guidelines for compensation, fixing lump-sum payments in a range between Rs 50,000 to Rs 300,000 (£1,080 to £6,500) as full and final compensation for relatives of the deceased.⁴⁶ The first awards were made three months later.⁴⁷ Unfortunately, the processing of claims has been characterised by corruption, unreasonable burdens of proof, and miserly assessment of damages. The Claims Courts require claimants to prove "beyond reasonable doubt that the death for which compensation is sought is attributable to gas exposure."⁴⁸ Even though most of the people who died in the first few days after the leak were buried in mass graves or cremated without post-mortem examinations, the Claims Courts have required claimants to produce post-mortem reports in order to qualify for compensation. Consequently, by June 1993 the Claims Courts had rejected about 70% of the 3,849 death claims which they had heard.⁴⁹ In such circumstances, even legitimate claimants are often forced to resort to bribery and forged post-mortem reports in order to secure compensation. Moreover, due to a lack of experienced district magistrates, new recruits with little or no experience in tort law have been brought in to make awards. One astonishing feature of the awards to date is that in assessing the quantum of damages, most have relied exclusively upon estimates of pecuniary loss, thus ignoring entirely the question of damages for non-pecuniary loss.

The activist groups in Bhopal have done their best to provide claimants with medical and legal advice, but the challenges of graft and judicial ignorance are large indeed. One of the problems which the Bhopal claimants share with plaintiffs in other toxic torts is the extreme difficulty in proving a causal link between exposure and chronic illness. Like many toxic substances, MIC produces idiosyncratic health effects which are subtle in manifestation and complicated or opaque in causation. The available epidemiological evidence is scanty, and riddled with methodological difficulties. Even where clear medical evidence exists – for instance in the link between MIC exposure and increased susceptibility to tuberculosis – the Claims Courts have generally refused to acknowledge its relevance to the quantum of damages. In an attempt to assemble independent medical evidence for the courts, the Bhopal Group for Information and Action, in collaboration with support groups in the United States, the United Kingdom and Canada, raised funds to sponsor an international medical commission to evaluate the health status of selected individuals in early 1994. However, even armed with better medical evidence,

the activist groups may have to rely upon protests, lobbying and press coverage to secure better treatment before the Claims Courts.

V. Conclusion

Bhopal activists, like those in many other public interest movements, have used law as only one tool in a larger struggle involving campaigning, lobbying and grassroots welfare work. For the most part, they take the view that while the law is sometimes useful to secure minor gains, it has proved to be a failure in providing an adequate measure of justice to the victims of the gas leak. Nevertheless, the work of the activists and public interest lawyers has not only helped protect the interests of Bhopal victims, it has also had an impact on the evolving shape of environmental laws in India. The pace of legal change, to paraphrase Max Weber out of context, is often akin to the slow boring of very thick planks. However, the gas-affected people of Bhopal have not had the luxury of time: they had immediate need for a comprehensive and flexible regime that could cope with complex medical, legal and social issues with a minimum of bureaucratic hassle. They have also voiced another need: a need for justice. The Bhopal groups have been consistent in their view that ample medical care and economic relief are not adequate alone. They will continue to demand that liability for the leak be determined, and those found responsible punished. One would not wish to endorse their call for capital punishment, but their strong views are an instructive caution against unthinking reliance upon the law of tort.

A question for further exploration, in Bhopal and elsewhere, is the nature of the interaction of popular and official conceptions of justice. The activist groups in Bhopal were clearly influenced by legal understandings of liability, and yet they have retained a distinct autonomy from those understandings and were able to provide a sophisticated and compelling critique of many legal concepts. By shifting the idiom from one of civil responsibility to one of criminal responsibility and human rights violations, groups in Bhopal were able to articulate strong demands in ways which were more immediately accessible to demotic understandings. Of course, the ability of lawyers to translate popular understandings of justice into effective legal language is constrained by judicial attitudes and existing procedures. But to ignore popular notions of justice entirely would be a disservice both to client groups and the broader interests which the legal system is meant to serve.

⁴⁶*Financial Times*, 22 June 1992. Activists and lawyers note that these amounts are only a tiny fraction of what probably would have been secured in US tort litigation.

⁴⁷It is probably no coincidence that these were announced at the same time as the hearings of the Permanent Peoples' Tribunal *op cit* (n 38).

⁴⁸Saranghi S, "It seems that we, not Union Carbide, are the culprits", *Times of India*, 30 March 1993.

⁴⁹Singh NK, "No Succour in Sight", *India Today*, 30 June 1993. The courts have even rejected a large number of claims which were previously verified by a government committee of experts.