Economic Aspects of Environmental Compliance Assurance

Proceedings from
the OECD Global Forum on Sustainable Development
2-3 December 2004
OECD Headquarters, Paris, France

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

These proceedings present the results of an international meeting on Economic Aspects of Environmental Compliance and Enforcement that was organized by the Organisation for Economic Co-operation and Development (OECD) on the 2-3 December 2004 in Paris. The meeting was conducted in the framework of the OECD Global Forum on Sustainable Development.

The specific objectives of the meeting were to:

- Discuss experience from designing optimal enforcement/compliance assurance strategies and tools that can maximise environmental benefits and minimise costs to the regulators and regulated community, and

- Facilitate a dialogue and exchange of experience between OECD countries and non-members from transition and developing economies on good practices that can help Governments and their partners in designing and applying more effective and efficient compliance incentive structures.

The views expressed in this document are those of the authors and do not reflect necessarily the official opinion of the OECD, its member countries, or the national governments mentioned throughout. The papers have been reproduced in the proceedings in their original form. All the presentations made at the conference and other background materials are available on the OECD conference web site: http://www.oecd.org/ccnm/sustdev.

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SUMMARY OF THE DISCUSSION

1. Introduction

The role and design of systems that ensure environmental regulatory compliance has become a subject of particular interest in light of society's demand for policies that target a high level of environmental protection, public awareness and participation, and economic growth. Recent discussions within governmental and academic circles have shown the need to better understand firms' incentives to comply with environmental regulations and to optimise the structure and costs of strategies aimed at ensuring environmental compliance.

A Conference on Economic Aspects of Environmental Compliance Assurance, organised on 2-3 December 2004 in Paris, within the framework of the OECD Global Forum on Sustainable Development, facilitated a dialogue between OECD countries and transition and developing economies on designing optimal enforcement strategies and tools that can maximise environmental benefits and minimise costs to the regulators and regulated community.

Participants shared their experience and ideas, and re-confirmed the need for more empirical analysis of compliance rates, as well as the costs and benefits of government compliance assurance programmes. Participants requested the OECD and its Partners to extend the dialogue and to especially help non-member countries to design policy approaches that ensure environmental compliance and that are cost-effective for the administration and the regulated community.

Environmental enforcement (or compliance assurance in a wider sense) programmes involve a broad array of actions that governmental agencies, alone or in co-operation with other stakeholders, take to prevent or halt environmentally damaging behaviour. Practice shows that despite the comprehensiveness and recourse-intensity of existing programmes, compliance rates are still unsatisfactory. Detecting and prosecuting non-compliance is complex, and time- and resource-consuming.

2. Need for a Thematic Global Forum for Sustainable Development (GFSD)

Low compliance rates often stem from inadequate incentives provided by regulatory frameworks, the institutional capacity of enforcement authorities, or the social and cultural environment. There is often a lack of in-depth analysis of the entire spectrum of economic and social factors that influence the decision of the firm to comply, or not, with environmental requirements. This includes, for example, the likelihood of a violation being discovered and sanctioned versus the levels of penalties and timeliness of response, the selection of an appropriate type of penalty for non-compliance (administrative or criminal), the firm's capacity (financial, technical, or human) to address environmental issues, existence of tax incentives, etc. At the same time, aiming to achieve perfect (*i.e.* 100 %) compliance rates may not always be the best strategy due to its high costs in comparison with eventual benefits.

In recent years, there has been a rapid growth in theoretical discussions about the economic framework for environmental compliance and enforcement. However, in-depth analysis of government enforcement policies from the economic angle has been carried out mostly in OECD countries. In transition and developing countries such analyses are largely absent.

Worldwide, the majority of the competent authorities still pay inadequate attention to answering the following questions:

- Why do firms comply (or not) with environmental laws?
- What are the optimal enforcement strategies and packages of tools that can maximise environmental benefits and minimise costs to the regulators and regulated community?

3. GFSD on Economics of Environmental Compliance and Enforcement: Agenda and Participants

The Organisation for Economic Co-Operation and Development (OECD) hosted, on 2-3 December 2004 in Paris, an international conference to advance policy dialogue between senior government officials, researchers, NGOs and business people from OECD member and non-member countries on economic aspects of environmental compliance assurance. The meeting convened around 100 enforcement practitioners, economists, lawyers, scientists and representatives of business and NGO circles from 37 developed, developing and transition countries. The Conference was financially supported by the OECD, the World Bank and the government of Denmark. It was organised in cooperation with partners working within the framework of the International Network for Environmental Compliance and Enforcement (INECE).

The Conference was structured around four main issues:

- Incentive framework for firms to comply (or not) with regulations (Session 1);
- Government approaches to ensuring environmental compliance (Session 2);
- Empirical evidence on budget allocation for enforcement activities (Session 3);
- Innovative approaches that could save administrative and compliance costs (Session 4).

4. Environmental Compliance Assurance - the "Cinderella" of Environment Policies

So far, enforcement of environmental policies, and more specifically the economic aspects of compliance assurance programmes, has attracted relatively less attention compared with other aspects of environmental policy. Workshop participants characterised enforcement as the "Cinderella" of the environment policies. Problems stemming from this neglect include: i) inadequate consideration of likelihood of spontaneous compliance and enforcement capacities while designing environmental policies; ii) limited empirical analysis of actual compliance rates; iii) lack or partial consideration of financial and economic impacts of enforcement programmes; and iv) lack of *ex ante/ ex post* cost-benefit and cost-effectiveness analysis of compliance assurance policies, in general, and concrete enforcement actions.

To address these problems, the costs and benefits of compliance and enforcement need to be taken into account throughout the whole cycle of a policy design and implementation. During the concluding session, participants agreed on the importance of:

- **Adequate policy design:** Designing policy mixes that are adapted to the specific context, greater use of economic instruments, when possible, to reduce the costs to regulatees; and developing appropriate approaches to the problems of small polluters. They stressed the need to consider enforcement in the design phase of a policy and hence to increase cooperation between enforcers and policy makers;

- **Better analysis of inputs and results of compliance assurance strategies:** More empirical analysis on compliance rates, and the benefits of compliance assurance. Further work is also needed on enforcement and compliance indicators and more empirical analysis of types of enforcement policy approaches that lead to more transparency and better performance. Analysis of funding and the efficiency of inspectors work were also identified as areas for further research;

- **Adoption of innovative approaches:** Creating an appropriate environment for the involvement of the public ("whistle blowers" protection; transparency; freedom of information; "name and shame" approaches using public disclosure of information and performance rating that is understandable to third parties; education);

- **Extended dialogue:** More dialogue between economists and practitioners, as well as between practitioners of different areas (e.g. "brown" and "green" sectors) and among countries.

The implementation of these recommendations would help countries to obtain greater environmental effects at lower costs overall, and to focus scarce resources where they are most needed and where they have the greatest effects, as well as to limit corruption.

The participants considered that the OECD conference was timely as there were few forums where discussions could be held between enforcement practitioners and economists. They called for continuation of this dialogue, for more empirical analysis, and the identification of best practices that can serve as recommendations for countries. The OECD expressed its readiness to provide a platform for further dialogue and analysis in co-operation with the INECE and its Partners.

5. Factors Driving Compliance with Environmental Regulations

Discussion during Session I centred on the adequacy of the economist's basic enforcement model that describes firm behaviour. Do firms weigh up compliance and non-compliance costs and choose the least cost alternative or do they rather have an intrinsic motivation or self-interest to comply with environmental regulation?

In considering factors that can drive or impede compliance, a set of eleven factors under three headings was presented by the Dutch Inspectorate which relate to:

i) spontaneous compliance (knowledge of the regulation, cost-benefit ratios, degree of acceptance of the regulation, loyalty and obedience of the regulatee, informal self-monitoring);

ii) monitoring aspects (informal reporting probability, monitoring probability, detection probability, selectivity of inspectors); or

iii) aspects of sanctions (probability of sanctions, severity of sanctions).

An ongoing OECD project on impacts of government environmental policies on firm's management identified a number of factors that can influence compliance, including consideration of the stringency of regulations, the place of environmental officers in a firm's management hierarchy, and the perception of penalties.

Testimonies from various participants suggest that large, multinational firms often work towards high environmental performance standards independent of the location of their sites. Such firms have incentives to comply not only following the policy of the parent company but also to build their global reputation and image even in countries where environmental regulation is lax or absent. Based on this, a BIAC[1] representative suggested that regulators should apply different approaches towards firms that put effort into achieving compliance, on the one hand, and companies that may have incentives not to comply with environmental requirements, on the other.

Other participants stressed that the economist's compliance model is not necessarily in contradiction with sociological and political explanations of firm behaviour (reputation, social norms, etc.). Rather, these explanations are considered complementary as firms have multiple objectives and react to multiple signals and incentives. Firms may well aim to improve their environmental behaviour even without the treat of a punishment. Nevertheless, the model assumes that penalties need to be applied in some circumstances as even law-abiding firms that do not want to violate the law may be subject to random (management) errors that might lead to non-compliance. In such cases enforcement may increase the care they apply. Most participants agreed on this view and suggested that, next to penalties, the monitoring frequency – and in particular non-predictability of inspections - is an important factor in inducing compliance.

A further discussion addressed the issue of workers' and labour/trade unions' influence on compliance. Can workers be expected to care about environmental needs and compliance, and to influence, or report on, the non-compliance behaviour of their employer firms? And what is the role of trade/labour unions? Participants suggested that the influence of workers might depend on the existence of "whistle blowers" (individuals or groups prepared to alert the public and other stakeholders of non-compliance), as well as on the risks associated with such actions, e.g. a firm closing down owing to uncovered environmental problems. It was also suggested that workers might be less involved when unions are stronger but more involved when there are links between environmental and health effects. The latter aspect points to the usefulness of creating a link between health & safety and environmental inspections. Indeed, the US Environmental Protection Agency (US EPA) plans to share information between the two responsible agencies, i.e. the US Department of Labour Occupational Safety and Health Organisation (OSHA) and the US EPA, in the future and to set up joint inspections.

6. Characteristics of Environmentally Effective and Economically Efficient Regulation

The discussions in Session II mainly focused on four broad issues:

i) the enforceability of environmental policies,

[1] Business and Industry Advisory Committee to OECD

ii) types of policy instruments and enforcement approaches that encourage firms to comply,

iii) interagency cooperation and coordination, and

iv) the discretion of enforcers.

Several speakers stressed the importance of focussing not only on the actual enforcement of policies but also on the enforceability of policies. This issue points to a need to assess what part of non-compliance can be attributed to "bad policy" and what part to "bad implementation" and aims at avoiding dealing with symptoms without knowing the causes. It was the reasoning, for example, behind the EU's "Better Regulation" initiative developed by the Environment Agency of England and Wales. The Agency identifies six principles that demand regulation to be: i) transparent (clearly communicated); ii) accountable; iii) consistent (within and between sectors and over time); iv) proportionate (risk-based); v) targeted (outcome-focused); and vi) practicable (proper funding for enforcers and clarity for business about what they have to do).

Interaction between policy makers and enforcers is well developed in the Netherlands where the enforcement agency reviews all policies with respect to their enforceability and provides feedback to the policy makers where problems are identified. The US EPA's enforcement office is reported to usually be involved when laws are written. All in all, early interaction between policy makers and enforcers when policies are designed can help create understandable and enforceable regulation.

With respect to regulatory approaches and policy instruments that further compliance and innovation, participants agreed on the need to apply a policy mix that is adapted to the specific context. In particular, economic instruments, when appropriately designed, can reach environmental objectives at lower costs than "command and control" type regulation, and additionally, drive technology development. Nevertheless, workshop participants also pointed out the possibility of "win-win" situations for firms developing environmental technologies as a result of stringent regulations. While more empirical analysis is needed regarding the choice between "command and control", economic instruments (such as trading schemes) and/or voluntary agreements, it was suggested that the involvement of third parties, for example of NGOs taking on a "watchdog" role, might improve their selection and credible functioning.

As Small and Medium Size Enterprises (SMEs) can significantly impact the environment[2], the choice of adequate instruments for their regulation is important. Shareholder pressure is generally not an important factor for this type of firm. Since SMEs may also have limited management capacity, information provision and compliance promotion is an important starting point and can be supported by translation of legislation into management procedures, advising on how to comply, and making clear what exactly constitutes compliance. But also incentives for compliance should be provided, which can be captured in the formula "help and threaten". Some participants suggested the application of a gradual approach, which starts by soft and voluntary instruments but eventually includes penalties in cases of prolonged non-compliance (cf. the "Enforcement Instrument Pyramid", presented in a paper by N. Gunningham).

Next to the issue of "getting the regulation right", effective and efficient policy making also requires that different actors coordinate their work. A lack of inter-agency cooperation was not

[2] Twenty million SMEs account for 60% of pollution in the EU.

only reported with respect to policy makers and enforcers, but also between inspectors and prosecutors or the Ministry of Justice and the Ministry of the Environment. This is frequently because agencies lack a comprehensive view of enforcement and their responsibilities in this regard.

The issue of discretion for local regulators was discussed at length with the following conclusions:

- Discretion usually requires local regulators to prove that their actions are in line with the regulation. Inspectors therefore may prefer "command and control" regulation. More generally, they tend to focus more on "activities" than on "outcomes", while the opposite would be preferable from an economic and environmental point of view;

- Enforcement agencies at the local level will have better knowledge of the local situation, allowing enforcement to be better targeted and more efficient in principle. In practice, however, these agencies often focus on ensuring that, first and foremost, the costs of their operations are (re-) covered;

- Discretion may provide opportunities for corruption. Thus it is essential that incentives are set to discourage corrupt behaviour by inspectors. This involves local enforcers being paid adequately and corruption cases appropriately punished (including imprisonment).

A related issue addresses a question of how to best finance enforcement agencies. As state budgets face constraints, enforcement agencies are frequently under-funded. To address this issue, agencies should work towards recovering their costs where possible (although an ultimate goal is to receive adequate resources from the state budget), but not rely on income from non-compliance responses (penalties) as a major source of revenue as this could create perverse incentives. As an example, the UK Environment Agency partly recovers the cost of its Environmental Protection Operator and Pollution Risk Appraisal (OPRA) scheme through permit charges that reflect the risk and therefore the regulatory effort involved.

7. The Optimisation of Compliance Monitoring and Enforcement

The discussions during Session III showed that there remains a difference between the economist's and the practitioner's view with respect to the meaning of "optimisation" of enforcement activity. Whereas practitioners seem to favour a view according to which enforcement should focus on where the pollution problems are the biggest (i.e. highest non-compliance risk), economists would advocate targetting problems that achieve the biggest return on resources invested ("the biggest bang for the buck"). As an example the Dutch Inspectorate's compliance strategy was discussed, which distinguishes two dimensions when determining priority tasks: the present state of a) risk and b) non-compliance. From an economist's point of view, economic aspects (the environmental benefits attainable through compliance assurance compared to the costs necessary to reach compliance) should be included as a third dimension. Even though the marginal impact of a unit of enforcement resources spent is difficult to measure, enforcement agencies should reflect on this issue and adjust their activity accordingly. This should take into account, but also manage appropriately, the local discretion of enforcement field officers.

The participants stressed the need to distinguish "decent" operators (firms that are willing but maybe unable to comply) from those that do not want to comply and can be characterised as

"environmental criminals". With this in mind, the UK Environment Agency is currently focusing the work of inspectors so that they can promote compliance and help firms to address their environmental problems, and to refocus enforcement and non-compliance responses on those who avoid compliance.

An important point highlighted with respect to limited enforcement resources is the asymmetry in information that can work in favour of the regulator. Using this information asymmetry, (partly by "bluffing" on the side of enforcement agency ["blitz and bluff"]) deterrence can be created. Publishing information on enforcement and non-compliance measures can also be helpful in this respect.

Participants acknowledged the need for better data to assess whether/where enforcement results justify enforcement (cost-benefit analysis). Additionally, more empirical research is needed on the impacts of different enforcement approaches. It was suggested that both extremes, an "aggressive" style, and a "cooperative" approach, might be counter productive. To the extent that this is true, a gradual approach may be more effective, starting with information provision and persuasion, but applying severe penalties where this is not sufficient ("compliance promotion/ non-compliance response pyramid") so the enforcement style is adjusted to specific corporate attitudes.

8. Innovative Approaches

Session IV focused on empirical examples of information disclosure programmes ("name and shame" approaches and community pressure) and their possible role with respect to "classical" government enforcement actions.

Several participants reported positive experience from their countries:

- In the US, the ECHO (Enforcement Compliance History Online) Internet site, together with the "Freedom of Information Act" and the possibility for citizens to sue companies after informing the EPA, has been effective in improving the enforcement system.

- In Japan, citizens and the mass media have a "watchdog" role (demonstrations against polluting industries played an important role in the 1960s and 1970s).

- The EU aims at a stronger involvement of NGOs and the general public, which is reflected in its engagement in the Convention on Access to Information, Public Participation in Decision Making, and Access to Justice in Environmental Matters (the Århus Convention). By granting the public access to justice and thus promoting private litigation, the EU aims to strengthen the role of national courts in enforcement.

- Indonesia's PROPER programme, and similar approaches applied in India and China, are other well known examples of disclosure-of-information, and enterprise environmental performance rating approaches. Such programmes are considered to be easy to develop, providing good ways of co-operating with various stakeholders and environmentally effective. The PROPER programme, under which firms are rated based on compliance checks with the regulation, can be regarded as a complement to the enforcement agencies' work. Where PROPER shows that no improvements take place, environmental inspectors check and eventually take enforcement actions. Participants also suggested

that the involvement and use of multiple sources of information within the PROPER programme might provide a way of handling corruption.

Discussing the relative importance of traditional enforcement versus public pressure, participants warned that community pressure should not be seen by the government as a sign that they can do less. It was suggested that "green" consumers and public pressure can help but will never be sufficient to solve environmental problems. Therefore, traditional enforcement and public pressure will need to be considered as complements. Furthermore, it was suggested that involving the public might be more difficult in some areas than in others.

The role of NGOs was considered particularly important in the OECD countries as a source of information for enforcement agencies about problems and possible solutions. Such co-operation should be pursued in developing countries where regulation and enforcement are less robust. Empowering NGOs and providing the public with information can be considered as crucial tasks in compliance with environmental requirements.

BACKGROUND PAPER
ON ECONOMIC ASPECTS OF ENVIRONMENTAL COMPLIANCE ASSURANCE

Part 1: Incentive Framework for Firms to Comply With Regulations[1]

Compliance with environmental regulations is rarely complete. For OECD countries, Russel [47] reports that 65% of regulated sources in the US may be in violation of air emission limits, and the compliance of Canadian pulp and paper mills with federal BOD standards in 1987 was 69% on an annual average [24]. Heyes [29] points out that actual compliance rates may even be lower than reported compliance rates, as the latter only indicate that the inspection agency has not been able to prove non-compliance. Still there is very little information on the compliance rates even in the most developed economies of OECD.

Knowledge of the factors that drive environmental performance and non-/compliance behaviour of firms vis-à-vis environmental regulation is crucial to designing and applying regulations to stimulate firm's behaviour. It is also important to identify central political action variables that can influence the firms' constructive response to regulations. With the aim to identify key characteristics of an incentive framework for firms to comply with regulations, this part of the discussion looks both at theoretical suggestions and empirical evidence on what drives firms' compliance decisions.

The "Normative" Environmental Economics View

The normative environmental economics approach towards compliance with, or violations of, environmental regulations assumes that regulated agents are rational when making compliance decisions: they decide whether to comply or not on the basis of a cost-benefit analysis. This involves comparing expected compliance costs (*i.e.* expenses for technological and management improvement which will allow to meet environmental requirements) with non-compliance costs (*i.e.* costs of non-compliance fees, penalties and other associated costs) and eventually choosing the least-cost option.

Usually, compliance costs are easy to calculate but non-compliance costs are more complex as, in reality, compliance monitoring is not complete, either due to scarce administrative resources or efficiency reasons. Therefore, non-compliance will only be sanctioned within the terms of a certain probability. The cost of non-compliance is hence the statistical expectation of the sanction x = pF, where p is the probability of monitoring (detection) and F the severity of the punishment (financial or non-financial sanctions).

Normative economics literature which deals with implementation of environmental policies models the monitoring probability and the penalty as constituting the variables of available political actions from which the regulator can start in order to increase deterrence.[2] The regulator can, therefore, either raise the probability of detection and conviction (for example by increasing the monitoring probability via an increase in the monitoring frequency and/or by applying advanced monitoring technologies), or by changing legal rules to increase the probability of conviction (*e.g.* requiring less evidence) and/or the severity of the monetary or non-monetary sanction (*e.g.* increasing level of penalties).

In economic terms, it is suggested that in order to save monitoring costs, an arbitrary increase in F in the form of a monetary fine[3] could be compensated by an equal percentage reduction in p, leaving the expected penalty pF unchanged (p and F as perfect substitutes for deterrence). Whether this is the case, however, depends on the regulated agent's attitude towards risk, *i.e.* on the elasticity of the response of violations to changes in p and F [1].[4] Next to risk aversion, there may be further limits to high fines, such as exogenously imposed limits due to

legislation, social norms or just for reasons of perceived fairness ([23; 45]). It can also depend on wealth constraints (risk of insolvency of a firm) where the monetary penalty exceeds the polluter's wealth and simply makes it impossible for him to pay the potential fine. In an extreme case, where the polluter can declare bankruptcy because of a penalty, the sanction may lose its deterrence effect [6; 29; 49].

"Positive" Approaches to Explaining Compliance Behaviour

Literature takes also a more "positive" stance by seeking to explain the empirically established behaviour of regulated agents. There may be a few suggestions on why compliance may sometimes be higher than expected with the current levels of monitoring and enforcement by regulatory agencies (so called "Harrington paradox"[5]):

- Firstly, firms often subjectively overestimate the expected penalty [6]. Therefore ***perceived levels of inspections and sanctions*** as compared to actual levels may determine firms' compliance behaviour and explain compliance despite low sanctions.

- Secondly, compliance may also be the effect of dynamic regulator-regulated relationships with ***government-operated enforcement schemes***, *i.e.* the expectation of becoming subject to stricter monitoring and sanctions if previously found non-compliant [22; 23] (cf. also session 4).

The literature, furthermore, acknowledges a larger variety in regulatory behaviour than suggested above. On the one hand, ***"regulatory dealing"*** (or "issue linkage") may explain cases where firms comply without a credible threat of sanctions [29]. The idea is that enforcement agencies may interact with a firm in more than one context, for example they meet in several regulatory settings or because of a firm have several plants. As a result, agencies may tolerate non-compliance in one setting if they judge it to be ameliorated by the firm's over-compliance in another. On the other hand, regulators may also provide ***positive incentives***, such as subsidies for compliance, for example in the form of tax breaks, which may add to firms' compliance by affecting their cost-benefit calculus [6].

Finally, this literature also suggests a broader view on compliance motivations. It acknowledges that not only publicly enforced sanctions for environmentally unfriendly behaviour/non-compliance may determine compliance. These may include ***market forces*** which may in addition penalise firms and influence compliance behaviour as potentially adverse reactions of customers, investors, stock-market valuations or employees may be stimulated by information about a firm's negative environmental impact. Such information could also influence the general public image of the firm concerned, or lead to exerting pressure by the surrounding local communities [29].

Next to extrinsic (external) motivation, through regulatory deterrence suggested by normative economics, ***intrinsic (internal) motivation***, such as honesty or social norms, might also lead to environmentally friendly behaviour and voluntary compliance, and explain compliance independently of costs [3; 16]. The "Harrington paradox" may be magnified in cooperative cultures with very widely shared communal values where many more people act based on non-economic reasons to avoid non-compliance. These may include the desire to avoid personal feelings of guilt, or family/employee/public shame from being known to violate strong communal values. These values also include cleanliness and avoiding risking/hurting nature or one's fellow humans. This line of argumentation is also found in sociological and public policy analyses of

regulatory compliance issues [6] which show that acceptance of the regulation and the values of the regulated agent response. Next to 'sticks and carrots', enforcement agencies might thus also rely utilising shared communal values and co-operation as tools to further compliance.

Evidence from Empirical Studies and Surveys

Many of the factors for non-/compliance outlined so far are taken into account in enforcement strategies in OECD countries, as for example in the Dutch compliance strategy (cf. box A.1 in the Annex) and are supported by empirical findings. There is evidence that the tools monitoring and enforcement, when applied, are generally effective [cf. for example 19; 20; 27; 33; 37].

Interestingly enough, recent empirical research established that fines have a deterrent effect not only on the sanctioned firms but also on other firms in the same regulatory region. In this regard regulator's credibility is enhanced with more that a firm targeted for compliance [50; 51]. Empirical evidence exists also for the impact on compliance by ***compliance costs*** (frequently proxied by the size/capacity and age of plants) and the feasibility for firms to comply without going bankrupt (reflected in the influence of a firm's liquidity and probability of closure) [19; 20; 26; 27]). Comparing compliance across various plants of the same firm may give indications about the firm's general ***attitudes towards compliance*** [19].

There is indeed evidence that ***information disclosure*** strategies may improve the environmental performance of firms and sometimes even yield strong effects on compliance [15; 55]. Frequently, however, studies which assess stock market fluctuations (as reaction to the publication of positive or negative firm-related environmental information) do not go as far as estimating whether these market reactions eventually lead to environmental improvements [*e.g.* 10]. Evidence on the ability of ***community or market pressure*** to increase plant compliance remains mitigated [for example 9; 25]).[6]

In this context, a survey on firms in 7 countries[7] carried out by the OECD [13] investigated *inter alia* the influence of different stakeholders on environmental practices of facilities belonging to the manufacturing sector. The study identified public authorities as most influential, while only a limited influence was reported for consumers, industry/trade associations and environmental NGOs. Shareholders were found to play a relatively important role only in some countries.

Some investigations found differences in compliance patterns across different ***firm types***. For example higher percentages of compliance amongst Mexican manufacturing factories were found for larger, multi-plant, multinational and publicly traded firms as compared to small, single plant, domestic and individually owned firms [9] (cf. Figure A.1 in the annex).

Certain firm types may also be more strongly affected by further obstacles to compliance than others: smaller firms, for example, reported more frequently a lack of available resources. This resulted in a lack of access to environmental consultants and scarcity of resources for training than larger firms [8]. Smaller firms, with lower public profiles, may also be less exposed to pressure groups, while in particular public enterprises are vulnerable to share price and investor perceptions [21]. Firms also frequently point at a lack of ***information regarding policy requirements*** and their applicability [8; 14].

Finally ***firm's internal organisation and management aspects*** may impact on compliance. A strong relationship between the implementation of an environmental management system (EMS) and compliance or pro-environmental firm behaviour was found in various OECD countries [13; 14]. The same holds for the presence of an environmental department and a budget for environmental R&D within the firm. Finally, the ***stringency of environmental policy*** is identified as having a strong impact on environmental investment [17].

Part 2: Government Approaches in Ensuring Environmental Compliance

It has been firmly established that there are clear benefits to sound environmental performance of industry. It relates both to society overall in the form of reduced health and economic impacts of emissions and damage, and also to business in the form of cost savings through improved resource efficiency, reduced risk, improved reputation and employee motivation [56]. However, in order to realise these benefits fully enforcement systems are needed. They must nevertheless operate in an effective way in order to make sure that the limited enforcement resources can be used in the most efficient way. In addition, modern approaches to regulation should be pursued that aim, first and foremost, at an optimisation of the regulatory strategy overall.

This part of the discussion analyses regulators' actions from the perspective of economic and political economy-based literature and discusses the types of regulatory approaches. It also discusses issues of rent seeking behaviour and personnel management and capacity building to encourage inspectors to carry out their job effectively. Finally, this part presents some characteristics of an efficient regulation which can further compliance and innovation.

Theories of Enforcement Behaviour

From an economic perspective, regulators would aim to maximise welfare when enforcing a regulation and aim to balance administrative and compliance costs with the environmental benefits from reduced pollution. In practice, however, enforcers are often subject to political pressures, or they may just follow different strategies, such as trying to maximise compliance with environmental legislation.

Looking at the compliance issue from the regulator's side one can identify two distinctive reasons for why firms may not comply with a regulation:

- the enforcement authority may be ***unable*** to prevent non-compliance because of weak powers and limited resources, or
- the authority ***may not want to*** force all firms into compliance for efficiency, political or other reasons.

Under both settings the regulators will allocate their enforcement budgets to perform a limited number of enforcement activities. How they do this will be crucial to environmental and compliance outcomes and to the efficiency of the enforcement overall.

Much of the normative economics literature on monitoring and enforcement assumes that the regulator can be described as a "***benevolent welfare maximiser"*** in the sense that his objective is to minimise the overall costs for society. However, the established political economy and public choice literature considers that this assumption may need to be adjusted to understand

empirically found enforcement behaviour and actual political outcomes. This assumption considers political and administrative actors as individuals making rational, self-interested decisions and that the influence of interest groups is allowed. Therefore, possible regulator behaviour is classified below according to alternative objective functions[8] and their relevance in practice. Furthermore, in light of these discussions and those in session 1, the present session aims at determining the characteristics of an (efficient) regulation that is required to further compliance and innovation.

The enforcer characterised as a "*benevolent maximiser of welfare*" can serve as the benchmark case for evaluating the economic efficiency of enforcement patterns. This type of "enforcer" will balance the costs of compliance against the benefits of compliance so as to reach the ***maximum environmental benefit at minimum cost overall***. In practice, this could result in a pattern where enforcement resources are allocated to those plants that have low marginal abatement costs or that cause high environmental damage. Provided the enforcer is not subject to any constraints (*e.g.* availability of information on pollution), the resulting compliance outcome would be economically efficient. This does not necessarily imply that all firms comply. Rather, compliance would occur at the level where overall compliance costs and benefits are equalised.

Taking the positive theory of regulation (initiated by Stigler [53] and Peltzman [44]) as the reference model it was suggested that enforcers might be seeking to maximise certain (personal) political objectives or (net) political support, instead of welfare. Such a "***politically biased enforcer"*** will target polluters that are less likely to reward him with political benefits or more likely to harm him politically in the absence of the enforcement action**.** On the other hand, the enforcer might also try to gain support from an environmentally aware community, which may result in "visible" monitoring and enforcement actions [12]. While the compliance outcome here can generally be expected to be inefficient in an allocative sense of balancing costs and benefits of environmental regulation[9], it may nevertheless be compatible with some normative macro level political objectives (*e.g.* securing employment).

In practice, corruption (*i.e.* an enforcer accepting a bribe in exchange for over-looking a violation [2]), can also be considered as the way for an enforcer to follow personal objectives when making enforcement decisions. Bribery is socially undesirable because it dilutes deterrence of non-compliance and it results in a lower payment by the violator than the sanction for a violation. For firms using bribes, more pollution would be optimal than if they were forced to pay the penalty.

While bribery leads to reduced enforcement activity, ***the enforcer which follows a "budget maximising"*** behaviour may spend excessive amounts of resources at monitoring compliance. The reference model of "bureaucratic behaviour theory" was presented by Niskanen's [39]. It is based on the assumption that government personnel derive benefits (*e.g.* in the form of secured employment and career enhancements) that increase with their budgets. Assuming further a "principal-agent" relationship and asymmetric information between the bureaucratic agency and a higher government level, it is suggested that the agency may follow behavioural patterns that lead to an increase in its budget.

In some cases, observed in the communist or other totalitarian regimes, enforcement could also be considered as a pure law enforcement function designed to achieve (at least in theory) the ***maximum possible rate of compliance*** [6]. Taking the law as the truth, this enforcer type would concentrate his enforcement efforts on those plants that are less likely to comply, for example

because of their particularly high compliance costs, or on easy enforcement targets, irrespective of the environmental benefits achievable. Such a strategy ignores costs altogether, hence implicitly presume that compliance is equally desirable regardless of the impact of the plants' emissions on the environment, and regardless of the firms' compliance costs. The level of compliance resulting from this strategy will be effectively limited by budget constraints, not by efficiency considerations.

Yet an alternative enforcement pattern is the ***maximisation of environmental benefits***. Here, the regulator would rather focus on plants with the highest environmental pay-off per monetary unit invested in enforcement effort. If the enforcer's budget is limited, he might shift his enforcement resources away from high-cost firms (from which it is more difficult and more costly to obtain compliance) and the result might come closer to the socially optimal strategy of a maximisation of net environmental benefits [6].

It is not always easy to distinguish unambiguously to which enforcement theory enforcement patterns found in practice apply.[10] While the results should not be generalised, various econometric studies – primarily carried out in the North-American context - suggest that enforcement decisions, tend in practice to follow a mix of different objectives. Some of them may be more sensitive to the damage of violations, other to the community's willingness to pay as well as to other political variables. In addition, compliance history, *i.e.* past violations or past enforcement actions towards a plant, frequently shows significant impacts on enforcement behaviour [12; 19; 26; 27; 32; 35; 42; 43].

An interesting question in this context is how much discretion should be left to local regulators in determining their enforcement patterns. On the one hand discretion by local authorities may actually increase the efficiency of the initial policy when assuming that national regulations (*e.g.* standards) are unlikely to be optimal as they do not take account of the heterogeneity of the local context. The reason for this is that the local enforcement officials are supposedly better informed about the local situation than their central level counterparts [*e.g.* 12]. On the other hand, local discretion opens possibilities for corruption or the non-transparent granting of exemptions resulting in lowering compliance. This is an issue which has been rampant in the region of Eastern Europe, Caucasus and Central Asia [5]. At the same time, however, these transition economies have been subject to complicated legal frameworks with excessively strict standards, poor economic situation and severe human and resource constraints in the enforcement agencies.

Helland [27], who studied the US American federal context about who actually determines compliance outcomes (the local or the national regulator), finds that local discretion can be limited by the central regulator. He confirms that local regulators are able to respond to local interests only to some extent as the national regulator has ability to alter regulatory policy.

Rent-Seeking Behaviour and Corruption

In principle, possibilities for ***rent-seeking behaviour*** by regulated firms exist wherever policy measures set no fixed rules but give discretion to enforcers. In cases where a lighter regulatory touch is given, for example, in exchange for firms applying environmental management, firms may try to obtain regulatory relief, then postpone sound environmental management and spend efforts on convincing the regulator why they need more time. Rent-seeking may also occur in cases where the enforcer is given discretion to award firms with additional time for complying with regulatory requirements without imposing sanctions.

Furthermore, approaches that adjust sanctions for the polluter's ability to pay may induce firms to not reveal accurate information regarding compliance costs and their ability to afford compliance costs or penalties.

Corruption of enforcers or higher government levels is considered a pervasive constraint to enforcement of environmental regulations but also with respect to management of natural resources (*e.g.* illegal logging) in many countries [4]. According to a recent report of the World Resources Institute [36] a combination of economic, social and administrative factors, such as poverty, weak mechanisms of accountability and oversight, low salaries for civil servants responsible for the enforcement of regulations and the social acceptance of corrupt behaviour, creates favourable conditions for corruption,

This finding points to the need of establishing systems for ***personnel management and capacity building*** to encourage inspectors to carry out their job effectively. Indeed, sufficient scientific, economic and legal qualification of staff; human, financial and material resources; and motivation are considered a prerequisite for enforcement agencies to effectively and correctly carry out their work [cf. 41]. In addition to an appropriate material basis, this requires adequate staff selection procedures, continuous personal development and training, adequate salaries, appraisal and promotion criteria and remuneration for good performance. Clear and transparent guidelines should be provided to ensure that the regulated community is treated in a consistent and proportionate manner. Furthermore, full accountability of inspectorate staff can increase their integrity, in particular, as inspector work will frequently involve some level of personal judgement and, hence, require discretionary decisions. While it is generally considered that enforcement related decisions are best carried out at the lowest administrative level possible, support from national agencies may be necessary where local level agencies are subject to pressure from powerful pressure groups or large facilities.

Characteristics of an Efficient Regulation Furthering Compliance and Innovation

The enforcement strategies are only one element which can influence and modify enterprise behaviour. In general, they operate within, and have to be consistent with, the framework of existing regulations. Therefore, some analysis of the key characteristics of an efficient regulation is required to ensure that both the regulations and their enforcement can further compliance and promote innovation.

As presented in previous sections, enterprises have a variety of motivations for compliance. At the same time, there are differences in capabilities to comply as well as the resources constraints on the side of enforcement agencies. These factors imply that regulatory approaches have to be tailored to specific contexts in order for both the regulator and the regulatees to reach environmental objectives effectively and in a cost-effective way.

Approaches to modern regulation (*e.g.* of the US EPA [59]; the UK [56]; or [21]) aim at a high level of environmental protection at least cost to society. They point at the need for a "smart regulation" that chooses regulatory and non-regulatory measures according to the specific context of the environmental issue and the regulated community. The key objective of these strategies is to increase the polluters' responsibility for the environment and, at the same time, to increase their flexibility in reaching compliance. They also target to minimise the bureaucratic burden to firms and to focus on environmental outcomes, firm performance and the prevention of pollution when creating an adequate policy mix (cf. Table A.1 in the annex for the suitability of specific instruments according to context factors).

Broad, integrated preventive strategies consisting in an optimal mix of policy instruments could also be applied step-wise. Gunningham [21] suggests a hierarchy of control, especially for SMEs, which could start by the facilitation of voluntary action through information and support for cleaner production initiatives, escalating through the use of positive and negative incentives, and culminating in enforcement of direct regulations for firms not reactive to less interventionist strategies.

Regulatory agencies could furthermore try to initiate supply chain pressure (from upstream suppliers, customers), thus relying on the market to introduce EMSs, or increase the demand for 'green' products and the application of sound environmental technologies through public 'green' purchasing policies.

Voluntary business action can also be promoted through regulations or public/private partnerships, such as the European Union's EMAS scheme or US EPA's "National Environmental Performance Track Programme" (see Box 1). These initiatives can help facilities of all size and types to work their environmental performance and reach continuous environmental improvements. The USEPA lists participants on the programme's web-site.

Box 1. USEPA's "National Environmental Performance Track Programme"

This programme strives at creating networks between participating facilities to share their information. It also aims to attract environmental leaders to encourage other facilities to join and educate the public.

Incentives to firms consist, for example, lower priority for routine inspections, facilitation of reporting requirements, granting flexible permits or performance permits which contain less specific requirements, speeding up of permit processes and a reduction in the burden of reporting.

Similarly in the Netherlands customised and framework licences are used for companies which properly operate environmental management systems. This can provide firms with greater flexibility about how to achieve prescribed environmental targets, to set their environmental priorities, and to modify production processes without notification [40].

In addition to public information disclosure programmes, there are also examples of corporate reporting requirements, such as the French law on "New Economic Regulations" that requires reporting on environmental and social performance from firms traded at the stock-market.

Both the USEPA and the UK Environment Agency suggest that "modern" (or "smart") regulation should be coupled with an enforcement approach that concentrate resources where risks are the highest and performance the poorest. Emphasis is also given to a consistent and transparent behaviour of regulatory agencies when applying enforcement tools. Not only would this allow firms to know the rules and processes when making compliance decisions, but it also increases the regulated community's trust in enforcement agencies and limits the agencies' misuse of local discretion. Such an approach requires effective tools of compliance, performance and risk assessment of polluters, which should be applied continuously in order to allow for an evaluation of policy outcomes and, hence, regulatory learning.

Part 3: Optimising Compliance Monitoring and Enforcement

Economics suggest that in order to ensure marginal deterrence, expected penalties should be lower for minor than for major infractions. Marginal deterrence is socially desirable because it ensures that those who are not deterred from committing a violation have a reason to, at least,

reduce the level of harm they cause [29; 46]. As pointed out in session 1, expected penalties can generally be increased by raising the possibility of detection (monitoring probability) as well as the level of the sanction.

The key objective of this part is to examine the application of the two traditional instruments of environmental inspectorates which are: i) *compliance monitoring (inspections)* and ii) *enforcement actions (or non-compliance response)*. On the basis of empirical evidence, this part discusses several inter-related issues: how inspectors allocate their limited enforcement budgets between compliance monitoring (inspections) and enforcement (sanctions); What kind of enforcement measures they apply according to which rules; On which criteria they base penalties; And the extent to which "deregulatory strategies" are pursued (*e.g.* regulatory relief in return for the application of environmental management systems and publication of environmental performance information).

Risk and Performance Based Targeting Priorities in the Netherlands and the UK

Both in the Netherlands and the UK, ***priorities for monitoring and enforcement*** are based on compliance or performance and risk criteria. In the Dutch context, priorities are identified for each environmental law and for each regulatee separately by evaluating by experts the present state of risks and compliance behaviour [61]. In the UK, where more integrated approach is applied, the risk and performance assessment focuses on a more general assessment of operators. For both assessment criteria, scores are allocated to operators which allow the Dutch and UK regulators to establish priorities and non-priorities for enforcement (for more details cf. Box 2 and Box A 1. in the annex).

Box 2. The Dutch and UK approaches to setting priorities

The Dutch approach

In the Netherlands the regulations are firstly classified according to four compliance gap indicators: good, sufficient, medium, and bad compliance. Secondly, risk indicators are established which cover aspects of public health, safety, sustainability and social factors in the absence of enforcement. On that basis the firms are categorised in four risk classes: very high, high, mediate, and low, to which scores are allocated. The results are then transposed to a 2x2 matrix with risk and non-compliance on the axes. This approach allows establishing priorities and non-priorities for enforcement.

A specificity of the Dutch compliance strategy is that it includes an assessment of individual legal act with respect to its possibility of compliance, enforcement and sensitivity to fraud. A negative score implies that the inspectorate should not put efforts to enforce the legislation as this would be ineffective and inefficient. Instead, the legislation is addressed back to the legislator for improvement.

The UK approach

Inspection targeting priorities for facilities regulated under IPC are established in the UK on the basis of the "Operator and Pollution Risk Appraisal" (OPRA) methodology. It assesses the inherent environmental risks of processes ("Pollution Hazard Appraisal" - PHA) and the operator's ability to manage the environmental risks of processes ("Operator Performance Appraisal" – OPA; for the attributes comprised in PHA and OPA cf. Box A.2 in the annex).

Allocating scores from 1 (low hazard/performance) to 5 (high hazard/performance) to each attribute and separately adding up of all PHA and OPA scores leads to a classification in 5 bands (A- lowest pollution hazard/best operator performance, E – highest pollution hazard/worst operator performance) which can then be allocated to a matrix on which priorities are based.

The Environment Agency's decisions about the level and nature of compliance assessment are furthermore based on "Compliance Assessment Plans" (CAPs). It is used to ensure that all requirements of permits and other regulatory approaches are checked within a defined period. In addition "Compliance Classification Schemes" (CCS) are used which classify non-compliance with permit conditions according to the potential impact on the environment.

Compliance assessment activities cover site visits (pre-arranged or unannounced), audits and review of procedures; analysis of reports, monitoring data and progress of improvement programmes, check-monitoring; and the responding to incidents and complaints. Resources are allocated to assess compliance at all sites and activities, but effort is targeted to the performance and level of environmental risk of facilities. Where non-compliance is detected, the Agency's enforcement powers are used.

The Choice of Specific Enforcement Actions in the UK

The UK Environment Agency's enforcement powers fall in two categories:

- measures aimed at the prevention or remediation of harm to the environment (injunctions, suspension, variation or revocation of licences, prohibition notices, enforcement notices, works notices and the carrying out of works initiated by the agency and recovery of costs); and

- measures providing a response to a criminal offence (warning, formal caution, prosecution).

The criminal process is used to institute prosecutions, which aim at punishing wrongdoing, avoiding recurrence and acting as a deterrent to others. The courts decide about the penalties to be applied[11]. For criteria determining the normal enforcement response in the UK (cf. Box 3).

Box 3. Criteria determining specific enforcement actions in the UK

Non-compliance at permitted sites in the UK is assessed with respect to the potential environmental effect according to the 'Compliance Classification Scheme' (CCS) and rated according to four categories which decide about the normal enforcement response. The categories distinguish non-compliance with a potentially "major", "significant", "minor" and "no potential" environmental effect. Normal enforcement responses are differentiated according to these categories. Compliance history, foreseeability of the event, the polluter's attitude and his intent, the deterrent effect of a prosecution, and personal circumstances of the offender are also taken into consideration when deciding about the adequate enforcement action.

Prosecutions are generally issued for incidents or breaches with (potentially) significant consequences, lack of relevant operation licences, excessive or persistent breaches of regulatory requirements, non-compliance with remedial requirements, reckless disregard of management or quality standards, failure to supply information without reasonable excuse or knowingly false or misleading information, and obstruction or impersonating of Agency staff.

Where appropriate, prosecutions may be used in conjunction with other available enforcement tools, such as a prohibition notice requiring stopping the operation until specified requirements are met. According to the Agency policy, prosecutions are only commenced or continued where there is sufficient evidence for a violation and a realistic prospect for conviction.

Penalties Based Upon "Harm" and "Gain"

One important question is whether penalties should be based on the "harm" caused by an environmental violation to the environment, which can be assessed in monetary terms, or on the basis of monetary "benefits" to the polluter (*e.g.* in the form of foregone abatement costs).

Cohen [6] notes that, in practice, governments base penalties either on gain or on some combination of harm and gain. In the following text box the examples of two countries, the UK and the United States, are presented. In both cases penalties are based both on the harm to society and the gain to the offender. In addition, further criteria such as the blameworthiness of the offender, his cooperativeness or his ability to pay also impact the level of penalty (cf. Box 4).

Box 4. Harm and gain based penalties in the UK and the US

The UK approach

Sentences are required to reflect the damage - including environmental, economic and social impacts - resulting from an environmental offence (polluter-pays-principle). At the same time they also require to reflect gains to the offender [34]. Further criteria are also taken into account when deciding on the sentence for an environmental crime. They include: liability related criteria (blameworthiness/culpability of the offender), the potential risk brought about by an offence, the offender's ability to pay (facility closure should be avoided where possible), the overall deterrence effect of the sentence (fines on companies should be large enough to make an impact also on shareholders), and the offender's cooperativeness. Finally, the level of the fine should also reflect prosecution costs. Costs for clean-up and restoration - if not carried out by the offender himself - should be recovered.

The US EPA approach

The "Penalties under the Clean Air Act Stationary Source Civil Penalty Policy" [60] cover an economic benefit component (reflecting benefits both from delayed or avoided cost), and a gravity component (reflecting the seriousness of the violation which includes actual or possible harm influenced by the amount of pollutant, the sensitivity of the environment, and the toxicity of the pollutant as well as its duration). The gravity compound should furthermore increase with the size of the violator's business since a given fine does not have the same economic impact on small and large companies [12].

Adjustments of the gravity and benefit components are possible under clearly specified conditions and for clear criteria (*e.g.* degree of wilfulness or negligence, degree of cooperation, non-compliance history). The risk of litigation and the offender's ability to pay are also to be taken into consideration when determining penalties, although the USEPA reserves the option of imposing a penalty that might contribute to the company closing down if necessary to ensure the deterrence effect. Formulas and penalty amounts for specific circumstances of a violation are defined in the policy document. Unlike the UK, the US set a statutory upper limit to monetary sanctions imposable per day and violation.

Regulatory Relief in the US

Next to negative (deterrence based) incentives for compliance, the USEPA also provides positive incentives in the form of penalty relief and lower reporting requirements under its Audit Policy "Incentives for Self-Policing: Discovery, disclosure, correction and prevention of violations". Conditions that render firms eligible for a reduction in the gravity based penalties and to an omission of recommendations for criminal prosecution are given in Box 5.

Box 5. Conditions for penalty relief in the US

The discovery of non-compliance is voluntary (and not through legally required monitoring); disclosure of the discovery to USEPA is prompt; discovery and disclosure are independent (not through EPA investigations or third-party information); correction and remediation occur within a specified time; a recurrence of the violation is prevented; and the disclosing business cooperates.

Certain types of violation are ineligible for the scheme, such as repeated violations, violations resulting in serious actual harm or violations that may have presented a substantial endangerment. Moreover, gravity based penalties can be eliminated if firms additionally meet the condition of systematic discovery, *i.e.* discover the violation through an environmental audit or a compliance management system. Finally, EPA refrains from routine requests for audit reports from business disclosing information under the Audit Policy.

USEPA also offers a further scheme for penalty relief under its Small Business Compliance Policy which is specifically tailored to the small and medium size enterprises. To the extent that such programmes are taken up by business, administrative costs for investigation and enforcement can be reduced.

Both the USEPA and the UK EA demand the violator's ability to pay to be taken into consideration when determining a sanction. But both agencies also put the burden of proof on the firm. In the US, when a violator fails to provide sufficient information for demonstrating inability to pay, this factor should be disregarded in adjusting the penalty. Comparably, the UK

enforcement approach foresees that a company not producing its accounts can be assumed by the court to be able to pay whatever fine the court imposes. To better determine a firm's ability to pay, the USEPA uses additionally a number of economic enforcement models which can evaluate not only firm's claim that it cannot afford compliance costs (clean-up costs or penalties), but also can calculate violators' economic savings from delaying and/or avoiding pollution control expenditures, the present value of clean-up costs or the real cost of a supplemental environmental project.

Contradictory Signals

It should be noted, however, that in many cases the introduction of regulation is often followed a few years later by subsidies where regulators, even in the presence of non-compliance, use "carrots" rather than "sticks" to improve the environmental outcomes. Where subsidies are provided solely to close the funding gap to industry, and do not trigger environmentally friendly technological progress which can increase productivity, the coexistence of regulation and subsidies represent contradictory political signals. Such subsidies also prohibit the internalisation of the full environmental and social costs of economic activities because some of the damage caused by these activities is not paid for by those undertaking the activities.

Part 4: Promoting Innovative, Cost-Effective Approaches to Compliance Assurance

In order to attain a higher level of environmental protection in light of scarce resources of enforcement agencies, it is crucial to identify and apply approaches susceptible to reducing the administrative costs of monitoring and enforcement. Whereas high fines coupled with a low inspection probability appears, on first sight, as an attractive option for ensuring deterrence and keeping administrative enforcement costs low, an arbitrary increase in fines is not always feasible (due to external, *e.g.* regulatory, limits or affordability) or not desirable (when taking account of risk aversion). High fines may even be counterproductive, as they may induce the regulatees to spend resources on evading liability through, for example, falsification of monitoring reports, hiding of pollution incidences, challenging of enforcement decisions in court, or attempts to bribe officials [6].

In practice, schemes where only a few violators are monitored and detected but punished severely are rarely found [see for example 45]. Given these findings, this part of the report focuses on various alternative approaches suggested by economic theory that may help to reduce the administrative costs of monitoring and enforcement. It also aims to assess their limits to administrative cost savings and with respect to their effects on firms' compliance costs.

Links between Government Compliance Monitoring and Self-Monitoring by Enterprises

Targeting non-compliant firms is one option to reduce enforcement costs suggested by economic theory. It follows the idea that the intensity of monitoring of a polluter may be based on the firm's prior compliance history [6]. By introducing ***compliance dependent compliance monitoring and enforcement***, firms previously complying might be monitored less frequently [22, 23]. They can also be fined less if found non-compliant, than firms previously violating legislation. The threat of being placed in the "more frequently monitored" and "more severely punished" group serves as an incentive to comply. Empirical examples of targeting firms with a greater risk of non-compliance and using higher penalties for repeat-offenders were found in the USEPA's enforcement approach. Unlike the empirical examples, Harrington's [23] approach

suggested to not monitor firms with the highest compliance costs because this would need over-proportionally high enforcement resources. This strategy, however, does not take account of damage costs.

The introduction of ***self-monitoring and self-reporting schemes*** as a complement to state monitoring has been considered as a possible means of substituting government compliance monitoring efforts by passing some of the monitoring responsibility and cost on to the firm without decreasing deterrence [6]. It is obvious that this may help save administrative enforcement costs to the extent that the firm's self-monitoring and reports replace monitoring activity and detection by the government. This approach also assumes that related cost reductions would not be over-compensated by costs for processing the reports and by the potentially increased frequency of imposition of fines.[13]

As an additional incentive for firms to report correctly, it has been suggested that a combination of self-reporting schemes with differential penalties be implemented. The idea is to impose lower penalties on correctly reported violations or pollution than on not reported violations which have been detected by the authority [6; 28; 31; 54]. In reality, environmental legislation (for example in the EU) frequently requires the regulated agents to install monitoring equipment, to report emissions, and to report violations of the regulations (*e.g.* in cases of malfunction of abatement equipment). Furthermore, the US EPA Audit Policy (see above) is an example where positive incentives are granted for self-monitoring and correctly self-reported non-compliance. The quality of monitoring data delivered by operators and regulated processes may also be furthered by monitoring certification schemes as used in the UK. In non-OECD countries, enterprises frequently lack the necessary monitoring equipment and self-monitoring is hence much less developed.

Personal Liability for Non-Compliance

The previously suggested approaches treated the regulated firm uniformly, not distinguishing the various actors in a firm. However, it is known that pollution releases may often depend on the individual behaviour of employees (principal-agent relationship between the firm management and employees). Therefore, the question arises how sanctions could be best allocated between the firm and the employee. Economists argue that the actors who are in a position to magnify risk of pollution should have sufficient incentives to reduce this risk. When the hierarchical control of the employees is limited, or when specific allocations allow them to evade the burden (for example because the penalty is too high to be recovered from wage reductions) corporate fines are not perfect substitutes. In these cases the allocation of penalties matters, *i.e.* the employee should be penalised rather than the firm and/or imprisonment rather than financial sanctions may be considered [6; 18; 30; 48; 52]. As shown in Box 6, there are practical examples of countries that take criminal proceedings against company employees.

Box 6. Personal liability in the UK

The UK Environment Agency's enforcement policy foresees that criminal proceedings would be taken against those persons responsible for an offence [58]. While the usual practice is to prosecute the company where an offence resulted from, any part played in the offence by officers of the company (*e.g.* directors, managers) is also considered and action may be taken against these. Where it can be shown that the offence was committed with the company's consent or due to their neglect, both, individual officers and the company may be prosecuted. Where appropriate, the Agency may seek disqualification of directors.

The Role of the Public, the Courts and Market Forces in Compliance

There are generally two principal enforcement channels: the administrative enforcement channel and a legally based channel (private litigation). The earlier has been mostly applied in government policies, especially in Europe. The latter has been common in the US and also attempted in the countries of Eastern Europe.

The legally based enforcement is an important instrument as can allow citizens to bring polluters before court for damage caused by their non-compliance with regulation. A recent literature discusses the desirability of this so-called "private" enforcement route. Advantages of a private involvement in enforcement are, amongst other things, the direct impact on private agents, which may make them a better judge of polluting behaviour (due to, for example, proximity of their communities) than enforcement agencies. Private enforcement might also improve enforcement towards certain firm/industry types, such as government-owned polluters, where public enforcers might lack the will to enforce. "Private" enforcement can also provide the possibility to save government monitoring costs, and allows the limited public enforcement means to be better targeted [6; 38].

A disadvantage, however, may be associated with the possibility that "private" enforcement may lead to over-enforcement and thus to over-deterrence.[14] This may be the outcome when citizen suits are added to the government enforcement but not taken into account when setting the government enforcement action. It is particularly likely if a reward for private enforcement is available [46].

Some international agreements aim at developing access to information, complaint procedures and access to litigation to facilitate the public's possibilities for private enforcement (see the Århus 'Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters' of 25 June 1998 (http://www.unece.org/env/pp/welcome.html) and the European Directives aligning Community legislation with the Convention's provisions, http://www.europa.eu.int/comm/environemnt/aarhus).

For the US, Cohen [6] reports findings that link an increased number of citizen suits in the early 1980s to facilitated access to information on polluters. It should nevertheless be mentioned that there are limits to complaint driven enforcement. An empirical study of environmental complaints in China found that citizen complaints seem to focus on highly visible, and therefore not necessarily on the most harmful pollutants [11].

Information provision may play the further role for triggering market reactions and community pressure to pollution incidents or non-compliance that would be discussed in session 1. Various countries use instruments of information disclosure as complement to public enforcement action. One well-known example is the Toxic Release Inventory (TRI) programme under the US Community Right-To-Know Act which makes publicly available information on toxic chemical releases reported annually by certain industry groups and federal facilities that manufacture, process or use significant amounts of such chemicals. There is evidence that firms have decreased their emissions following disclosure [6]. While TRI is about legal pollution releases, the Environment Ministry of British Columbia in Canada regularly publishes two separate lists of firms that do either not comply with existing regulation or whose environmental performance causes concern. Especially the listing on the 'out of compliance' list appears to have a positive impact on the subsequent compliance behaviour of firms [15]. The OECD in its work on Pollutant Release and Transfer Registers (PRTRs) has been promoting wider use of such instruments (cf. Box 7).

Box 7. OECD programme on Pollutant Release and Transfer Registers

A key tool governments are using to provide data to the public about potentially toxic releases to the environment is a Pollutant Release and Transfer Register (PRTR). A PRTR is a database, or register of the quantities of potentially harmful chemicals, reported by facilities, which are released to air, water and soil and/or transferred.

In 1996, the OECD Council adopted a Recommendation on implementing PRTRs. Since its adoption, OECD has worked with governments, industry and NGOs to develop practical tools that help reduce efforts by OECD member countries provide outreach to non-member countries, and co-ordinate international activities. One key document prepared by OECD is the PRTR Guidance Manual.

With PRTR programmes in place, government authorities can set priorities for reducing or even eliminating the most potentially damaging releases and track progress toward meeting environmental objectives. A PRTR also provides an incentive for industry to reduce its releases and transfers.

To help Member countries implement efficient and effective PRTR systems, OECD produces documents dealing with: the experiences of countries who have developed PRTRs; current and emerging uses of PRTR data; and how PRTRs differ; and the identification, selection and adaptation of release estimation techniques that industry uses to calculate PRTR releases and transfers.

However, PRTR schemes are usually sophisticated thus resource-consuming. To lower costs associated with establishing such schemes a simplified systems have been applied in developing countries. An example is Indonesia's PROPER PROKASIH programme. The programme gathers information about releases of selected, key pollutants as well as environmental management in selected enterprises. On that basis, regulators rank the performance of individual facilities according to specific criteria. The ranking is then communicated to the media and the public using a simple colour label pattern (gold, green, yellow, red and black). The programme is reported to have been successful in improving the environmental performance of participating companies, leading to community pressure, negative media attention and increased likelihood of ISO 14000 certification [21]. It has been then successfully applied in other parts of the world, such as India, China and other countries.

Overall, evidence shows that government enforcement policies can be supplemented by a number of information and liability based instruments. They can increase the probability of detecting non-compliance; create deterrence effects and lower administrative costs of enforcement. The issue for further discussion is how to create a coherent and cost-effective mix of appropriate regulatory and other instruments which are targeting priority pollutants and are adapted to the specific economic, social, and environmental circumstances.

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Annex

Box A-1: Reasons for compliance or non-compliance identified in the Dutch compliance strategy

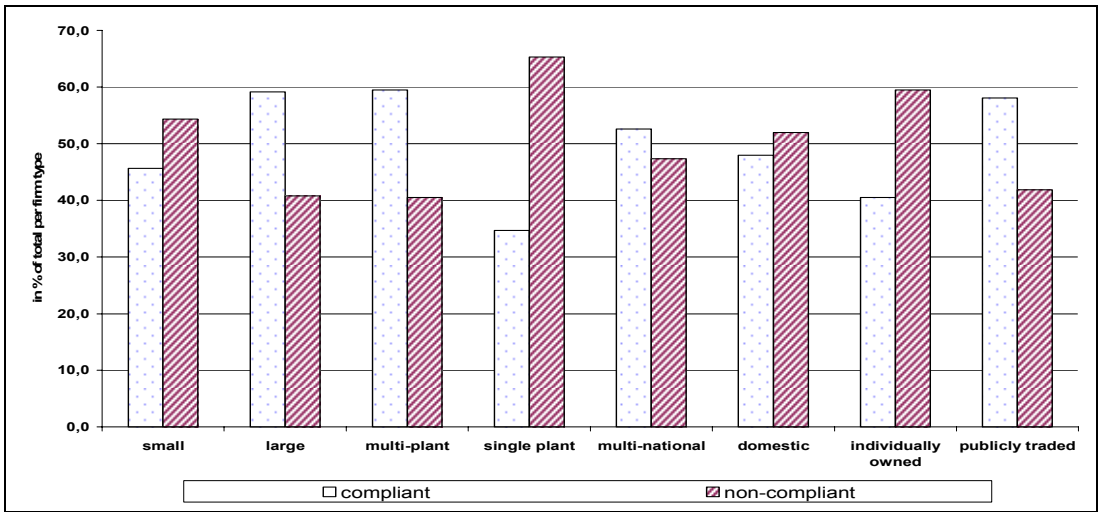
Dimensions for spontaneous compliance
Knowledge of legislation
Cost/benefit
Acceptation of the rules
Values of regulatee
Informal control (within the regulate branch)

Control dimensions
Informal probability of being snitched
Perception of the control probability
Perception of the probability of detection (when controlled)
Selectivity of the inspector

Sanction dimensions
Probability of being sanctioned
Height of the sanction

Source: Van der Schraaf and van der Plas, 2003

Figure A-1: Impact of plant size, firm type and ownership status on firm compliance in Mexico's manufacturing industry



Note: The sample comprises 92 small and 71 large firms, 121 multi plant and 98 single plant firms, and 19 multi national, 200 domestic, 121 individually owned and 74 publicly traded firms. - Source: Dasgupta et al., 2000, adapted.

Table A-1: Policy instruments and appropriate contexts for their application

Instrument	Appropriateness	Advantage
Direct regulation	Pollution from relatively small numbers of large point sources; Particularly suited to localised pollution issues also useful to underpin other instruments such as economic or voluntary approaches	can ensure a minimum level of performance; can improve performance of environmental laggards, not sensitive to more flexible instruments
Permits setting conditions at a high level, thus avoiding detailed prescriptions	Cf. 'direct regulation'; performance and conformance with permit conditions must be measurable	leaves the operators flexibility in the ways to reach objectives by avoiding detailed prescriptions; can increase cost-effectiveness
voluntary or negotiated agreements	small number of relatively major companies	Can increase commitment of business; usable to negotiate enhancement above a legislative minimum
Educational programmes, technical assistance projects (training and information dissemination on regulatory obligations, financially attractive opportunities for environmental improvement), codes of practice	small and medium sized enterprises (SMEs) and individuals where compliance is hindered by informational problems parallel to issuing new (regulatory) initiatives	Can reach groups which are not subject to direct regulation and who have little resources and capacity for environmental protection make new measures quickly known
Economic instruments a) taxes b) tradable permits	 Where alternative less polluting practices and products are available; modest price signals have an effect on behaviour; simple, broadly applicable rules can be used where a range of options to environmental improvements exist, and where pollutants have a long-range spatial impact	operators can choose the least cost option for their situation, are flexible in the means to reduce pollution and in the timing of pollution investment
Environmental management systems (EMS) simplified versions (*e.g.* self-inspection, self-audit) subsidised environmental management training	Certified EMSs rather applicable to large business for smaller companies not having the adequate resources to apply certified EMSs countries characterised by weak regulation	Further responsibility of business for environmental impacts; help to improve the management of environmental risks; may deliver cost savings from more efficient resource use might provide a useful complement to (uncertain) conventional enforcement
Disclosure of compliance, performance and enforcement information	large, reputation sensitive enterprises	sets incentives for improved performance by making use of potential market reactions
Rewards in the form of regulatory relief (*e.g.* lower priority for checks by enforcers)	Proofs of a continuing high level of environmental management and compliance, *e.g.* through self-auditing and reporting	limits costs to both the firm and the enforcement agency

Source: US EPA; UK EA; EPA/CMA, 1999; Gunningham, 2002

Box A.2. Attributes contained in the UK's Pollution Hazard and Operator Performance Appraisal

Pollution Hazard Appraisal (PHA)

Presence of hazardous substances
Scale of hazardous substances
Frequency and nature of hazardous operations
Technologies for hazard prevention and minimisation
Technologies for hazard abatement
Location of process
Offensive characteristics of emissions

Operator Performance Appraisal (OPA)

Recording and use of information
Knowledge and implementation of authorisation requirements
Plant maintenance
Management and training
Process operation
Incidents, complaints and non-compliance events
Recognised environmental management systems

Source: UK EA (1997)

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[1] This paper was prepared by Ms. Simone Schucht, consultant, under the guidance of Mr. Krzysztof Michalak of the OECD Secretariat. The report provided the basis for discussions during the meeting.

[2] This view is based on Gary Becker's [1] seminal article 'Crime and Punishment: An Economic Approach', not specifically dealing with the environment but developing a more general economic model of crime. Following this article, the economic theory has taken monitoring and enforcement costs into account.

[3] Because these are less costly to society than for example imprisonment.

[4] In fact, p and F being perfect substitutes is strictly correct only in the case of risk neutral agents, but would no longer hold if actors had a preference for risk or were risk averse. While an increase in p compensated by a reduction in F would still not change the expected income from non-compliance, it could change the expected utility. In the case of risk aversion a regulatee would get a higher utility out of secure than out of insecure situations and payments. This means that their utility is higher if they are monitored more frequently and pay a lower fine if found non-compliant than if they are seldom monitored but have to pay a high penalty if found non-compliant [6; 45]. In the case of a risk preference, an increase in p would reduce the expected utility and with that non-compliance more than the equal percentage increase in F. In the case of risk aversion, F would have the greater effect.

[5] According to Becker's [1] theory of rational crime, a profit-maximizing firm will comply with an environmental regulation only as long as the expected penalty of violating exceeds the compliance cost. On this background, economists faced evidence seeming to indicate that firms comply with a much higher degree than predicted by this theory. Harrington (1988) summarized this phenomenon in the following three statements:

(i) For most sources the frequency of surveillance is quite low.
(ii) Even when violations are discovered, fines or other penalties are rarely assessed in most states.
(iii) Sources are, nonetheless, thought to be in compliance a large part of the time.

[6] Furthermore, the major part of the literature empirically investigating whether market forces and community pressure may constitute an alternative to formal public enforcement estimate their impact on environmental performance but not on compliance.

[7] Countries included in the survey are: Canada, France, Germany, Hungary, Japan, Norway and the United States.

[8] Next to these more general behavioural assumptions presented here, there exist further approaches based on more detailed interactions between the Congress or oversight committees and the regulatory agency adapted to the US American context.

[9] Except if the local preferences reflect efficiency considerations.

[10] To give just two examples, empirical evidence of enforcers targeting plants according to their compliance history (prior non-compliance) is compatible with compliance maximisation, but also with political support maximisation where the public demands it. It may even be compatible with welfare considerations where enforcers apply state-dependent enforcement schemes, further discussed in session 4 [cf. also 6]. And indications that enforcement measures

are in line with environmental preferences is sometimes interpreted as enforcers taking account of perceived benefits of pollution reduction (welfare), and sometimes as enforcers being sensitive to political support or opposition by their constituencies.

[11] In the UK, magistrates' courts and the Crown Court may deal with environmental offences. Sufficient gravity of an offence or its effect may justify the referral of a case to the Crown Court. The courts are encouraged to consider the gravity of the offence and to decide about the penalty accordingly. Magistrates' courts can issue penalties up to 6 months imprisonment and/or £20,000 fine, the Crown Court can issue penalties up to 5 years imprisonment and/or an unlimited fine.

[12] Note however, that penalties increasing with firm size are not in line with the economic optimal penalty theory.

[13] As a second advantage, self-reporting may reduce the risk for firms, as pay-offs become more certain, i.e. firms reporting their behaviour bear certain rather than uncertain sanctions [31].

[14] Over-deterrence characterises for example a situation where the regulated agent spends more resources on abating pollution than is socially optimal.

WRITTEN CONTRIBUTIONS BY CONFERENCE PARTICIPANTS

INTRODUCTORY REMARKS

Kiyo Akasaka, Deputy Secretary-General, OECD

Ladies and Gentlemen

On behalf of the OECD let me extend a warm welcome to you all on the occasion of this meeting of the Global Forum on Sustainable Development. Several years ago the Organisation established several Global Forums to examine issues of global significance. Amongst other things these Global Forums are intended to foster dialogue between OECD members and their partner countries. So I would like to extend a special word of welcome to representatives of countries that are not members of OECD.

In previous meetings within the Global Forum on Sustainable Development, we have looked at climate change and financing environmental protection. In our meeting over the next two days we will look at the issue of environmental enforcement and compliance. I believe that enforcement and compliance issues are a little bit the "Cinderella" of environmental management; that is to say, they have not received the same attention or resources as some other areas of environmental policy. There are signs that this is changing, and I hope that this meeting will provide further momentum to this development.

Let me share with you a personal experience that I believe helps illustrate why environmental enforcement and compliance is an important part of the sustainable development agenda. Several weeks ago I was visiting a country – I will not say which one - and I read a story in a local newspaper about some environmental inspectors who were making a visit to a factory. Apparently when the inspectors got close to the factory, they were met by a group of people with clubs and other weapons who were intent on stopping the inspection from taking place. While I hope that this is not a typical experience for environmental inspectors, I think it illustrates how environmental enforcement and compliance relates to the three pillars of sustainable development.

First, the environmental dimension: if inspectors cannot work to promote compliance with environmental requirements, polluters are effectively allowed to transfer the costs associated with pollution from themselves to the rest of society. This may result in adverse impacts on the health of the populations or unsustainable use of natural resources.

Second, the social dimension: establishing and enforcing clear and fair rules of the game in the environmental and other sectors is a fundamental component of governance and the establishment of the rule of law. This in turn requires the involvement of relevant stakeholders so that they are willing to abide by common rules. Equally it requires a fair and impartial enforcement system that shows no favouritism, and which cannot be deflected from its primary goal by bribes or other inducements.

Third, the economic dimension: economic actors need clear, stable, and predictable rules of the game that can help reduce uncertainties when making investment and other decisions. The impartial enforcement of such rules helps to create a level playing field and avoid distortions to

competition. Designing and applying the rules in ways that encourage flexibility and innovation can help to minimise compliance costs and enhance the efficiency of compliance programmes.

The systems that we have put in place to protect the health of our citizens from adverse environmental impacts, and to safeguard the natural resource base of our economies, will only be as strong as the weakest link. We might write very good laws and regulations, and apply sophisticated policy instruments, but if polluters do not comply with them it counts for little. Some analyses suggest that in OECD countries, 60-80% of regulated sources may be in violation of air emission limits. If this is true, it is very worrying. We know too from our work in some countries of the former Soviet Union and in Asia that enforcement and compliance are major concerns for the environmental authorities. However, there are few if any systematic analyses of enforcement systems and compliance rates in transition and developing countries.

What we propose to do in this conference is to focus on a few key aspects of environmental enforcement and compliance systems. The agenda is structured around four themes, each of which will be the focus of discussion for approximately half a day.

- First, we will examine the incentive framework within which firms operate. What leads firms to comply – or not to comply – with environmental requirements? And how does the size, sector, or other characteristics of the firm affect their behaviour? It is essential for policy makers to develop better insights into these questions in order to make their interventions more effective. We will also examine some of the latest research findings in this area.

- Second, we will look at the framework within which environmental inspectorates are operating. What are the types of regulatory approaches that are enforceable and lead to achieving real environmental outcomes? Different regulatory approaches will also have cost implications for both the regulator and regulatee, and these need to be assessed.

- Third, we will review the traditional instruments of environmental inspectors: monitoring and enforcement. What is the appropriate balance between these tools? How far can the application of these instruments be traded off against voluntary commitments by firms that take certain actions such as implementing environmental management systems?

- Fourth, we will assess experience with a broader range of instruments that can be used to induce compliance with environmental requirements. These include: performance rating and information disclosure schemes, and enhancing the role of the courts.

We hope to have a lively debate on these issues as today's meeting is truly multi-disciplinary: it gathers lawyers and economists, inspectors and researchers, representatives of industry and NGOs, as well as representatives from OECD, transition, and developing economies.

We do not intend that this conference should be a one-off event. The results of this conference will contribute to work we are carrying at the regional level, in the former Soviet Union and Asia. We are also working closely with several international networks concerned with environmental enforcement and compliance, notably the International Network for Environmental Compliance and Enforcement, or INECE. In fact we cooperated with INECE last year in organising a workshop on indicators for environmental enforcement and compliance. The report from the workshop is available at the back of the room. The INECE is organising a global

meeting of its network in Marrakech next April, and we plan to feed the outcomes of this meeting and the workshop on indicators into that event. We will also be prepared to work further with our members, and our partner countries, on designing more effective and efficient environmental compliance assurance programmes.

Ladies and Gentlemen, welcome once again to OECD and to the Global Forum on Sustainable Development. I am confident that we can look forward to two days of stimulating and productive discussion.

WHY DO FIRMS COMPLY (AND SOMETIMES "OVER-COMPLY") WITH ENVIRONMENTAL REGULATIONS?

Mark A. Cohen, Owen Graduate School of Management

I. Introduction

This paper briefly reviews the theoretical underpinnings and empirical evidence on why firms comply (and sometimes over-comply) with environmental regulations. The underlying assumption throughout the analysis is that the goal of the firm is to maximise shareholder value, and that the goal of the government regulatory agency is to devise an optimal penalty. However, as we will discuss, it is possible that neither assumption will hold, leading to inevitable complications in practice.

Most of the literature on why firms pollute has focused on whether or not firms comply with government regulatory standards. Subsequent empirical tests of this literature in the context of pollution control have shown that firms respond to marginal incentives such as higher penalties and more certain monitoring and enforcement. On the basis of pure theory, firm compliance often appears to be irrational, as the "expected monetary penalty" from non-compliance may be less than the actual cost of compliance. Studies of penalties for environmental crimes have found that the monetary penalty seldom exceeded the harm caused by the offence (see *e.g.* Cohen, 1992). This could only be "optimal" if the probability of conviction was one, or if there were collateral sanctions that imposed other costs on the firm. Under such a scenario, possible explanations for firm compliance include the existence of more elaborate enforcement mechanisms that involve long-term relationships or more complex penalty schemes (see *e.g.* Harrington, 1988), and non-governmental penalties such as the prospect of a private citizen lawsuit (see *e.g.* Naysnerski and Tietenberg, 1992) or of damaging a firm's reputation (see *e.g.* Cohen, 1992). Thus, while government-imposed penalties might be an important policy instrument to ensure compliance; they are not likely to be the only deterrent operating in the system. Indeed, they might be considered as complements to other external deterrent forces.

To those who wonder why firms comply, an even more intriguing question now appears to be of importance: why firms might reduce pollution even in the absence of (or beyond existing) regulatory standards. There is a growing trend in both the U.S. and abroad for firms to reduce emission levels beyond the legally required mandate. There are many potential reasons why firms might agree to go "beyond compliance." For example, firms might want to preclude further government regulation. If consumers care about environmental performance, they might base some purchase decisions on the environmental performance of the firm whose product they are considering. Community groups might pressure firms to reduce pollution by threatening implicit or explicit boycotts, zoning restrictions, and less favourable treatment elsewhere in community activities. Concerns over employee morale might make some form of pollution reduction in the firm's best interest. It is also possible that in large, publicly traded companies, it is in the shareholder's interests to reduce pollution voluntarily.

II. Theoretical Framework: Why Do Firms 'Voluntarily' Comply with the Law?

The basic "optimal penalty" model of Becker (1968) assumes that firms maximize expected profits. This model has been applied to environmental compliance (see Cohen, 1987, 1992). With any legal or extra-legal concern for environmental performance absent, the profit maximization problem could be represented by:

$$Profit = F\ (Revenue - Costs)$$

Profit maximization would occur at an output level where the marginal cost of production equals the price of the output. Moreover, since the cost of pollution is not taken into account by the firm, there will be more than the socially optimal level of pollution. If the government imposes a penalty on firms that violate environmental laws, the "expected profit" for the firm becomes:

$$Profit = F\ (Revenue - Cost - Expected\ Penalty)$$

The "expected penalty" using the Becker framework is simply equal to the environmental harm caused by the illegal activity, divided by the probability of detection and conviction. Thus, if the government regulator "gets it right," (*i.e.* correctly sets the penalty equal to the expected harm divided by the probability of detection and conviction), the socially optimal amount of pollution will be emitted. There will be some "non-compliance," but only to the extent that it is socially efficient to pollute, *i.e.* where the social harm caused by the pollution is less than the social benefit from polluting. The "social benefit" from pollution might sound like an oxymoron. However, the concept makes sense if one realizes that to reduce or prevent pollution from occurring in the first place, the firm – and ultimately society – must incur some costs. Those costs might include pollution control costs or simply the foregone benefits of a product that is no longer produced. Thus, the "social benefit" from pollution is the cost that is not incurred – or the opportunity that is not lost – by polluting.

Of course, there is no reason to expect, a priori, that the government enforcement agency will "get it right." They might have inadequate resources to monitor effectively and there might be legislative or practical barriers to raising penalties high enough to provide the proper incentives for firms to reduce pollution optimally. Alternatively, they might simply not have adequate knowledge of the harm or probability of detection. Regardless, it is possible that a third form of "cost" might be imposed on firms that pollute and violate environmental laws: the "external penalty" imposed by third parties on violators. That "external penalty" might take the form of pressure from community or environmental groups, reduction in the value of a brand name to the extent consumers shy away from the firm's products, or downward pressure from shareholders who believe that future regulatory scrutiny or other risks lie ahead for the firm.

$$Profit = F\ (Revenue - Cost - Expected\ Penalty - \text{"External Penalty"})$$

To the extent that there are these external pressures, we expect higher firm compliance than we would get solely from government enforcement efforts. In addition, the external penalty might actually be an external "benefit" to the extent the firm goes beyond compliance. A superior environmental record might ultimately end up rewarding firms with "ecolabels" or good publicity from environmental organizations and consumer groups. Employees might prefer to

work for environmentally responsible companies, thus providing a high quality, stable work force that is motivated to work on behalf of the company. Regardless of the mechanism, it is possible that for the firm that goes "beyond compliance" the external effect is positive – and there is thus an incentive for some firms to exceed their regulatory minimum standards.

It is evident from this simple model of firm behaviour that the decision about whether or not to violate the law depends on a number of factors that relate to the incentive and the ability of firms to comply:

$$Compliance = f\ (incentive,\ ability)$$

At a very general level, the government can affect incentives and ability in various ways: it can increase the penalty, increase monitoring activities, or increase compliance subsidies. However, the firm is not only influenced by these factors. To the extent that the firm cares about its external reputation, it will also have an incentive to comply. Of course, ability to pay is also a factor that might affect the firm's compliance propensity.

In addition to the governmental and external incentives identified above, there are other factors that might affect the likelihood of compliance. First, profit maximization might not be the goal of managers of firms whose incentives are not fully aligned with shareholder interests. That is, managers might take shortcuts or otherwise not comply, either to save money and enhance reported profits or to minimize their level of effort (see *e.g.* Alexander and Cohen, 1999).

Second, it is possible that larger firms – especially multi-plant firms - are more likely to comply with environmental laws. One reason this might be true is that larger firms have economies of scale in numerous activities including regulatory compliance. They can afford to spread the costs of an environmental compliance staff over a larger number of facilities and may thus develop expertise in compliance. They might also have an incentive to invest in compliance more than single facility firms because any negative reputation effect of a non-compliance penalty might apply to other facilities within the corporate umbrella. On the other hand, larger firms are more difficult to manage. Thus, it is possible that larger, multi-plant firms will have more difficulty in compliance.

Third, foreign-owned facilities might have more difficulty complying with environmental laws because they lack the legal/regulatory expertise they might develop in their home country. On the other hand, to the extent that the foreign regulatory requirements are more stringent and technologies more advanced, it is possible that the opposite result will be found: foreign-owned firms (especially large multi-nationals) will have relatively uniform standards across their facilities and thus in some countries will be better environmental performers.

Fourth, to the extent there is shareholder or market pressure, we would expect publicly traded firms to be in compliance more than privately held firms that do not have to answer to external pressures. Finally, to the extent there is strong community pressure, firms might be more likely to comply.

Many of the factors that are likely to encourage firms to comply with environmental laws are also likely to encourage "over-compliance." However, for over-compliance, a few additional factors might come into play. For example, if shareholders believe pollution to be a sign of productive inefficiencies, information about how firms compare to competitors might be relevant for investors. The fact that a firm is known as one of the dirtiest in an industry may provide

strong incentives to improve environmental performance, even if the firm is in compliance with environmental laws.

Empirical Evidence on Compliance and Over-Compliance

There is considerable evidence that firms respond to increased monitoring and enforcement efforts.[1] While numerous studies have failed to find a relationship between higher penalties and compliance, it appears to be because the level of penalties has been so low that they had no deterrent effect. One recent study suggests that higher penalties might deter violations.[2] There is also good evidence that firms in financial distress are less likely to comply (or over-comply) with environmental regulations.[3]

In terms of firm characteristics, the evidence is mixed. There is some evidence that larger firms are more likely to go beyond compliance, but these studies all deal with publicly traded firms.[4] Despite the fact that larger firms appear to be better in terms of compliance and over-compliance, there is some evidence that firms with multiple facilities exhibit poorer environmental performance. This is consistent with an "agency cost" theory that multi-plant firms are more difficult to monitor by top management.[5] There is also some limited evidence that foreign-owned firms operating in the U.S. generate more hazardous wastes than domestic U.S. firms, presumably due to the difficulty of understanding domestic laws.[6] However, to my knowledge, this finding has not yet been tested with respect to regulatory compliance or over-compliance, or outside the U.S.

What about community and consumer pressure? Again, the evidence is mixed. There is evidence that local community pressure can have an impact on both compliance and over-compliance.[7] However, there is little evidence that consumer pressure has any systematic effect on regulatory compliance, although there have been isolated instances of firms that have lost significant sales following news of poor environmental performance.[8] There is also some indirect evidence of such pressure as dirtier firms within an industry suffer from a decline in the intangible asset value of their stock.[9] The growing use of mandatory and voluntary reporting initiatives – including the Global Reporting Initiative (www.globalreporting.org) that standardizes reporting indicators – reduces the burden of acquiring information about the environmental and compliance performance of firms. Thus, in the future, public pressure may play a more important role.

Policy Implications

Understanding why firms comply and over-comply with laws can help government regulatory agencies be more effective in improving compliance. By targeting firms that are less likely to comply, enforcement agencies can get more "bang for their buck". In fact, many government agencies (including the U.S. EPA and U.S. Coast Guard) have adopted targeted enforcement. Firms with past violations are often inspected more often, while firms that have demonstrated over-compliance are less likely to be inspected.

To the extent that community and/or consumer pressures are real, government regulators may also be able to encourage firms to improve environmental performance by requiring disclosure, even of legal pollutants.[10] This approach has the added benefit of not being very resource intensive to the government agencies. While we have seen cases where information disclosure has resulted in significant improvements in environmental performance, the mechanisms by which this happens are not yet clear. Future research should focus on understanding the extent to which community pressures, market pressures, or other forces align to provide an incentive for firms to voluntarily reduce pollution. Ultimately, policy makers and economists who study compliance need to continue to push the envelope towards conducting cost-benefit studies of enforcement policies.[11]

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[1] See Cohen (1999) and Cohen (2000) for surveys of this evidence.

[2] For example, earlier studies of U.S. Coast Guard penalties found no deterrent effect. However, Weber and Crew (2000) find such an effect.

[3] For example, Alexander and Cohen (1996) show that firms convicted of environmental crimes are more likely to be in financial distress. Konar and Cohen (2000) find that firms with higher cash flows had lower levels of toxic emissions.

[4] For example, Florida, Atlas, and Cline (2000) found that companies that use green design practices, on average, had twice the number of employees and sales than those who did not engage in green design. Arora and Cason (1995) found that larger firms were more likely to participate in the 33/50 program, a voluntary program designed to reduce toxic chemical emissions.

[5] For example, King and Shaver (2001) found that chemical and petroleum firms generate more waste if they operate multiple facilities across multiple jurisdictions in the United States. Gray and Deily (1996) found that multi-plant firms were more likely to be in non-compliance than single plant firms in the steel industry. Note however, that to the extent multi-plant firms are larger, they would be expected to be able to take advantage of economies of scale. Empirically, one needs to separate out the effect of "size" from the effect of "multiple facilities."

[6] See King and Shaver (2001).

[7] For example, Pargal and Wheeler (1996) report on a program in Indonesia where disclosure of compliance information to the public had an effect on subsequent compliance. Similarly, Brooks and Sethi (1997) suggest that differences in toxic emissions may be partly explained by community pressure. In both cases, it appears that the extent to which communities bring pressure depends upon educational level and poverty status.

[8] Well-known examples would include consumer reaction to the Exxon Valdez oil spill and the announcement that Shell was to sink the Brent Spar. However, both of these incidents were extremely high profile and the effect on sales was short-lived. There is also growing anecdotal evidence that young consumers in some countries purposefully boycott certain firms' products due to their perceived lack of environmental or social responsibility. None of this, to my knowledge, has been subjected to rigorous academic research.

[9] See Konar and Cohen (2001).

[10] For example, Konar and Cohen (1997) found that following the disclosure of legally allowable toxic emissions in the U.S., firms that had the largest emissions and whose stock prices were most affected by the disclosure subsequently "voluntarily" reduced their emissions the most.

[11] For an example of a cost-benefit analysis of enforcement policies, see Cohen (1986). One of the implications of that analysis was a prescription to shift resources from one enforcement mechanism to another to increase effectiveness.

ECONOMIC ASPECTS OF ENVIRONMENTAL COMPLIANCE ASSURANCE: INCENTIVE FRAMEWORK FOR FIRMS TO COMPLY WITH REGULATIONS

Dirk Hazell, BIAC Environment Committee

Thank you for the opportunity to offer a business perspective at this important Conference on behalf of the Business and Industry Advisory Committee to the OECD, which is the recognised contributor on behalf of business to the OECD's proceedings. BIAC's Environment Committee represents a wide range of sectors and countries and its purpose is to support the environmental objectives of the OECD's members in an economically sustainable way.

In the UK, the Environmental Services Association (ESA) represents a sector that exists only because of environmental regulation. Driven by EU law, our sector will invest up to US$20 billion in new infrastructure over the next decade. We therefore want good environmental regulation to help the UK to invest in the best infrastructure to align economic and environmental sustainability.

In "*Sustainability through the Market: seven keys to success*", Holliday and Pepper prioritise a smart hierarchy of public policy tools. They most favour voluntary initiatives, followed by negotiated agreements, then economic instruments and finally command and control regulation.

Most of my comment will be on economic instruments. At this stage I will make just two points on this hierarchy which arises from next generation environmental work in structures like the OECD and the European Union:

- First, this work will increase the relative weighting of the alternatives to command and control; and

- Second, the future character of environmental regulation will be more numerate. It will need to give more weight to monitoring companies' compliance systems than to site inspections. In sectors such as the one ESA represents, this will involve more use of IT and real-time reporting of data to regulators as has, for many years, been the case with financial services regulation.

Complementing Mr Cohen's comment, we have produced a slide showing how a voluntarily negotiated agreement has secured dramatic increase in use of recycled fibres in newspapers in the UK.

We have also produced a slide taken from "*Walking the Talk",* published by the World Business Council for Sustainable Development for the Johannesburg World Summit. It lists desirable qualities of environmental regulatory instruments: environmental effectiveness, economic efficiency, fiscal neutrality and simplicity seem particularly apt. Again, achieving this will involve a radical modernisation of environmental regulation to align economic and environmental sustainability.

I fundamentally disagree with the proposition in the helpful preparatory paper for this Conference that business compares the costs of compliance and non-compliance with environmental regulation and then chooses the least costly alternative. This is simply not how legitimate regulated business behaves. Yes, mistakes can be made, but legitimate regulated business plans on the basis of compliance with the law.

To help legitimate business to plan to comply with the law, obviously regulators should help to minimise compliance costs, for example by using companies' own management systems for environmental protection. Particularly if environmental regulation is not to become an excuse for protectionism, environmental outcomes must be secured without depressing rates of return on capital. This points to risk-based and outcome-focussed environmental parameters, where smart regulation works with the grain of markets as in cap and trade mechanisms pioneered in the USA.

I offer the thought that the x=pF proposition in the preparatory paper, and developed by Mr Cohen, is more relevant to criminals than to legitimate regulated business.

ESA has been a strong advocate in the UK of increasing "p"; the chance of detecting environmental offences by criminals. Our regulated industry sometimes makes mistakes but its purpose and plan is to protect the environment and human health. In contrast, criminals such as flytippers deliberately damage the environment and health: they also, effectively, steal from those who invest in legitimate regulated treatment infrastructure.

One question raised today is about SMEs. I know of no evidence that SMEs are inherently more dishonest. On the contrary, they are often subject to intense local community pressures on their conduct. However, multi-tasking is typically intense for the leadership of an SME. This does mean authorities have a particular duty to inform SMEs of their legal duties where these duties are not obvious. For example, in the UK, 75% of legitimate businesses (in other words most of the Country's SMEs) simply do not know about their own legal duties as producers of waste.

Again, the market will increasingly be a more apt tool of environmental regulation than "command and control". Market tools give business more flexibility on choosing whether to buy a permit to comply or whether to invest in abatement and innovation.

We have produced a slide noting that market instruments, as in Colorado, can be used to achieve a specific environmental outcome: the reduction of wood burning.

A further slide compares the British and German packaging regimes. Yes, Germany recovers more packaging than the UK but does anyone know whether this provides an environmental benefit justifying a cost 25 times higher than the UK's trading scheme for packaging?

In some sectors, market forces will drive higher environmental standards. In half a century, the real cost of insuring against extreme weather has risen 1 000%. Even so, environmental regulation has a role in dealing with different timescales and helping to spend relatively little now to avoid major environmental damage later in the century. Capping and trading global warming emissions is the obvious solution.

Work by the EU and OECD on topics such as life cycle analysis, resource efficiency, and producer responsibility will radically change the character of environmental regulation.

Producer responsibility, which is of course not universally popular with producers, illustrates the radical shift from regulating industrial processes to more focus on overall environment impact, including the use and post-use phases. If all producers are required to design sustainability into relevant products, no producers can escape. The EU's model for waste electrical and electronic goods should, for example, additionally ensure that the consumer carries the environmental costs associated with relevant products.

Biffa, the waste management subsidiary of the British utility company, Severn Trent, has produced a table showing the impact on the retail price of various goods if their prices reflect the cost of environmentally neutral end-of-life treatment. The extra cost is very low for cars (0.5%) and surprisingly low for brown goods (2.5%) but is 44% for fluorescent lights, an amount equivalent to the factory gate price. Set against the expensive end of life treatment for fluorescent lights is their relatively moderate global warming impact in their use phase. Getting overall price signals right is going to be more the future of environmental regulation than prescriptive regulation of process.

Community, reputational, and other pressures and social norms are obviously key drivers of legitimate corporate conduct. Perhaps the single most salient characteristic of the Johannesburg World Summit was the advocacy of Corporate Social Responsibility (CSR), including a strong environmental component, by global business leaders, particularly the leadership of the two largest groups - Suez and Severn Trent - in ESA's membership.

As you can see from the slide, Thames Water is open about its approach to CSR. Similarly, SITA's reports to Suez Environment feature only three aspects: financial performance, health and safety, and environmental compliance. This, not x=pF, is how such companies think.

We have produced a slide illustrating the growing awareness of the financial services sector to environmental compliance. Overwhelmingly, companies subject to environmental regulation will also be subject to additional regulatory regimes such as those of stock exchanges. In a number of sectors, commitment to an environmental agenda is also increasingly part of the basis of competing for good quality employees.

I offer just one quick thought in the time available. Environmental regulation must not become an excuse for protectionism, so confidence in a level regulatory playing field cannot be confined to one country. In our manifesto for this year's European elections, ESA recommended that the European Environment Agency be given the power to audit EU Member States' compliance with EU environmental law. We believe that in Europe this could be as helpful as the European Union's Implementation and Enforcement of Environmental Law Network (IMPEL) activities on operational aspects of environmental regulation in Europe to level up environmental standards across Europe and to do so in a way that is affordable.

Closing Statement

On behalf of BIAC, I would again like to thank the OECD for the opportunity of representing business at this conference. The presentations have ranged from the practical to the analytical and it was very useful yesterday to hear of the OECD's current work.

Yesterday we also heard a very substantial presentation from the US EPA, which emphasised how environmental protection can be combined with economic understanding. This

is the most important priority of the Conference and it is the one to which I will return in a moment.

But before leaving this theme I would like to say that my employer is delighted with the approach being taken by the European Commission to align economic and environmental objectives. I would also commend the intervention this afternoon by the European Commission implicitly recognising the need to reduce compliance costs for business. Achieving low compliance costs for business will help to secure environmental success.

There has been quite a lot of discussion about penalties and access to justice. I think from a business point of view, appropriate transparency is perhaps more the key priority.

Regulators have a duty to educate businesses about their duties and this particularly applies to SMEs. There was an important intervention this morning from the US EPA, in the chair, about the EPA's own work on transparency and ESA appreciates the Environment Agency's acknowledgement that ours is the leading sector on transparency in the UK. More generally, I think we were all very interested in Indonesia's presentation on transparency and discussion of their scheme, PROPER.

Regulators heard over the last two days of a shared frustration of business and NGOs: the failure of regulators to catch criminals. Having listened carefully to comments over the last two days, and while circumstances are clearly very different in different countries, I have formed the conclusion that most of the regulators in this room could usefully develop a clearer distinction between legitimate regulated business on the one hand, and criminals, on the other.

Where a clearer consensus did seem to emerge was on the issue of corruption: it is a clear priority that this be eliminated wherever it exists.

There has been debate about voluntary instruments: this is a subject on which BIAC has very strong views. My presentation yesterday gave a clear and specific example. The right voluntary agreements manifestly do work. They should not be dismissed by regulators: they are an effective means to an end.

I think there was agreement with a number of comments about the need to get the laws right. On behalf of BIAC, I think this means shifting to risk-based and outcome-focussed regulation with much greater use of economic instruments.

India rightly made the point yesterday that developing countries need to master regulation of processes. However, both developed and developing countries share a strong interest in successful cap and trade mechanisms to regulate, for example, emissions of global warming substances. It is the best way forward for all of us.

I do want to pursue a comment made by Mr Ruffing, not to be pedantic but to make a substantive point with which I am sure he will agree. It is very important not to include fiscal instruments in broad references to economic instruments. Fiscal and economic instruments have different characteristics and do different things. It is important to maintain transparency on this point and not simply to end up with a position where business is presented with tax increases following imprecise debate on economic instruments. As I said yesterday, fiscal neutrality is an important objective of the work we have been discussing and we do need to debate separately fiscal and economic instruments.

The move to economic instruments will result in a fundamental change in the character of environmental regulation: there will be a progressive shift from physical inspection of facilities to auditing operators' own compliance systems. There will need to be a qualitative shift in the quality of data maintained by environmental regulators, with much more intelligent use of information technology.

If we all succeed in our common objectives the result will be to avoid environmental standards becoming an excuse for protectionism and instead securing a position where the financial services sector most routinely invests in well-run businesses with good environmental standards. That has got to be good news for all of us.

ENVIRONMENTAL PERFORMANCE AND COMPLIANCE: CHANNELS OF ENFORCEMENT

Nick Johnstone and Pascale Scapecchi, Empirical Policy Analysis Unit, National Policies Division, OECD Environment Directorate

Introduction

Since long before Becker's (1968) classic theoretical formulation of the issues, it has long been assumed that the primary motivation for compliance with environmental regulations rested with two levers at the public regulatory authority's discretion: probability of enforcement; and magnitude of the sanctions imposed. While the basic model has been elaborated upon, it remains – rightly so – at the core of the analysis of environmental compliance. However, recent years have witnessed growth in the interest in two other types of enforcement channel:

- Informal community/stakeholder enforcement channels; and
- Internal self-enforcement by officials within the firm/facility.

While these are best understood as complements to (rather than substitutes for) enforcement via public regulatory enforcement channels, recognition of the role that they can play has brought about a change in the manner in which enforcement of environmental regulations is viewed.

In order to cast light on the role played by these three different channels (the public policy framework; the role of non-governmental stakeholders; and internal self-enforcement mechanisms), this report draws upon data collected from over 4 000 manufacturing facilities in seven OECD countries (the United States, Canada, France, Norway, Hungary, Germany, Japan). The data allows for a rich characterisation of facility-level attributes (size, sector, etc.) as well as the public environmental policy framework. In addition, data was collected on the perceived influence of stakeholders, facility management structure and tools, and commercial and economic factors. While the issue of compliance was not addressed specifically in the questionnaire, data on self-assessed environmental performance and reported investments undertaken can cast indirect light on the importance of these three channels.

Public Policy Framework

In the Becker (1968) context, compliance is characterised as an "economic decision", and is fundamentally a function of the magnitude of penalties/sanctions and the probability of enforcement. A number of empirical studies have been undertaken using this framework. Most frequently, efforts are made to assess the effects of differences in the probability of enforcement through inspection rates or public resources devoted to monitoring, as well as the nature of the enforcement activity undertaken (i.e. random versus scheduled inspections) (see Magat and

Viscusi 1990; Telle 2004; Epple and Visscher 1984; Helland 1998; Gray and Deily 1996; Cohen 1987; and Earnhart 1998).

Not surprisingly, there is general support for the view that increased enforcement efforts and/or penalties result in higher compliance rates and improved environmental performance. However, it is less evident that the compliance rates witnessed reflect an optimal strategy on the part of firms. Generally speaking compliance rates are higher than a simple cost-minimisation strategy based upon probabilities of enforcement and magnitude of sanctions would imply. Moreover, the variation in compliance rates across facilities is not easily explained by existing results.

Various reasons have been forwarded, most of which relate to the use of information by public authorities to "target" enforcement resources in an intelligent manner. There are three potential sources of information that are at the disposal of public authorities to help target resources. In effect, it is not assumed that each potential violator has an equal probability of being in non-compliance, and there are sources of information that allow the public authority to assess where probabilities are highest, and thus where resources should be devoted.

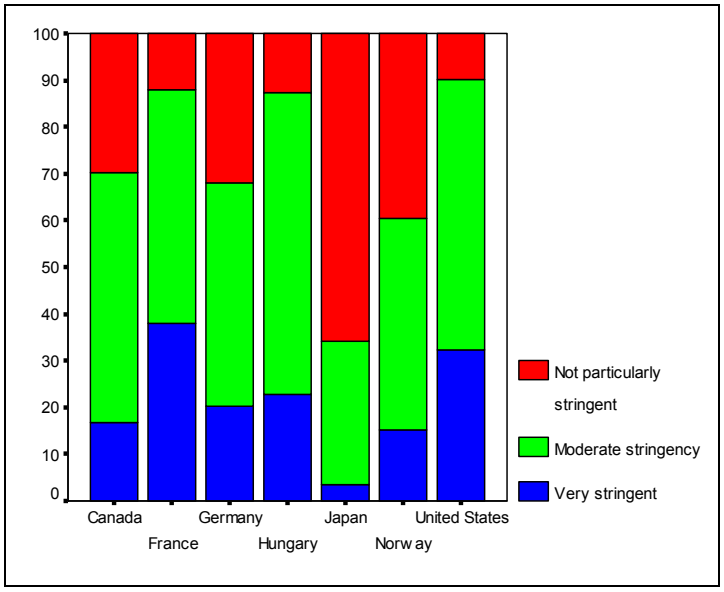
The first, and most thoroughly examined, is through the use of information based upon past compliance behaviour (state-dependent inspections). Harrington (1988) was the first to formalise this view, but it has since spawned a vast and rich literature, with Helland (1998) making a particularly significant contribution, finding that public authorities do target on the basis of past compliance and that firms seek to avoid being targeted.

The second source of potential information on likely compliance rates relates to differences in the structural characteristics of the facility, which are thought to affect abatement costs for the facility and/or environmental damages, and thus the net "cost" of being in compliance. For instance, plant size has been found to be positively related to inspection rates (Laplante and Rilstone, 1996). Clearly, sectoral classification is also important with respect to both abatement costs and potential environmental damages and is likely to be an important factor in the public authority's allocation of enforcement resources.

Finally, the public authority may well use indirect visible "signals" (or proxies) related to environmental performance in order to allocate resources. For instance, the growth of the use of environmental management systems (EMS) by facilities may provide information to public authorities about the sensitivity of management to environmental concerns. This, however, raises the significant danger that facilities will use EMS, at least partly, as a means to reduce inspection frequency, an issue explored in Johnstone *et al.* (2005). Another possible "signal" is the designation of somebody responsible for environmental matters.

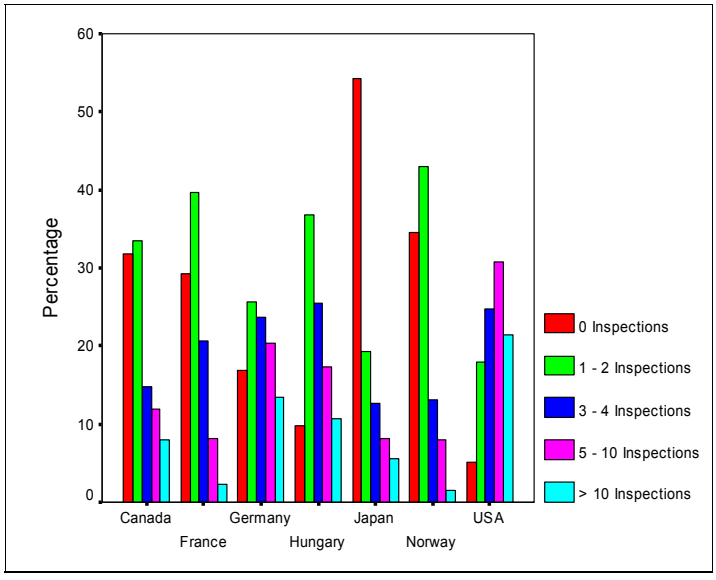
The OECD database collects information on both the perceived stringency of environmental policy regimes and inspection frequency. There is very wide variation in the perceived stringency of the environmental policy regime. For instance, while less than five per cent of facilities in Japan felt that the environmental policy regime was very stringent (and more than 65% found it to be not particularly stringent), the figures for France and the United States are between 30% and 40% (see Figure 1). These have little evident relationship to the relative stringency of policy regimes actually prevailing in different countries, but give a good indication of the perception of their relative stringency (and perhaps strategic bias in responses).

Figure 1: Relative Stringency of Environmental Policy Regime



In addition, figures on the mean number of times that facilities report having been inspected varies markedly by country (see Figure 2). For instance half of all facilities in Japan report that they were not inspected in the last three years. This may be due to the greater stigma associated with inspections in Japan, indicating that the threat of inspection itself plays a greater deterrent role.[1]

Figure 2: Frequency of Inspections in Last Three Years



Overall, somewhat more than five per cent of facilities report having been inspected more than 10 times in the last three years. The correlation between reported number of inspections and the degree of perceived stringency of the policy regime is only 0.3, indicating that the two variables provide quite different information, as expected.

Applying the inspections data, least squares analysis using a fixed effects model (with dummies for country and sector) was undertaken in order to assess which factors were most important in determining inspection rates. Unfortunately, the cross-sectional nature of the data prevents us from assessing the importance of past environmental compliance behaviour. However, the results are of interest with respect to the other channels and are presented in Table 1.

Table 1. Results of OLS Estimation of Inspection Rates

	Coefficient	P-value
Constant term	-2.340	0.119
Self-assessed Negative Impact With Respect To		
Air Pollution	0.638	0.056
Solid Waste	-0.978	0.004
Waste water	0.051	0.881
Public Environmental Policy		
Perceived Policy Stringency	2.261	0.000
Environmental Management		
Having an EMS	0.777	0.032
Senior Management	0.525	0.268
EH&S Department	2.813	0.000
Prod/Operations	1.482	0.019
Other Location	0.978	0.054
Structural and Commercial Characteristics		
100-250 EMPL	0.091	0.815
250-500 EMPL	-0.141	0.749
> 500 EMPL	2.501	0.000
Business performance	0.025	0.940
National market	-0.999	0.122
International market	-1.060	0.118
Firm on stock exchange	0.847	0.042
More than 5 direct competitors	0.062	0.844
Positive change in sales	0.043	0.900
Countries		
USA	1.340	0.075
GERMANY	2.459	0.001
HUNGARY	1.101	0.135
JAPAN	1.129	0.119
FRANCE	-3.107	0.001
NORWAY	-0.874	0.288
Sectors	N.S.	N.S.
Number of observations: 2095		
Degrees of freedom: 2061		
Adjusted R^2: 0.16		
Prob(F[33,2061])<0.0000		

Facilities that see their impacts in terms of air pollution or water pollution as either moderately or very significant are more likely to be inspected. Larger facilities are more likely to be inspected, but only when they reach a size of 500 employees or more. In addition, facilities in some countries (the USA, Germany) are more likely to be inspected. Interestingly, the Japanese coefficient is not significant, indicating that the much lower inspection rates arose out of correlation with other variables in estimation. Interestingly, the sectoral dummies do not prove to be significant. The only "economic" variable that is significant is that indicating whether the firm of which the facility is a part is listed on a stock exchange.

There is little support for the hypothesis that public authorities use managerial signals (EMS or designated responsibility) in order to target enforcement resources. Indeed, facilities with somebody designated as being responsible for environmental matters are more likely to be inspected than if nobody is designated, unless such a person is in senior management. In addition, the presence of an EMS appears to result in increased inspection rates. However, given the importance of signalling, the model was re-estimated using only "certified" EMSs (EMAS or ISO 14001) as "yes" in the binary variable, and in this case the coefficient was negative but not significant.

Community/Stakeholder Enforcement

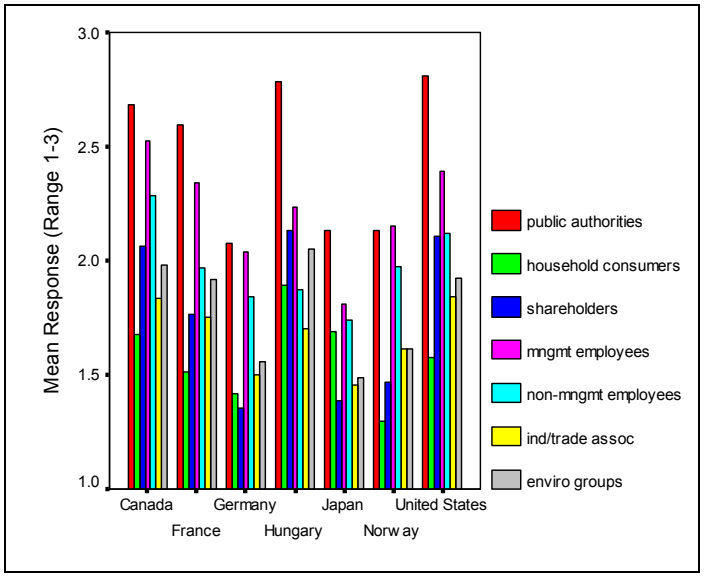
As noted above, the role of informal community enforcement, and enforcement by other stakeholders is a subject of increased interest. In effect, it is increasingly being argued that the motivations behind a facility's environmental strategy need to be framed in a much broader context than has usually been the case. The costs of non-compliant behaviour (and benefits of beyond-compliance behaviour) need to be understood in the context of the full set of actors with which the firm interacts. At the very least this includes:

- Financial markets: through implications for the firms in terms of the cost of and access to capital markets
- Community/neighbourhood: through the costs (time and resources) associated with permitting, etc.
- Consumers: through implications for markets, whether due to product differentiation or firm branding
- Workers: through the implications that environmental performance can have on labour productivity and turnover

Much work has been done on the role of financial markets, with some support for the role that financial markets can play on encouraging improved environmental performance (Khanna and Anton, 2002; Cormier et al., 1993; Lanoie *et al.*, 1998; Hamilton, 1995). There has also been considerable work done on the role of community pressure, particularly in developing countries (Pargal and Wheeler, 1995; Arora and Cason, 1996; Brooks and Seith, 1997; Konar and Cohen, 1997). However, in the latter case estimation is complicated by the fact that the variables that reflect community pressure can also reflect other factors, some of which may have a countervailing influence on environmental performance. As such, interpretation of the results is problematic (see Hamilton, 1995, for a discussion.) The role of other stakeholders is much less amply assessed.

Figure 3 reports on data collected on the reported influence of different "stakeholders" on facilities' environmental practices. In terms of the descriptive data the most significant influences are public authorities and management employees. The latter were, of course, themselves the respondents. Recognising that this may be important, the specific respondent within the facility was also requested to identify their position and institutional location within the facility. Consumers, industry/trade associations, and environmental NGO's all had limited influence. The role of environmental NGO's was greatest in Hungary. Shareholders play a relatively important role in the United States and Hungary.

Figure 3: Reported Influence of Selected Stakeholders on Environmental Practices



Presence of Environmental Management Tools

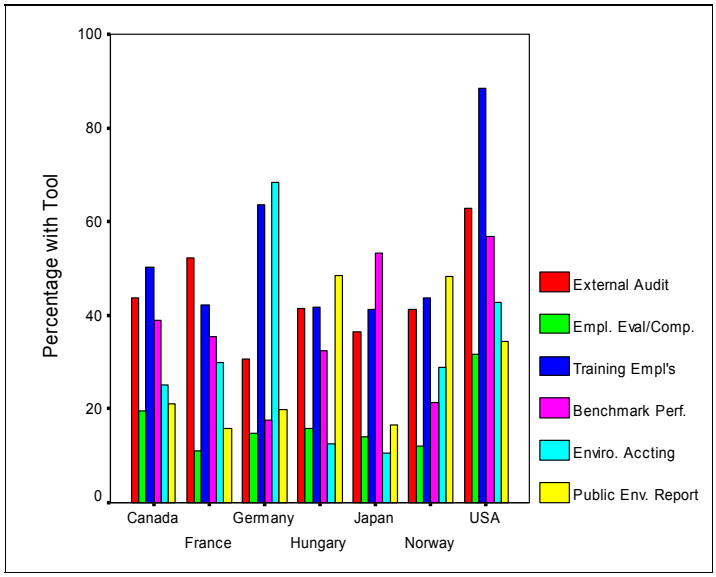
One of the primary objectives of the questionnaire was to collect information on the nature and extent of environmental management in different facilities since recent work has indicated that the management strategies adopted by firms can have a significant influence on their environmental performance. (For a good discussion of the importance of an understanding of the internal workings of the firm see Gabel and Sinclair-Desgagné, 1993 and 2000.) They may also improve levels of compliance. Evidence has shown that sub-optimal abatement strategies and non-compliance are rarely deliberate, but instead are often a function of information barriers (and even organizational failures) within the firm, i.e. mistakes (see Harrington 1988 and Cohen, 1998). Thus, non-compliance with environmental policies is usually inadvertent, rather than the outcome of a rational calculus of costs and benefits. Thus, more attention is being paid to the role of environmental management systems and tools with regard to the ultimate objective of public environmental policy, i.e. improved environmental performance or compliance (see Anton *et al.*, 2002, and Dasgupta *et al.*, 2000, for recent empirical analyses.)

The characterisation of environmental management relates not only to the presence of environmental management systems (certified and uncertified), but also to more specific environmental management tools, the institutional location of the person responsible for environmental matters, and general management practices that may have environmental implications. Overall, 37% of respondents reported having an EMS. However, the number of facilities reporting that they had environmental management systems in place varies widely

across countries, with figures ranging from just under 30% (Germany and Hungary) to almost 45% (United States).

Since an EMS can mean very different things to different facilities in different countries, it is perhaps more interesting to examine facilities' responses to questions concerning specific environmental management tools (see Figure 4). The most commonly reported tools are "written environmental policies" and "environmental training programmes", with the "use of environmental criteria as an element of personnel policy" much less prevalent. There is, however, variation across countries. In Germany, environmental accounting is much more important than elsewhere, and much more important than other tools. In the United States, there is much greater tendency to use environmental training programmes. There are few facilities that evaluate or compensate employees on the basis of environmental criteria, except in the United States. Hungary has the greatest proportion of facilities with public environmental reports.

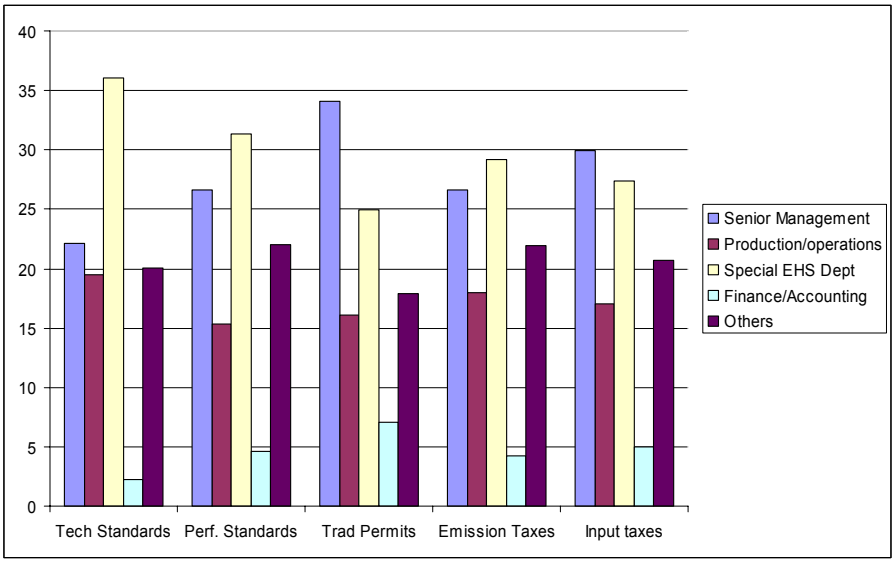
Figure 4: Proportion of Facilities with Selected Environmental Management Tools



It is interesting to note that approximately 30% of facilities did not report having anybody explicitly responsible for environmental matters. This ranges from a figure of over 45% amongst facilities with less than 100 employees to 6.6% of facilities with more than 500 employees. Across countries the highest value is in Japan (over 40% do not have such a person) with the lowest in the United States (less than five per cent). For those who reported having somebody explicitly responsible, in over 40% of facilities in France responsibility rests with someone in an "environmental health and safety department", compared with approximately 15% in Norway and Japan. Norway, Canada and Japan have the largest proportion of facilities for which the person responsible for environmental matters is characterised as "senior management". Norway and the United States have the highest proportion defined as being in productions/operations departments.

Interestingly, there appears to be a close relationship between the introduction of certain types of public environmental policy tools and the institutional location of the person responsible (see Figure 5). Thus, it is found that the presence of economic instruments is correlated with having senior management responsible for environmental matters, while direct regulations are more highly correlated with responsibility being vested with someone in a specialised environmental health and safety department.

Figure 5: Locus of Responsibility for Environmental Matters Against Environmental Policy Instruments



Whether or not differences in managerial strategies (adoption of EMS and other management tools, location of official responsible for environmental matters, etc.) have a distinct effect on environmental performance and compliance managerial is clearly an issue that warrants attention. However, it is not always straightforward to determine the direction of causality since these decisions are often simultaneous (see Johnstone *et al.*, 2005 for a discussion). In particular, if the environmental strategy is an endogenous response to efforts to improve performance or ensure compliance, it is not sufficient to assess the two decisions separately.

Empirical Analysis

In order to assess the role of these different "enforcement channels", bivariate probit models were estimated using two different dependent variables:

- Reported changes in environmental impacts (ENVPERF): whether (=1) or not (=0) the facility reported significant decreases in environmental impacts with respect to any of the three areas (solid waste, air pollution, or water pollution).

- Reported concrete environment-related actions undertaken: whether (=1) or not (=0) the facility reported having undertaken significant investments in each of the three areas (solid waste, air pollution, or water pollution).

In order to test our hypotheses the explanatory variables included in the model include public policy framework (policy stringency and inspections), the role of different stakeholders (financial, suppliers, workers, etc.), and "self-enforcement" variables (environmental management tools and presence & location of official responsible for environmental matters). However, and as noted above, in order to capture the true effect of possible targeting of inspections based upon other factors, a simultaneous equation model was estimated with the probability of having been inspected (INSPBNRY) being estimated simultaneously. The rho-test indicates that the two are endogenous in two of the four models estimated (aggregated environmental performance and air pollution actions).

The principal results for the estimation of the model using the "reported changes in environmental impacts" are reported in Table 2, with full results in the Annex.

Table 2. Principal Results of Bivariate Probit Estimation (ENVPERF)

	Coefficient	P-value
ENV PERFORMANCE EQUATION		
Constant term	-1.047	0.000
Public Environmental Policy		
Perceived Policy Stringency	0.085	0.054
Inspection frequency	0.018	0.000
Performance-based standards	0.173	0.026
Technology-based standards	0.137	0.060
Emission taxes	0.044	0.585
Input taxes	-0.065	0.444
Voluntary agreement	0.046	0.540
Subsidy	0.142	0.118
Technical assistance	0.025	0.764
Stakeholders		
Consumers	0.143	0.110
Suppliers and buyers	-0.160	0.062
Financial	-0.133	0.091
Workers	-0.028	0.683
Industry and trade associations	0.025	0.810
NGOs	0.036	0.669
Self-Enforcement (tools)		
Written environmental policy	0.078	0.262
Evaluation of employees	0.072	0.324
Training	0.158	0.014
External audit	0.181	0.003
Internal audit	-0.030	0.660
Benchmarking	0.188	0.002
Accounting	0.200	0.003
Public environmental report	0.075	0.224
Environmental performance indicators	0.173	0.007
Self-Enforcement (institutional location)		
Senior Management	0.022	0.783
EH&S Department	0.027	0.785
Prod/Operations	0.191	0.064
Other Location	0.076	0.378
Number of observations: 3063		
Log likelihood function: -3115.20		

One striking result is the important role played by the public environmental policy framework. Perceived policy stringency and inspection frequency are significant and positive influences. In addition, the presence of direct regulations (performance and technology standards) in the policy mix has a positive and significant role. When interpreting the latter result it is important to recognise that the dependent variable does not refer to the economic efficiency of the measures undertaken, but rather to the environmental effectiveness.

Table 3. Principal Results of Bivariate Probit Estimation (Air Pollution, Solid Waste, Wastewater)

	AIR POLLUTION		SOLID WASTE		WASTEWATER	
	Coefficient.	P-value	Coefficient.	P-value	Coefficient.	P-value
ACTION EQUATION						
Constant term	-1.523	0.000	-0.638	0.050	-0.942	0.002
Public Environmental Policy						
Perceived Policy Stringency	0.435	0.000	0.153	0.016	0.199	0.001
Inspection frequency	0.014	0.000	0.007	0.476	0.070	0.000
Performance-based standards	0.297	0.014	0.055	0.664	0.366	0.002
Technology-based standards	0.066	0.515	-0.079	0.493	-0.112	0.314
Emission taxes	0.119	0.395	-0.004	0.976	-0.031	0.815
Input taxes	-0.034	0.816	0.053	0.698	-0.056	0.698
Voluntary agreement	-0.094	0.388	0.092	0.429	-0.117	0.277
Subsidy	0.022	0.877	-0.123	0.413	0.343	0.029
Technical assistance	-0.120	0.348	0.079	0.518	-0.223	0.123
Stakeholders						
Consumers	0.020	0.871	0.195	0.178	0.182	0.157
Suppliers and buyers	0.048	0.704	0.114	0.442	-0.109	0.399
Financial	0.109	0.303	0.090	0.518	0.190	0.134
Workers	0.080	0.381	0.247	0.050	0.207	0.058
Industry and trade associations	0.198	0.175	-0.013	0.939	-0.190	0.214
NGOs	0.130	0.287	0.045	0.740	0.126	0.321
Self-Enforcement (tools)						
Written environmental policy	0.075	0.445	0.229	0.010	0.010	0.920
Evaluation of employees	0.090	0.330	0.139	0.253	0.150	0.161
Training	0.191	0.046	0.135	0.148	0.170	0.068
External audit	-0.037	0.666	0.095	0.331	-0.046	0.611
Internal audit	0.029	0.772	0.138	0.157	0.069	0.494
Benchmarking	0.130	0.116	0.247	0.007	0.242	0.007
Accounting	0.111	0.230	0.378	0.000	0.195	0.031
Public environmental report	0.074	0.358	0.254	0.017	0.050	0.572
Environmental perf. Indicators	0.093	0.280	0.101	0.284	0.095	0.273
Self-Enforcement (Environmental Management)						
Senior Management	0.074	0.471	0.138	0.178	0.227	0.030
EH&S Department	0.175	0.166	-0.058	0.680	0.191	0.129
Prod/Operations	0.113	0.412	0.000	1.000	0.484	0.000
Other location	0.226	0.039	0.052	0.648	0.125	0.250

Conversely, other stakeholders have little influence. Those which are significant at the 10% level (financial markets, buyers, and suppliers) are negative. There is no good reason to expect such a result. In terms of "self-enforcement tools", five environmental management tools emerge as being significant: training, external audits, benchmarking, environmental accounting, and environmental performance indicators. In terms of the designation of responsibility for

environmental matters it is only when such an official is responsible for production and operations that it has a significant influence. The results for the other variables (and the inspections equation) are presented in the Annex.

The results for the estimation using the self-reported actions with respect to air pollution, solid waste, and wastewater are reported in Table 3. The results for the policy variables are largely consistent with the results presented above, with the exception that inspection frequency does not have a positive influence on actions undertaken in the area of solid waste. Indeed, with respect to solid waste, none of the policy variables are significant except policy stringency. In addition, in the case of wastewater, subsidies seem to play a positive role. The role of stakeholders is more mixed, with workers emerging as significant in two cases (solid waste and wastewater), the only variable to do so.

In terms of the "self enforcement variables", written environmental policies (solid waste) training (solid waste, wastewater), benchmarking (solid waste, wastewater), accounting (solid waste, wastewater), and public environmental reports (solid waste) have a significant and positive influence. No tool is significant for air pollution. Relative to the case where nobody is designated, when somebody in senior management and production or operations is designated as being responsible for environmental matters this has a significant and positive effect for wastewater, and "other" (financial, human resources, marketing etc.) for air pollution.

Conclusions

This report has examined the influence of three separate but related "enforcement channels": the public policy framework; the role of non-governmental stakeholders; and internal self-enforcement mechanisms. While the role of the former remains clearly dominant in most theoretical and empirical analyses, the role of the latter two is clearly rising in importance. Unfortunately, the empirical evidence remains limited.

Based upon a database of over 4 000 manufacturing facilities in seven OECD countries it has been possible to assess the role of these three different channels. While the data upon which this report is based does not allow for the assessment of compliance *per se*, it does cast indirect light on the relative importance of these three different channels. Through empirical analysis of the determinants of self-reported changes in environmental impacts and actions with respect to solid waste, water pollution, and air pollution the following results have been obtained:

- The public policy framework is clearly important, both in terms of reported policy stringency and inspection frequency;
- The choice of policy instrument applied within the policy mix does not appear to be particularly significant;
- The influence of non-governmental stakeholders is limited, except perhaps with respect to workers;
- Some environmental management tools appear to be determinants of pro-active environmental behaviour, particularly training, environmental accounting, and benchmarking; and,

- The designation of somebody with responsibility for environmental matters is of some importance, particularly if in senior management and production or operations.

The report has also cast some light on the determinants of inspection rates. Surprisingly, sectoral classification is not important. This may be due to the level of aggregation employed, masking significant variation in potential environmental impacts within individual classes. Indeed the strong explanatory power of the variables reflecting perceptions of potential negative impacts on the environment supports this conclusion. Facility size does appear to be important, as do the country dummy variables. Perhaps most surprisingly, the presence of an environmental management system and the designation of somebody responsible for environmental matters have a positive influence on inspection frequency. However, teasing out the direction of causality with respect to these issues would require a panel data set.

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Table A.1. Results of Bivariate Probit Estimation (ENVPERF and INSBNRY)

	Coefficient	P-value
ENV PERFORMANCE EQUATION		
Constant term	-1.047	0.000
Perceived Policy Stringency	0.085	0.054
Inspection frequency	0.018	0.000
Performance-based standards	0.173	0.026
Technology-based standards	0.137	0.060
Emission taxes	0.044	0.585
Input taxes	-0.065	0.444
Voluntary agreement	0.046	0.540
Subsidy	0.142	0.118
Technical assistance	0.025	0.764
Consumers	0.143	0.110
Suppliers and buyers	-0.160	0.062
Financial	-0.133	0.091
Workers	-0.028	0.683
Industry and trade associations	0.025	0.810
NGOs	0.036	0.669
Written environmental policy	0.078	0.262
Evaluation of employees	0.072	0.324
Training	0.158	0.014
External audit	0.181	0.003
Internal audit	-0.030	0.660
Benchmarking	0.188	0.002
Accounting	0.200	0.003
Public environmental report	0.075	0.224
Environmental performance indicators	0.173	0.007
Senior Management	0.022	0.783
EH&S Department	0.027	0.785
Prod/Operations	0.191	0.064
Other Location	0.076	0.378
100-250 EMPL	0.084	0.165
250-500 EMPL	0.064	0.402
> 500 EMPL	0.072	0.394
Business performance	0.054	0.268
National market	0.095	0.326
International market	0.193	0.062
Firm on stock exchange	0.018	0.810
More than 5 direct competitors	0.076	0.118
R&D for env. concerns	0.112	0.203
USA	-0.013	0.924
Germany	-0.074	0.567
Japan	0.253	0.047
Norway	0.314	0.045
France	0.020	0.903
Hungary	0.207	0.129
Food, tobacco & beverage	0.056	0.760
Leather, fur & textile	0.035	0.862
Wood & furniture	0.348	0.097
Pulp & paper	0.071	0.708
Coke, chemicals & rubber	0.055	0.761

Non-metallic mineral products	0.237	0.279
Metal	0.092	0.599
Machinery & equipment	-0.113	0.516
Motor vehicles & transport equipment	0.049	0.800
INSPECTION EQUATION		
Constant term	-1.451	0.000
Environmental performance	1.501	0.000
Perceived Policy Stringency	0.497	0.000
Having an EMS	-0.191	0.003
Senior Management	0.044	0.553
EH&S Department	0.107	0.359
Prod/Operations	0.111	0.334
Other Location	0.067	0.427
100-250 EMPL	0.091	0.132
250-500 EMPL	0.095	0.243
> 500 EMPL	0.356	0.000
National market	-0.114	0.208
International market	-0.147	0.141
Firm on stock exchange	-0.149	0.064
USA	0.601	0.001
Germany	0.413	0.001
Hungary	0.453	0.002
Japan	-0.241	0.041
France	-0.331	0.040
Norway	-0.152	0.264
Food, tobacco & beverage	0.267	0.185
Leather, fur & textile	0.122	0.579
Wood & furniture	0.074	0.742
Pulp & paper	0.128	0.533
Coke, chemicals & rubber	0.159	0.415
Non-metallic mineral products	0.379	0.139
Metal	0.187	0.335
Machinery & equipment	0.066	0.727
Motor vehicles & transport equipment	0.209	0.309
RHO(1,2	-0.791	0.000
Number of observations: 3063		
Log likelihood function: -3115.20		

Table A.2. Results of Bivariate Probit Estimation (Air Pollution, Solid Waste, Wastewater)

	AIR POLLUTION		SOLID WASTE		WASTE WATER	
	Coefficient.	P-value	Coefficient.	P-value	Coefficient.	P-value
ACTION EQUATION						
Constant term	-1.523	0.000	-0.638	0.050	-0.942	0.002
Perceived Policy Stringency	0.435	0.000	0.153	0.016	0.199	0.001
Inspection frequency	0.014	0.000	0.007	0.476	0.070	0.000
Performance-based standards	0.297	0.014	0.055	0.664	0.366	0.002
Technology-based standards	0.066	0.515	-0.079	0.493	-0.112	0.314
Emission taxes	0.119	0.395	-0.004	0.976	-0.031	0.815
Input taxes	-0.034	0.816	0.053	0.698	-0.056	0.698
Voluntary agreement	-0.094	0.388	0.092	0.429	-0.117	0.277
Subsidy	0.022	0.877	-0.123	0.413	0.343	0.029
Technical assistance	-0.120	0.348	0.079	0.518	-0.223	0.123
Consumers	0.020	0.871	0.195	0.178	0.182	0.157
Suppliers and buyers	0.048	0.704	0.114	0.442	-0.109	0.399
Financial	0.109	0.303	0.090	0.518	0.190	0.134
Workers	0.080	0.381	0.247	0.050	0.207	0.058
Industry and trade associations	0.198	0.175	-0.013	0.939	-0.190	0.214
NGOs	0.130	0.287	0.045	0.740	0.126	0.321
Written environmental policy	0.075	0.445	0.229	0.010	0.010	0.920
Evaluation of employees	0.090	0.330	0.139	0.253	0.150	0.161
Training	0.191	0.046	0.135	0.148	0.170	0.068
External audit	-0.037	0.666	0.095	0.331	-0.046	0.611
Internal audit	0.029	0.772	0.138	0.157	0.069	0.494
Benchmarking	0.130	0.116	0.247	0.007	0.242	0.007
Accounting	0.111	0.230	0.378	0.000	0.195	0.031
Public environmental report	0.074	0.358	0.254	0.017	0.050	0.572
Environmental performance indicators	0.093	0.280	0.101	0.284	0.095	0.273
Senior Management	0.074	0.471	0.138	0.178	0.227	0.030
EH&S Department	0.175	0.166	-0.058	0.680	0.191	0.129
Prod/Operations	0.113	0.412	0.000	1.000	0.484	0.000
Other location	0.226	0.039	0.052	0.648	0.125	0.250
100-250 EMPL	-0.025	0.760	0.070	0.379	0.028	0.717
250-500 EMPL	0.199	0.038	0.164	0.161	0.148	0.140
> 500 EMPL	0.116	0.265	0.225	0.084	0.241	0.033
Business performance	0.059	0.403	0.218	0.003	0.110	0.130
Head office in foreign country	0.050	0.654	-0.004	0.977	-0.012	0.915
Firm on stock exchange	-0.083	0.392	0.181	0.184	-0.186	0.082
More than 5 direct competitors	-0.043	0.520	-0.008	0.918	0.031	0.647
R&D for env. concerns	0.018	0.878	0.202	0.234	0.031	0.815
USA	0.095	0.577	0.169	0.412	0.092	0.632
Germany	-0.122	0.471	0.108	0.535	-0.179	0.301
Japan	0.385	0.015	0.565	0.001	0.435	0.009
Norway	-0.132	0.484	0.689	0.002	0.285	0.139
France	-0.437	0.033	0.209	0.313	0.269	0.213
Hungary	0.046	0.780	0.161	0.357	-0.173	0.329
Food, tobacco & beverage	0.197	0.391	0.031	0.902	0.637	0.012
Leather, fur & textile	0.489	0.057	0.001	0.998	0.050	0.852
Wood & furniture	0.483	0.056	0.151	0.595	0.055	0.838
Pulp & paper	0.168	0.483	0.205	0.432	0.380	0.132
Coke, chemicals & rubber	0.256	0.249	0.167	0.503	0.125	0.596

Non-metallic mineral products	0.405	0.119	0.390	0.177	0.276	0.303
Metal	0.156	0.476	0.073	0.766	0.266	0.256
Machinery & equipment	0.103	0.638	-0.110	0.649	-0.088	0.702
Motor vehicles & transport equipment	0.323	0.173	-0.044	0.869	0.014	0.954
INSPECTION EQUATION						
Constant term	-1.043	0.002	-1.338	0.000	-1.141	0.001
Negative environmental impact	0.178	0.032	0.102	0.114	0.232	0.001
Perceived Policy Stringency	0.643	0.000	0.690	0.000	0.644	0.000
Having an EMS	-0.059	0.545	-0.097	0.231	-0.014	0.876
Senior Management	0.214	0.049	0.218	0.015	0.166	0.087
EH&S Department	0.369	0.026	0.327	0.013	0.303	0.036
Prod/Operations	0.454	0.010	0.380	0.004	0.391	0.007
Other Location	0.328	0.005	0.294	0.003	0.235	0.026
100-250 EMPL	0.154	0.085	0.159	0.027	0.182	0.020
250-500 EMPL	0.198	0.068	0.210	0.022	0.216	0.027
> 500 EMPL	0.570	0.000	0.595	0.000	0.672	0.000
Business performance	-0.078	0.340	-0.031	0.639	-0.063	0.385
National market	-0.104	0.472	-0.054	0.634	-0.106	0.378
International market	-0.188	0.243	-0.057	0.648	-0.133	0.313
Firm on stock exchange	-0.237	0.029	-0.170	0.069	-0.196	0.051
More than 5 direct competitors	0.059	0.439	0.107	0.093	0.116	0.095
Positive change in sales	0.100	0.243	0.094	0.184	0.142	0.066
USA	0.693	0.001	0.834	0.000	0.772	0.000
Germany	0.532	0.003	0.592	0.000	0.605	0.000
Hungary	0.688	0.001	0.678	0.000	0.781	0.000
Japan	-0.203	0.231	-0.138	0.340	-0.096	0.543
France	-0.359	0.112	-0.351	0.056	-0.434	0.027
Norway	-0.122	0.531	-0.083	0.609	-0.071	0.692
Food, tobacco & beverage	0.408	0.129	0.411	0.082	0.221	0.412
Leather, fur & textile	0.707	0.025	0.279	0.291	0.427	0.163
Wood & furniture	0.451	0.132	0.441	0.104	0.428	0.174
Pulp & paper	0.360	0.195	0.242	0.320	0.093	0.738
Coke, chemicals & rubber	0.262	0.303	0.252	0.269	0.185	0.486
Non-metallic mineral products	0.677	0.042	0.693	0.024	0.574	0.085
Metal	0.264	0.308	0.311	0.174	0.166	0.530
Machinery & equipment	0.086	0.728	0.040	0.857	-0.049	0.851
Motor vehicles & transport equipment	0.397	0.146	0.317	0.191	0.135	0.626
RHO(1,2)	0.158	0.002	0.006	0.906	-0.013	0.807
Number of observations:		2011		2639		2336
Log likelihood function:		-1924.84		-2175.33		-2064.34

[1] Personal Communication from Mr. Koichi Kawano, Japanese Ministry of the Environment.

INCENTIVE FRAMEWORK TO COMPLY WITH REGULATIONS: THE CASE OF THE NETHERLANDS

Angelique A.A. van der Schraaf, Annemiek Roessen, Inspectorate General of the Ministry of Housing, Spatial Planning and the Environment, the Netherlands

1. Summary

In this paper we will illustrate the Dutch Compliance Strategy developed by the Ministry of Housing, Spatial Planning and the Environment. In this strategy, compliance is seen as the behaviour of the regulatee. This compliance behaviour is the central point in all the action the department takes to reach the policy goals: contribution to a safe, healthy and sustainable environment.

A regulatee has certain reasons for responding positively or negatively to regulation. The responses are summarised in the so-called "Table of Eleven", a broadly accepted and used list of reasons for non-compliance in the Netherlands. Therefore: knowledge of compliance behaviour is essential for the ministry "to do the right things", "to do things right" and be accountable. Some examples are given of experiences with the compliance strategy.

2. Compliance as a central factor in the Dutch Compliance Strategy

In 2002, the Ministry of Housing, Spatial Planning and the Environment developed a Compliance Strategy. In 2003, this strategy was approved by the whole department (policy makers and Inspectorate) and since this moment the strategy has been fully implemented. So we now have some two years of experience with the implementation of the Compliance Strategy.

Compliance in the Dutch Compliance Strategy is seen as the behaviour the regulatee shows in responding to regulatory requirements. So the key word is "behaviour". The Ministry makes the behaviour (and the manipulation of the behaviour) of the regulatee the focus point in its compliance strategy.

The strategy can be seen as a way to make compliance transparent and to use newly-developed indicators for several purposes: priority setting (doing the right things), effective enforcement (doing things right), and accountability.

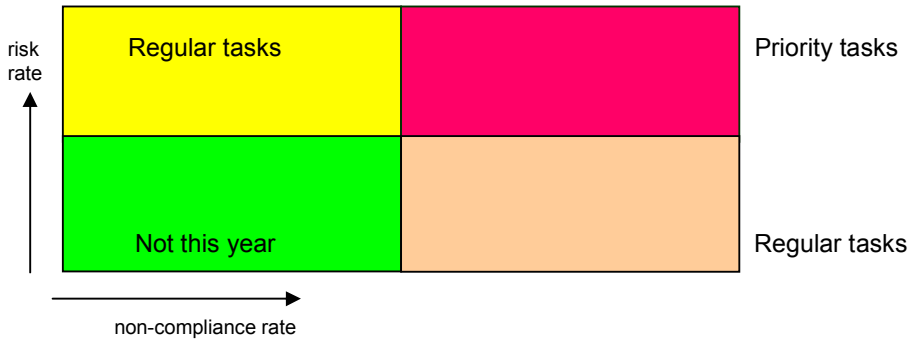
One of the first activities employed within the Compliance Strategy was the identification of all the sets of environmental legislation confined to firms, citizens, and other governmental actors (provinces, municipalities). In the Netherlands there are about 450 sets of legislation that the Inspectorate has to monitor. Some 70% of these regulations concern the environment. To ensure compliance monitoring authorities identified all the regulatees per set of environmental legislation. Furthermore, on this regulatee-level, the present state of risks and compliance behaviour were identified and classified in risk and compliance indicators. The heights of the risk

and compliance indicators were all estimated and are based on expert knowledge (inspectors and policy makers).

The compliance indicator is a measure for non-compliance. The compliance indicators will be used to calculate the compliance efforts the Ministry (and therefore also the Inspectorate) has to make on a yearly basis.

Risk indicators are developed in a similar way: during a number of expert workshops, risks were estimated per piece of environmental legislation per regulatee. These risks were related to the effects on: public health, safety, sustainability and social factors, where the Inspectorate does not enforce compliance.

When the risks and the non-compliance rates are known, the Ministry can prioritise the tasks with the help of the following matrix:



This therefore helps the department to pick the right things and be accountable for the choices it makes. Finally the reasons for non-compliance were identified per set of regulation and per regulatee.

3. Compliance behaviour

A regulatee has certain reasons for responding positive or negative to regulation. The responses to regulation are summarised in the so-called "Table of Eleven", a broadly accepted and used list of reasons for non-compliance in the Netherlands.

The basis of this table is formed by a combination of social, psychological and criminal theories found in literature on compliance behaviour and on practical experience within the field of the maintenance of law and order. The dimensions of the "Table of Eleven" can be seen as behavioural scientific parameters, which can influence compliance behaviour.

"Table of Eleven"
Aspects of spontaneous compliance:
knowledge of the regulation cost / benefit ratio degree of acceptance of the regulation loyalty and obedience of the regulatee informal monitoring
Aspects of monitoring:
informal report probability monitoring probability detection probability selectivity of the inspector
Aspects of sanctions:
Probability of sanctions severity of sanctions

Economic factors are part of the table. One factor that is often named as an important influencing factor is the cost/benefit factor (T 2). Firms complain that it is sometimes very costly to comply. The Ministry takes these complaints seriously: we have developed a programme to reduce the administrative costs. This is a programme within the policy-making part of the ministry. Another economic factor is the severity of the sanctions (T 11). The financial sanction is usually not so high as to make firms alter their compliance behaviour. Often it is more beneficial to violate instead of complying, i.e. the sanction costs are lower than the compliance costs. The regulatee rather takes the risk of detection and sanctioning and a subsequent fine, than invests in pollution reducing activities/materials.

In order to get an impression of the behavioural choices the regulatee makes and the "Table of Eleven", some questions are formulated:

Knowledge of the regulation: the acquaintance with and clarity of the regulation within the regulatee group.

- Does the regulatee know the rules? Is the regulation not too extensive? What should the regulatee do in order to know the regulation?

- Is there a possible doubt (within the regulatee group) about the applicability of the regulation? Does the regulatee understand what is meant by the regulation? Is a certain level of (technical or juridical) expertise necessary to understand the regulation?

Cost / benefit: the financial and material pro's and con's that compliance or non-compliance of the regulation entail in terms of time, money and effort.

Financial:

- How much effort to comply (administrative, physical)? Are there specific advantages due to compliance, e.g. financial incentives?

- Disadvantage of violation: Are there specific (physical) circumstances, that interfere with violation of the regulations (is there a violation threshold)?

- Advantage of violation: does violation of the regulation deliver advantages for the regulatee in terms of time, money?

Immaterial:

- Is compliance (or non-compliance) good for the image or reputation of the regulatee?
- Does compliance or violation of the rules deliver other social pros and cons?

Degree of acceptance of the regulation: the extent to which policy and regulations are acceptable for the regulatee.

- Does the regulatee accept the policy and the derived standards as reasonable? Can the regulatee agree with the underlying policy assumptions or is there a difference in point of view between policy makers and regulatees? Are there other actors (branch organisations or implementation organisations), that can promote compliance? Can the regulatee himself contribute to the policy (self regulation)?

Loyalty and obedience of the regulatee**:** the extent of conformance of the regulatee to the power of government.

- Does the regulatee comply most of the time? Does the regulatee respect government, the law, and the supervisor?
- To what extent do the values of the regulatees conform with the values of government? Does the regulatee have other customs, which compete with the rules?

Informal monitoring: the perceived probability of positive/negative sanctioning of the behaviour by non-governmental actors.

- Does the environment notice non-compliance? Is there a tight bond between the regulatee and his environment? Are there informal monitoring structures? Is there a form of social sanctioning?

Monitoring probability: the probability that an act of non-compliance will be reported to the government.

- Does the environment of a regulatee usually intent to report acts of non-compliance to the government? Doe they know where to report to? Are there means to enlarge the probability of reporting to the government?

Monitoring probability: the perceived probability of monitoring an act of non-compliance.

- How big is the actual probability (monitoring density)? How big does the regulatee think it is? On what issues does the subjective monitoring probability depend?

Detection probability: the perceived probability of detection of the violation when overseen by the supervisor.

How difficult is it to detect the violation? Are violations time- and/or place-bound and therefore more difficult to detect? How difficult is it to follow the violation back to the regulatee? Is it easy to falsify important documents?

Selectivity of the inspector: the (heightened) perceived probability of monitoring and detection due to selection of regulatees (firms, persons, acts, domains).

- Are there more non-compliers detected by random / non-random sampling? Does the regulatee think he is monitored more often than the ones who comply? What are the used methods to track down offences?

Probability of sanctions: The perceived probability of sanctions after detecting an offence.

- How big is the chance that a sanction will be given after detection? How big does the regulatee think it is? Is it hard to prove an offence? Does the regulatee think that the chance of aquittal is high? What about the tolerance strategy of the government?

Severity of sanctions: the height and sort of sanctions and the negative impact of sanctioning.

- Does the regulatee know which sanction can be given when non-complying? Does he think it will be high (long imprisonment, high penalty, much effort to undo the loss)? Does the sanction take the financial situation of the offender into account? How fast will the sanction be implemented? Is there a "name-and-shame" policy?

- Is the fact that one is prosecuted more important than the actual sanction? Are there other impacts at stake when sanctioned (loss of reputation, image, etc.)?

4. Interventions

In order to do things right, the reasons for non-compliance have to be taken into account. Within the Ministry it has been decided that the policy makers will tackle interventions on the dimension of spontaneous compliance; and the Inspectorate will tackle the monitoring- and sanction dimensions. Per reason for non-compliance an intervention mix can be generated to make the regulatee comply as meant by the regulations. This leads to a general intervention strategy.

Of course before intervening the context factors have to be taken into account: what is the type of firm? What is the financial status of the firm? What investments have already been made in order to comply? What is the history of the firm: does it have a large history of regular non-compliance or is this the first time of non-compliance? Is there a compliance pattern detectable within the whole branch? (See also the questions following each non-compliance dimension.)

This will lead to a tailor-made "smart" intervention strategy, with a mix of quite a number of (possible) intervention tools:

- Policy interventions;

- Policy development (new regulation, cost reduction programmes, etc.);

- Communication;

- Prevention;

- Compliance assistance;

- Deterrence;
- Enforcement: administrative, criminal and civil;
- Feedback to the minister and parliament (annual report of the Inspectorate).

At this moment we are busy defining possible sets of interventions per each reason for non-compliance. This is a way of working – by transforming the focus of the regulatee to the work of policy makers and inspectors - which is quite new and attractive.

COMBINING LEGAL MANDATES WITH ECONOMICS IN THE APPLICATION OF ENVIRONMENTAL LAW

Phyllis P. Harris, Principal Deputy Assistant Administrator, Office of Enforcement and Compliance Assurance, United States Environmental Protection Agency

I. Introduction

It is an honour and a pleasure to be here to talk with this distinguished international audience about the application or enforcement of environmental laws in the United States. I have served as the United States Environmental Protection Agency's number-two enforcement official since 2001. I am a lawyer by profession; I am not an economist. I am also a Co-Chair of the International Network for Environmental Compliance and Enforcement (INECE).

To begin, I will briefly describe the environmental enforcement challenges we have faced in the United States. Americans are very independent, individualistic, and motivated to succeed economically. After World War II, the U.S. was rapidly developing as a nation, as production and growth boomed, with few environmental controls or laws. By 1970, pollution in the U.S. became unacceptable. Many states became pollution havens, competing with each other in a "race to the bottom" by relaxing environmental controls to attract business investment and jobs. Today, in or among many nations of the world, is the possibility of the same type of economic competition that could lead to environmental destruction or pollution havens because of efforts to increase economic growth by weakening environmental protection.

In the United States, this economic competition and resulting environmental degradation resulted in the creation of the United States Environmental Protection Agency (EPA) in 1970. Since then, in the world's biggest economy, the EPA has been able to control pollution while at the same time allow our industries to be economically competitive in a global economy. Likewise, nations across the globe are privatising, democratizing, transitioning, and rapidly developing. In many respects, the U.S. is a microcosm of all of these characteristics. Science and technology are key to solving or improving most environmental problems. Knowledge is also widely shared as to what makes good environmental law. Many nations, however, lack the political will to enforce environmental laws. This lack of will arises from the perceived conflict between economic goals and the desire to protect the environment.

At the EPA, our experience since 1970 has been that strong environmental protection has helped, not hurt, the U.S. economy. We do not see the economy and the environment as being in conflict; in our view they are mutually supporting so that both can improve together. Our economic goal is a level playing field with competition that is fair and in no way distorted by environmental degradation or destruction. We design environmental standards and controls to assure that profits do not come from damaging the environment. Our environmental standards are developed to be both technically and economically feasible. Our standards are legal requirements, not voluntary or optional.

Responsibility for successful enforcement of environmental standards is in my office within the EPA, the Office of Enforcement and Compliance Assurance. In the enforcement of our environmental laws, we follow a philosophy of "Smart Enforcement", which is using the most appropriate tools to address the most significant problems to achieve the best outcomes. We also build in human economic motivators. As a result, we have made good progress toward including economic incentives within the effective enforcement of the law.

I will talk with you today about pollution control, which I think we handle very effectively in the United States. I will describe how the EPA uses sound economic approaches by applying the "polluter pays principle". We see this linkage of law and economics as a key ingredient of our success in enforcing environmental law, and we recommend this approach to any nation.

II. Economics and Making the Violator Pay

In the U.S., Congress created command and control statutory mandates that define prohibited acts and prescribe penalties. To execute this statutory intent, our core enforcement program has strategically focused on the "outlaws" or violators of environmental laws. The EPA applies these laws with well-known rigor that creates the cognisance in the regulated community that violations are likely to be detected and followed by an enforcement response that imposes a heavy penalty or sanction. By making it unprofitable to fail to comply immediately, the government is able to get prompt, voluntary conformity or compliance from most companies. The rest we punish, deter, or dissuade.

Our U.S. approach of large penalties, and sometimes imprisonment, may seem excessive today in countries where there is consideration of using economic instruments as the best way to encourage environmental compliance. Some countries enjoy a culture of greater cooperation, respect for government, and voluntary adherence to green values and laws. But in many parts of the world there is great poverty, corruption, and chaos, for which only a very strong hand of government can exert any control. As a result, based on the experience of the U.S., it may be necessary to be very strong in command and control applications of economics-based enforcement instruments.

The goal of a pollution control economic policy instrument is to minimize unwanted "externalities" by having enterprises internalise all costs including pollution control in product pricing. Because the EPA is well known to be an effective enforcer, most regulated enterprises choose to pay for effective pollution control and do achieve compliance. As a result, fear of EPA enforcement is an important motivator for compliance. Whatever other motivation may be present, a small governmental expenditure on dissuasion or deterrence produces a huge investment in pollution control. In this way, the permitted and lawful polluter internalises the cost of pollution control.

For violators, we make sure that the costs to be internalised and paid are even higher. In a limited way, we have done this under some of our laws that require the clean up of sites and natural resources damaged by the release or improper disposal of hazardous wastes and substances. In an ideal or theoretical world, we would always price the natural resources – including air and water – damaged. But in most pollution control enforcement cases, it is neither necessary nor possible for the EPA to price either the value of the natural resources damaged, or the cost of their clean-up or restoration. Usually, violations of our laws do not involve catastrophic spills. Most violations result from routine operational mismanagement and every-day illegal pollution from chimneys, stacks, and pipes from factories and other plant facilities.

Indeed, it is very important to our overall success that EPA laws are applied early and preventively, usually before there is measurable natural resource damage or harm to public health.

For the EPA enforcement program, it is enough just to prove that the violating source discharged, emitted, or released more pollutants to the environment than permitted or to prove that the facility operated outside of the law. Our source-based controls typically define the allowed parts per million or smaller for each chemical, and it is a violation to allow anything more to leave the chimney, stack or pipe. It is precisely because the EPA neither uses ambient controls nor tries to measure environmental damage, but relies on source-based controls, that it has become possible for the EPA to prove most routine violations. We do not have to prove the cost of the environmental damage or wrongful externalities. We look elsewhere. A starting point is the maximum penalty set by law; it provides the upper limit of the penalty amount. Under the typical EPA statute, each day of exceedance for each controlled chemical is a separate violation, and each day of violation may be penalized up to as much as $32 500 per day.

Violations continuing over a period of time or for multiple pollutants can quickly reach tens or hundreds of millions of dollars. By referring to that maximum penalty, the EPA quickly gets the attention of a violator.

The maximum penalty available by law often has little rational relationship to the facts and to economics. The EPA's goal is not to use the highest possible penalties to cause unemployment by closing enterprises, but to keep enterprises open provided they operate in compliance. Assuming that a violating enterprise wants to remain open, the EPA first requires the installation of all required pollution control equipment. Then, the EPA takes the following three steps to provide economic incentives to violators:

1. Assessing "Compensatory" Penalty Component to Recover the Economic Benefit of Non-compliance: In this penalty calculation, the EPA applies a very effective "economic instrument" by which "the polluting violator pays". In this regard, the EPA's economic goal is to level the economic playing field in the enterprise sector of which the violator is a member. The EPA sets the monetary penalty at a level that recovers, from the violator, the full "economic benefit of non-compliance," to recapture the violator's wrongful cost savings from not controlling pollution, and from undercutting non-polluting competitors. If this was not corrected, polluters would drive out compliers, and ultimately only lawbreakers would remain operating. To eliminate this unfair economic advantage, the EPA calculates the wrongful savings by the violator as this "compensatory" element of the penalty. "BEN" is the name of the EPA's model (http://www.epa.gov/oeca/datasys/dsm2.html) used to calculate the present value of the violator's failure to buy, install, and operate pollution-control technology. Because a violator should not be permitted to realize any illicit economic gain from a violation, this amount is almost always recovered and usually is not reduced in negotiations. EPA economists have testified in court in support of the efficacy of BEN calculations, and judges have regularly upheld EPA's penalty assessment method as principled and fair, and based on sound economics. BEN is a huge success for us.

2. Adding the "Punitive" Component of the Penalty: BEN is only the beginning. We have found that if all an enterprise has to do is pay a penalty to restore the level playing field, most will just wait until they are caught. Instead, to create a reason for business to comply voluntarily and to deter others from not complying with the law, the EPA increases the monetary penalty by

the punitive – what we call "gravity based" – element of the penalty. This is adjusted upward by considering factors such as the extent of departure from required behaviour and whether there was the potential or actuality of environmental harm. At this point, if we have any information as to the value of the natural resources damaged, this may be considered not as a matter of economic compensation but as justification for an additional penalty that is a punishment. Finally, we may also adjust penalties downward in consideration of the defendant's cooperation and lack of prior offences.

3. Reducing Penalties by the Value of Voluntary Work to Go Beyond Compliance: Beginning in 1991, the EPA began developing ways to reduce payment as punishment and to do more to encourage environmentally desirable behaviour, while still using our traditionally tough enforcement processes and large penalty assessments. We now may agree to reduce the punitive component of the final penalty assessment by the amount paid by the violator for certain extraordinary actions that the violator agrees to take to protect the environment or to assure future good behaviour. These refinements by EPA policy have been well received by the public and by companies found in violation. As a result, the EPA now has "carrots to accompany the stick" These "carrots" encourage the right behaviour, as well as benefit the environment and, in many instances, those communities that have been impacted by violator's actions.

Supplemental Environmental Projects (SEPs) are actions that qualify for such a penalty reduction. These must: (1) be in addition to required compliance with the EPA's end-of-pipe or stack pollution control requirements; (2) "go beyond compliance" with the EPA's pollution control requirements, and thus be extraordinary projects that are even more protective of the environment than is legally required; and (3) cost no less than the amount of the penalty mitigated. The EPA will not reduce its penalty more than the amount of the violator's expenditure on a SEP. Because a violator should not be permitted to realize any economic gain from a violation, the economic benefit component of the penalty is always recovered and not mitigated. Penalty reductions for SEPs may only apply to reduce the punitive penalty and usually at least some penalty must be paid so that no violation is "free".

Some types of SEPs are: (1) production process (source reduction, waste minimization) changes to prevent pollution (not just control it); (2) environmental restoration or clean-up activities upstream, where others caused contamination, or of damage not caused by the violation; and (3) community emergency planning and preparedness assistance, such as providing hazardous materials control equipment or training to local governments that must respond to pollution emergencies. To calculate the cost of the SEP on economic principles, we use a computerized economic model.

The EPA's Enforcement Policies on Environmental Auditing: In the U.S., permitted polluters must self-monitor pollution control performance and report certain self-monitoring results. Beyond this, there is no legal requirement for companies to conduct comprehensive self-audits or to develop environmental management systems. The EPA welcomes the activities of the industry-based International Standards Organization (ISO) that encourage environmental audits or environmental management systems (EMS).

However, because the ISO 14000 program does not address compliance *per se*, it does not fulfil EPA legal requirements. So, the EPA by policy incorporated environmental auditing firmly within the enforcement process, an achievement that we believe to be highly significant and perhaps unique. Starting in 1986, a violator's voluntary agreement to do an environmental audit

may be the basis for a substantial reduction in the punitive portion of its EPA penalty assessment. Additional penalty reductions may be given to government agencies or non-profit organizations that are violators, provided they use their money to come into compliance and stay there. Also, small enterprises in violation now may receive total penalty credit and pay no penalty if they agree to perform continuous environmental self-audits to report and correct violations. The EPA invites violators to "voluntarily" conduct an audit (which the EPA cannot legally require), rather like a voluntary Supplemental Environmental Project that the government will reward in the same way. It is the EPA's reputation for tough enforcement that has greatly increased the use of auditing. A 1995 survey showed that in the U.S. more than 90% of the responding enterprises that conducted environmental audits did so to find and correct environmental violations before they were found by government inspectors and punished. While the cost of the audit is credited to reduce the penalty, the cost of correcting or achieving compliance based upon the audit's findings – which by law must be done anyway – is not credited.

Even where the EPA has not identified a violation, the EPA's audit policy encourages companies to discover violations and disclose them to the EPA. This must be done in a way that is systematic, prompt and independent. The company must agree to correct and remedy harm, prevent recurrence, make information publicly available and cooperate with regulators. The EPA reserves, for the government, the right to protect the public health and the environment in cases of serious violation. The EPA's audit policy does not excuse and does not apply where there are repeated violations or there is a pattern of violations, imminent or substantial endangerment or serious actual harm, criminal conduct, or substantial economic benefit from non-compliance. There is no total amnesty.

Environmental Auditing in Relationship to Criminal Cases: Where a criminal case is filed, for many years it has also been the policy of national prosecutors and many national judges to encourage environmental auditing. A guilty environmental offender may receive a reduced sentence where there was already in effect a good faith environmental auditing or compliance program. Similarly, an offender can expect some leniency when, reasonably promptly after becoming aware of the crime, the offender reports it to government authorities, cooperates, and accepts responsibility. Also, when sentencing an environmental offender, leniency may be shown to the offender who agrees to begin an effective environmental auditing program to prevent and detect future violations. In this way, criminal punishment, like civil penalties, is reduced to encourage and reward environmental auditing.

The EPA by policy will not initiate criminal cases against companies that voluntarily and promptly disclose and correct violations and meet the specific conditions of the audit policy. But where an enterprise or its employees ignore audit reports of violations, are wilfully blind to violations or conceal or condone continuing non-compliance, any audit report may become what we call a "smoking gun" or strong evidence of guilt. Then, the audit report may be evidence of knowledge of violations, intent to continue to violate, and thus actual criminal behaviour of the most serious kind.

III. Case Studies

Now I will illustrate these principles with two examples of U.S. cases. Usually the EPA files a formal complaint with a court or administrative judge to begin the enforcement action based on violations. Civil court proceedings and administrative cases seek monetary penalties paid to the U.S. Treasury, and a court order, if needed, to stop an illegal or dangerous activity, or to

require a clean up. The filed complaint brings industry lawyers to the table to negotiate with the government over the resolution of the problems. Because the EPA collects good evidence of violations, most cases are settled without trial.

Civil Case Example: The "Petroleum Refinery Initiative," is one of the most successful enforcement initiatives undertaken by the EPA (http://www.epa.gov/compliance/civil/programs/caa/oil/index.html). This initiative illustrates how "global" agreements (addressing major sources of pollutants at all of an enterprise's refineries at once) in a specific sector are economically feasible while improving environmental performance. Since 2000, the EPA has entered into settlements for environmental compliance with petroleum refining companies that control approximately 40 per cent of the nation's refining capacity in more than 20 of our 50 states. Negotiations are continuing with refiners representing another 40 per cent of the nation's refining capacity. Taken as a whole, these settlements will (based on the settling companies' estimates) result in a reduction of atmospheric emissions of nearly 45 000 tons of nitrogen oxide, more than 95 000 tons of sulphur dioxide, and large reductions of benzene, volatile organic compounds and particulate matter. The companies agreed to invest nearly $2 billion in control technologies, pay civil penalties of $36.8 million, and perform Supplemental Environmental Projects valued at approximately $25 million. One SEP was the donation of an island for a county park, another to install pollution controls on public school buses.

The Petroleum Refinery Initiative applied an innovative, enterprise-wide approach, addressing major sources of pollutants at all of an enterprise's refineries at once, rather than taking a traditional facility-by-facility, violation-by-violation enforcement path. This approach enabled the EPA and refining companies to efficiently and quickly address many environmental problems presented by this large and complex industrial sector.

By agreeing to address pollution problems on a coordinated, enterprise-wide basis, settling refiners were able to receive the first refinery-wide emission caps negotiated in a consent decree. By avoiding a chimney-by-chimney regulatory approach, these plant-wide caps enhance a refiner's flexibility for producing fuels. These caps are expected to help eliminate production problems that could limit fuel supplies and raise prices, to improve plant efficiency, and to significantly reduce emissions. The refineries also agreed to use the most modern control technologies. For example, detection and repair of leaking equipment and benzene waste will be controlled by measures exceeding what is required by national law. Moreover, in some instances, as permitted by law, settling refineries are partnering to develop new and better control technology.

These cases illustrate that there is almost always some penalty money paid to the government, even when a company eventually cooperates. The U.S. approach to environmental enforcement which includes payment of penalties, is a strong deterrent to future violations. Without penalties, even for the first violation, most companies would not comply until they are caught. Moreover, the government does not have the resources to prosecute all of those companies who are out of compliance. Therefore, the EPA almost always imposes a cash penalty. We find that this creates an atmosphere in which people will chose to comply because they are "deterred" from committing violations, and because they believe that our system is fair. We estimate that in the U.S. the rate of compliance with EPA requirements is between 80% and 95% in various programs.

Criminal case example: In criminal cases, the government seeks prison time for individuals who commit environmental crimes. In the U.S., while we have been developing economic incentives to encourage compliance, simultaneously we have strengthened our means to compel it using forms of dissuasion exceeding what can be achieved by economics and monetary penalties. Today, we have a national force of about 225 EPA pollution control police officers. They increase the stakes for industry. Sending to prison those managers and workers who pollute intentionally is very popular with the American people, who regard environmental crime as unacceptable behaviour.

For example, treatment as criminals is both appropriate and necessary for international businesses that smuggle chlorofluorocarbons (CFCs). Within the U.S. the market for illegal CFCs is as profitable to smugglers as illegal narcotic drugs. The EPA's national environmental police, together with customs and revenue police find these criminals and bring them to our Department of Justice for prosecution.

The case of AGA International Corporation and Barry Himes is one of many in the U.S. against smugglers who would undercut the Montreal Protocol on Substances that Deplete the Ozone Layer. Mr. Himes imported CFCs from Russia and China that were shipped through Canada into the U.S. Between 1996 and 1998, more than one million pounds of CFCs were imported illegally, falsely described as recycled. The criminals used various shell companies and offshore bank accounts in the Bahamas and Antigua to conceal their control of these transactions in order to defeat efforts by tax authorities to collect the substantial excise tax that the U.S. imposed to promote the use of ozone-friendly replacement products.

Himes was charged as a criminal and pled guilty in a national court. In January 2003, he was sentenced to six and a half years in prison and ordered to pay $1.8 million in restitution and a fine of $12 500. Mr. Himes had previously forfeited to the government more than $3 million in property including an expensive home, car and jewellery. His principal colleague was sentenced to a term of four years in prison and ordered to pay $1.2 million in restitution. Ten other people pled guilty and each received an average of one and half years in prison.

This criminal case illustrates that sometimes deterrence fails. To an economist, it may seem crude or incorrect to say that such command and control enforcement illustrates the application of an economic instrument. To this I can only answer that surely criminal polluters “pay” dearly when they receive such sentences. A major advantage to society of having the criminal proceedings and penalties available is that this tool produces so great a deterrent effect that usually it seldom has to be used.

As economists observe, good information is essential to making rational choices. For this reason, the EPA regularly issues announcements regarding significant enforcement case filings and conclusions. We are very transparent, even making available on the Internet the compliance records of violators. From anywhere in the world, you can visit our Internet site to see if an enterprise operating in the U.S. has performed within the law or is in violation (http://www.epa.gov/echo). If a violating enterprise is coming to your nation, we want you to know, so that you may consider imposing special permit conditions and surveillance.

IV. Conclusion

I conclude by thanking you for this opportunity to describe how, in the U.S., we use sound economic approaches to apply the "polluter pays principle". Today the EPA achieves very high compliance rates without being unduly punitive and usually without closing enterprises or causing unemployment. We see this linkage of law and economics as a key ingredient in our success in the U.S., and we recommend this approach to any nation that would effectively enforce its environmental law.

As I close, I want to emphasize that the United States Environmental Protection Agency wants to cooperate with all nations seeking better environmental enforcement. We readily collaborate with all like-minded nations that ask our help to improve their domestic environmental enforcement capacity, and nations that want to develop cases against international environmental criminals. Please consider the EPA as a potential partner in this effort.

I appreciate this opportunity to come to talk with you today and for your attention. When the moderator wishes, I will entertain any questions or comments. I welcome meeting separately with any of you who might wish to discuss how we may help or work together.

Thank you.

SOME NOTES ON "OPTIMISING ENFORCEMENT"

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1. Introduction – Two Dimensions

As the stringency of environmental regulations in most countries has increased over the past two to three decades so, correspondingly, has the incentive for non-compliance and the need to enforce. Not surprisingly, theoretical and applied analysis of the problem has burgeoned. Heyes (2000, *Journal of Regulatory Economics* 17[2]: 107-129) provides a comparatively recent survey of much of this work.

It is obvious that enforcement issues matter in designing and appraising any regulatory regime. Importantly the two should articulate. The approach taken to enforce will be sensitive to the substance of the regulation, but equally the choice and design of regulatory instrument should anticipate and take account of the need to implement.

Policy analysts and practitioners have invested substantial effort in determining how enforcement programs can be designed and managed to ensure "optimal" outcomes.

Of course, in different contexts there will be a different answer to the question "optimisation of what?" Different regulatory agencies have different mandates and objectives, and will differ in the extent to which enforcement activities are delegated to an autonomous or quasi-autonomous entity. Reasonable objectives include:

- Maximizing environmental protection subject to a regulatory budget constraint;
- Achieving a pre-specified environmental objective at least cost;
- Maximizing environmental protection subject to a regulatory budget plus compliance cost constraint;
- Maximizing social welfare: taking account of the environmental benefits of enforcement action as well as the compliance and agency costs

The first two focus on the role of the enforcement agency in enforcement, the third and fourth give it a broader social role, encouraging it to take account of the broader social burdens of regulation. The primary difference amongst objectives is in the weight given to the compliance cost burdens borne by the regulated industry. Secondary objectives might include considerations such as equity.

In evaluating any enforcement program, in the environmental regulatory setting or any other, we can usefully divide issues into two distinct categories:

- Anatomy;

- Calibration.

The first incorporates those qualitative elements of an enforcement and compliance regime that constitute the program's "anatomical" structure. Does the program incorporate self-reporting by regulated parties? Are criminal as well as administrative penalties in play? Do private individuals or organizations have a role in the enforcement process (as under the Private Attorney's General (PAG) allowances in the United States)? Is inspection activity random, or triggered by complaints from the public, or the results of "precursor" evidence?

The second takes the anatomical structure as given and concentrates on quantitative aspects. If, for example, complaints trigger inspection, how is that trigger set? How many complaints, or complaints of what sort, are needed to induce action?

2. Calibration of a Regime

If one objective is to maximise the effective environmental protection delivered by a given regulatory budget (cost-effectiveness), then the principle of diminishing marginal productivity implies that an efficient allocation of resource – budget, personnel, *etc.* – will equate the marginal impact of resource employed in each different activity.

If the marginal productivity of resource spent on activity "x" exceeds that of the marginal productivity of resource spent on activity "y" then the overall cost-effectiveness of the regime would likely be enhanced by a reallocation of some resource from activity "y" to "x". Whilst there may be transition costs, and internal political barriers, to such redeployment – a field chemist cannot simply be reassigned to legal counsel duties - an aim of robust and reflective practice in resource allocation should be to prevent significant disparities in output returns on different sorts of activity sustaining in the long-term.

A number of empirical analyses allow the marginal impacts of alternative agency activities upon population compliance rates to be uncovered. The preponderance draws on North American examples, and very little work exists in the context of developing or transition economies.

Nadeau (1997, *Journal of Environmental Economics and Management* 34[1]: 54-78), for example, provides a high-quality econometric example based on water and air pollution control at the United States EPA. Treating non-compliance as something of endogenous length – rather than a momentary occurrence – he uses parametric survival techniques to estimate the impact of changes in the intensity of alternative activities, in particular monitoring and enforcement activity. He found that a 10% increase in EPA monitoring activity leads to a 0.6-4.2% reduction in the time firms spend in violation, whereas the same increase in enforcement activity results in a 4-4.7% reduction. It would be straight-forward to convert these into the marginal impact of alternative forms of spending in dollar terms.

3. Targeting Inspection and Enforcement

When the budget available to the enforcement agency is limited, and not all polluters can be visited, inspection and enforcement effort must be targeted.

3.1. Targeting on the Basis of Observables

The most obvious basis for targeting is on the basis of observable, intrinsic characteristics of the polluter, i.e. "profiling".

The rationale for such targeting is that the probability that sources will be non-compliant, or will respond differently to enforcement effort, differ systematically according to the profile. Underlying any targeting, then, must be some analysis either explicitly econometric, or more casual, based on "hunches" of inspectorate staff or rules of thumb – of a compliance function, mapping firm characteristics into probability of non-compliance.

The estimation of such compliance functions is part of the "bread and butter" of econometricians working in this field. Gray and Deily (1996, *Journal of Environmental Economics & Management* 31[1]: 96-111), for example use air pollution data from the US steel industry to estimate plant-level compliance. The authors use state-of–the art techniques, and provide excellent discussion of many of the difficult econometric issues that arise in work of this type. In terms of their results, they find that observable firm-specific characteristics have comparatively little impact on compliance decisions. Neither firm size, diversification, nor gross cash-flow turned out to be significant.

They do find evidence of a "residual corporate attitude towards compliance" even after controlling for plant and firm characteristics. This is consistent with the view of, for example, Dimento (1996, *They Treated Me Like a Criminal*, Pittsburgh University Press) that the idiosyncrasies and personalities of senior staff matter in determining a firm's compliance attitude.

Other studies of this sort include Rousseau (2004, *Selecting Environmental Policy Instruments in the Presence of Incomplete Enforcement*, PhD Dissertation Katholieke Universiteit Leuven), Laplante and Rilstone (1996, *Journal of Environmental Economics & Management* 31[1]: 19-36) and – in the context of a less developed country – Mani, Pargal and Huq (1997, Inspections and Emissions in India: Puzzling Survey Evidence About Industrial Pollution, World Bank Policy Research Working Paper #1810). Heyes (2000, *Journal of Regulatory Economics* 17[2]: 107-129) provides a more exhaustive and critical survey.

A serious issue that arises in adopting previously-estimated compliance functions for practical purposes is the so-called "Lucas Critique". Where a firms observable characteristics can be manipulated – say by the adoption of an environmental management system (EMS) – then past evidence that firms with EMSs exhibit higher levels of compliance can breakdown if that fact is used to target enforcement effort. In particular, in that example, if the agency decides to lessen scrutiny of firms with EMSs then firms with particularly poor performance expectations will be particularly likely to adopt (possibly bogus) systems, reversing the correlation.

3.2. Targeting on the Basis of Past Performance and Performance in Other Domains

There has been extensive academic interest in recent years in the most effective way of targeting inspection and enforcement effort on the basis of the past compliance/inspection history of firms.

The basic model implicitly assumes that the enforcement agency and firm: (a) interact only once, and (b) interact in only one context. Neither of these is realistic.

- Repeated playing of the enforcement-compliance game provides scope for the behaviour of one or both players in any given "play" to be sensitive to previous actions and/or outcomes;

- A variety of papers in the "straight" law and economics literature model the treatment of repeat offenders. More sophisticated attempts have been made to use Markov models to characterise optimal state-dependent enforcement strategies when penalties are restricted, and these are likely to be particularly applicable in regulatory enforcement settings. Such regimes typically involve some degree of "forgiveness" and are able to accommodate occasional type I monitoring errors.

The seminal ideas of Greenberg (1984, *Journal of Economic Theory* 32[1]: 1-13) and Landsberger and Meilijson (1982, *Journal of Public Economics* 19[3]: 333-352) are adapted to the context of pollution enforcement by Harrington (1988, *Journal of Public Economics* 37[1]: 29-53).

In a repeated, binary enforcement/compliance game with restricted penalties the EPA maximises the rate of steady-state compliance, it can be shown, by operating a state-dependent enforcement regime. In the simplest case, the agency groups sources according to recent inspection history - Group 1 containing firms found to be compliant at last inspection, Group 2 those found to be non-compliant - and levies no penalty upon a Group 1 firm caught violating but a maximal penalty upon a Group 2 firm caught likewise. In equilibrium a representative firm can be induced to comply a significant fraction of the time (whenever they find themselves in Group 2) despite penalties never being levied.

The model can be used to "explain" the paradox with which Harrington opens his paper, namely that despite the fact that: (i) when the USEPA observes violations it often (almost always) chooses not to pursue the violator and, (ii) the expected penalty faced by a violator who is pursued is small compared to the cost of compliance. It is still the case that, (iii) firms comply most of the time. Such (apparent) over-compliance has been observed in a variety of contexts by a number of authors. Harrington provides evidence of these and other stylised facts on pages 29-32, especially Table 1 and surrounding discussion. To take a typical example - Connecticut - from that table, over the sampling period including 800 known violations cases where Notices of Violations (NOV's) were issued in an average year, penalties were assessed in only 21 cases, and the average penalty in those cases was a meagre $221.

A firm can be induced to comply some of the time even though the limit on penalties is such that if all violations were penalised with certainty it would never do so. The (crude) state-dependent regime described generates "penalty leverage". When in Group 2 a source's incentive to comply is not just the maximal penalty that it avoids, but also the present value of reinstatement to Group 1 and the laxer treatment that entails in the next period. The optimal (compliance-maximising) state-dependent policy can be characterised by refining the crude regime described here to allow for differential rates of random inspection amongst Group 1 and Group 2 firms, and by making reinstatement to Group 1 less-than-automatic.

Empirical attempt to "fit" Harrington-type state dependent enforcement models to real world settings include Eckert (2004, *Journal of Environmental Economics & Management* 47[2]: 232-259) in the context of leakage from petroleum storage sites in Alberta, Canada.

Heyes and Rickman (1999, *Journal of Public Economics* 72[3]: 361-78) provide a cross-sectional analogue to Harrington's model - consistent with the same set of stylised facts that

motivated Harrington - in which an enforcement agency exploits issue-linkage opportunities. This formalises and provides a framework within which to think analytically about the sort of "horse-trading" that inevitably goes on between enforcement agencies and polluting firms.

The underlying assumption driving their results is that the EPA typically interacts with a particular firm in more than one enforcement "domain". This is realistic. It may be that the agency enforces the same rule at more than one plant of a multi-plant firm, or in more than one geographical area in which the firm operates. It may, equally, enforce several different sets of regulations - those regarding airborne emissions, waterborne discharges, noise. In that case, when penalties do not permit full compliance to be achieved, the EPA may be able to improve upon the population compliance rate achieved by a policy of full pursuit (penalising all violations with certainty) by engaging in "regulatory dealing". A regulatory deal involves agreeing (perhaps tacitly) to tolerate non-compliance in some sub-set of domains in "exchange" for compliance in others.

Consider a two-domain world in which the periodic cost of (binary) compliance by firm "X" is 15 in each domain, and the maximum penalty for violation in a domain is 10. It is then apparent that a regime that detects and penalises every violation will induce a zero rate of compliance. The firm's decision problem is separable by domain, and in each domain it will violate. When offered a deal (which amounts to, in words, "comply in one domain in exchange for us turning a blind-eye to violation in the other") the firm accepts $15 < 20$ - saving penalty in both regimes in exchange for compliance in one - increasing its global rate of compliance from zero to 50%. If every firm was like this firm then a compliance-maximising policy (characterised, as it would be, by dealing) would yield substantial compliance (50%) despite penalties never actually being levied. An external observer would calculate the expected benefit to compliance to be zero and so find the firms behaviour paradoxical in the sense of Harrington.

4. Some Things to Think About

Available time here precludes anything more than a cursory outline of some of the issues involved in the optimisation of any enforcement/compliance program. The discussion inevitably misses more of the issues than it hits, and asks more questions than it answers. Among some of the remaining issues that are ripe for serious thought are:

- **Regulatory style:** How far does the "style" of enforcement programs matter?
- **Unconventional penalties:** To what extent can criminalization, corporate "naming and shaming", or placing liability for wrongdoing on individuals rather than organizations, sharpen compliance incentives?
- **Community Pressure:** To what extent can community (local residents, investors, employees) pressure sharpen incentives for environmentally responsible behaviour, and how can that be "managed" by regulators?
- **NGO involvement:** To what extent is it sensible and effective to empower/encourage green NGO's to become pro-active in regulatory enforcement?

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OPTIMIZING COMPLIANCE MONITORING AND ENFORCEMENT: JAPANESE EXPERIENCE IN WATER POLLUTION CONTROL

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1. Introduction

This paper presents the Japanese experience in optimising compliance monitoring and enforcement of water pollution control. This experience had two outstanding features: the initial failure in taking proactive measures to prevent damages and the later success in enforcing strict regulations based on laws and local initiatives.

Japan's conspicuously high economic growth began in the mid-1950s and the expanded industrial production caused severe air and water pollution problems in the 1960s. The environmental laws and standards to control polluting industrial activities were established during the late 1960s and early 1970s. However, the delay in the response caused widespread damage to human health and the ecosystem, including Minamata disease and Yokkaichi asthma, which are among the most tragic episodes known. Faced with such severe damage, the national government laid out environmental laws and regulations, which were strictly enforced and backed by public support. The Environment Agency (now the Ministry of the Environment), created in 1971, worked towards the formulation of national environmental policies, while the enforcement of national laws and standards was delegated to local governments. Local governments, i.e. prefectures and municipalities, were authorized to set more stringent standards than the national uniform standards and conduct environmental inspections and monitoring according to national laws. They improved institutional and technical capacity for enforcing environmental laws and regulation by increasing the number of technical officials in charge of pollution control, as well as creating environmental research institutes and automated environmental monitoring networks. They also developed a unique voluntary approach based on pollution control agreements (PCAs) between local government and industry.

After passing through the turmoil of combating industrial pollution, the country entered a new realm of environmental management in the 1980s. The once serious industrial pollution had been successfully controlled and there were significant improvements in the overall environmental quality. Major pollution sources shifted from factories to households, i.e. from point sources to non-point sources. Countries were requested to implement new measures to cope with global environmental issues such as climate change. Command and control approaches which were effective for industrial pollution control proved to be neither necessarily effective, nor efficient in the new realm. The Basic Law for Pollution Control of 1967 that framed all environmental control measures in Japan was replaced by the Basic Environmental Law of 1993. The new Basic Law expanded the scope of environmental policy in order to respond to new environmental challenges, and encouraged the participation and collaboration of all stakeholders.

2. *Water Pollution Control in Japan*

2.1 Background

Japan is made up of many islands that have long and complex coastlines with many peninsulas and bays. Its land is mountainous and rivers are generally short with many rapids. The average yearly rainfall is about 1 700 mm, roughly twice the worldwide yearly average. Most rainfall is concentrated in the typhoon and rainy seasons. The population is concentrated in the coastal areas, especially in the Pacific Belt Area extending from Tokyo to the northern part of Kyushu Island, which includes many large cities such as Chiba, Tokyo, Yokohama, Kawasaki, Nagoya, Kyoto, Osaka, Kobe, Hiroshima, Kitakyushu, and Fukuoka. Agglomerations of heavy industries and population in this area have caused water pollution in Tokyo Bay, Ise Bay, and Seto Inland Sea, all of which are semi-closed. Moreover, lakes and reservoirs, which are important sources of drinking water, suffer from water pollution due to non-point sources.

In Japan, local affairs are conducted at two different levels of government: prefectural and municipal. The country has 47 prefectures and more than 3 000 municipalities. Prefectural governors and mayors are all elected by direct election. All prefectures and municipalities have autonomous power in conformity with national laws. Prefectures provide guidance to municipalities, but national laws can appoint cities with a status as a "designated city," which can have administrative powers on par with prefectures in enforcing relevant laws. The Pollution Control Law, for example, identified 96 cities as designated cities (as of 2002). Environmental control in the 1960s and 1970s was largely spearheaded by local governments. The financial bases of local governments, however, are generally weak and they largely depend upon subsidies and other modes of financial assistance from the central government. Improvement of environmental monitoring networks and municipal sewage systems, in particular, have been achieved by subsidies from the centre.

2.2 Environmental Standards and Monitoring for Public Waters

The Basic Environmental Law sets forth two kinds of environmental quality standards (EQS) on water quality: EQSs to protect human health and EQSs to protect the living environment.[1]

EQSs to protect human health have been established for 21 substances, such as cadmium and cyanide. Moreover, 22 additional substances for environmental standards for groundwater have been designated as "monitoring substances" to protect human health. EQSs to protect the living environment have been established for public waters, i.e. rivers, seas and coastal areas and lakes and reservoirs, in terms of biological oxygen demand (BOD), chemical oxygen demand (COD), and dissolved oxygen (DO). Further, EQSs for the living environment have been established for nitrogen (N) and phosphorous (P) in order to prevent eutrophication for some lakes/reservoirs and sea/coastal areas. Different values of EQSs for the living environment of different water bodies are determined taking into account their characteristics. Generally, stricter standards are applied to the upstream waters, which are important as a drinking water supply source, while less stringent standards are applied downstream, which is used for industrial purposes.

Environmental monitoring of the water quality of public waters is conducted by prefectures and designated cities. There are 125 automated water quality monitoring points operated by prefectures and designated cities, and 199 points in 93 major waterways operated by river management offices of the Ministry of Land, Infrastructure, and Transport. The compliance rate of EQSs for human health items measured at these points is almost 100 per cent, but that for organic contamination or living environment items still remains low, as demonstrated in Table 1.

Table.1 Compliance Rate of National EQSs for the Living Environment (in per cent)

	1975	1980	1985	1990	1995	2000
Seas	72.4	79.8	80.0	77.6	78.6	75.3
Rivers	57.1	67.2	67.7	73.6	72.3	82.4
Lakes and Reservoirs	38.6	41.6	41.2	44.2	39.5	42.3

Note: The data show the percentile of the number of EQS monitoring stations in compliance to the total number of monitoring stations.

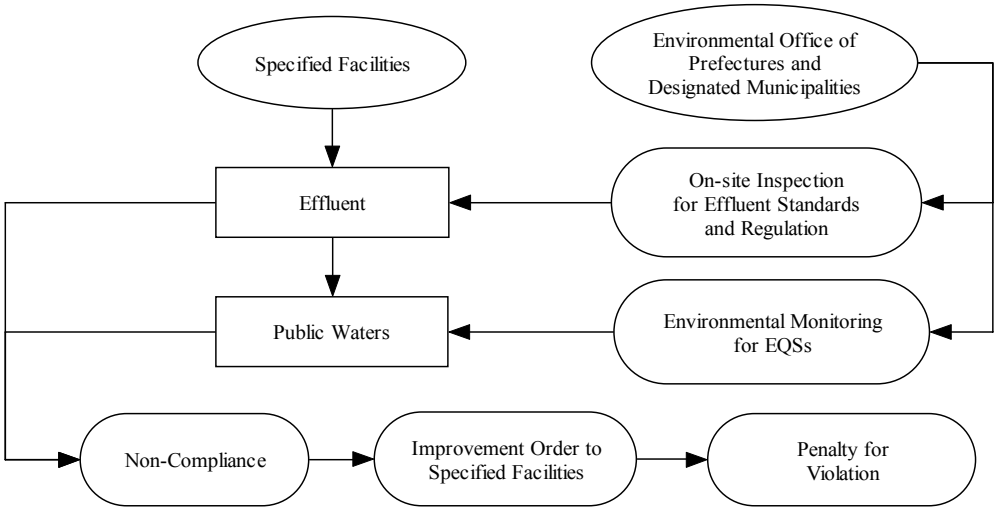
2.3 Effluent Standards and Regulation

Effluent standards define the permissible limit of the concentration of pollutants contained in effluent water from "specified facilities," which are factories and other commercial facilities that discharge wastewater into public waters. The standards are categorized into human health items and living environment items, as is the case of EQSs. In 2003, there were about 300 000 specified facilities in the country, including many small- and medium-sized sources which discharged more than 50 cubic meters of wastewater per day, such as hotels, cleaners, car washes, and night soil treatment facilities. The enforcement of effluent standards and regulations is based on the various forms of contact between the regulatory authorities of prefectures, the designated cities, and the specified facilities. In accordance with the Water Pollution Control Law, local regulatory authorities of prefectures and designated cities request specified facilities to submit reports when the installation of new facilities or modification of existing facilities is planned. They can order the facility to change its plan if they determine that the effluent water discharged from the facility will not comply with the effluent standards. Further, they can issue an "improvement order" that requires the facility to improve the wastewater treatment method or either suspend the use of the facility or stop the discharge of wastewater. The facilities must conduct measurement and monitoring of wastewater discharge and keep records of the results. Local regulatory authorities conduct on-site visits and inspections to check whether the facilities are properly carrying out self-monitoring and record keeping. The scheme of water pollution monitoring is summarized in Figure 1.

Moreover, prefectural government can define stricter effluent standards than the national uniform standards if they determine it is necessary to achieve the national EQSs. The law provides for penalties for violation of uniform or stringent effluent standards. Non-compliance with effluent standards can be traced by different means such as inspection by local regulatory authorities, information from residents, and investigation by police or maritime safety agencies. Further, according to the Health Damage Compensation Law, enacted in 1973, industries discharging toxic substances that damage health must pay compensation if they cause harm to human health.

In implementing the law, local regulatory authorities provide administrative guidance to facilities, if they consider it appropriate to prevent non-compliance even though there is not an absolute violation of the law. This administrative guidance is characterized as a Japanese model of law enforcement ("cooperative regulation"). In this model, regulatory authorities and facilities keep close contact and communication, and take preventive actions prior to the occurrence of non-compliance. This system worked well due to "informal institutions" or "social capital" that supplement formal laws and institutions, ensured by a relatively clean government free from bribes and corruption and the prestige of regulatory authorities.

Figure 1. Scheme of Water Pollution Monitoring

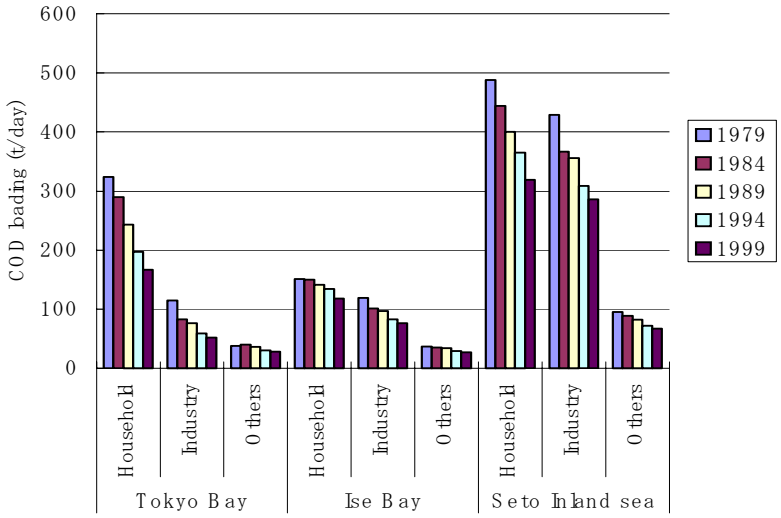


2.4 Area-wide Total Pollutant Load Control

In addition to more stringent standards, an Area-wide Total Pollutant Load Control System has been adopted for closed water bodies such as bays and inland seas in accordance with the Water Pollution Control Law and the Law on the Preservation of Seto Inland Sea. The latter law, in particular, targets the preservation of the Seto Inland Sea, which lies in the western part of the country, forming a narrow, semi-closed sea surrounded by Honshu, Shikoku, and Kyushu islands. The Inland Sea, full of scenic beauties, is especially important for fishery and has suffered from serious damage by the frequent occurrence of red tides due to eutrophication. National government determines the Environmental Preservation Plan of the Seto Inland Sea, and each relevant prefecture should prepare a prefectural plan on the environmental preservation of the Sea in accordance with the national plan. National government also determines the basic direction on the reduction of total water pollutant load (in terms of COD), and requests each prefecture to prepare a plan to set a reduction target, target year, and other necessary items. The Laws oblige facilities discharging effluent inside the specific regions where the Total Pollutant Load Control System is applied (Tokyo Bay, Ise Bay, and Seto Inland Sea) to measure their pollutant discharge loads and report the results to local regulatory authorities.

In all of the Total Pollutant Load Control Areas, households account for the largest pollutant load as shown in Figure 2. Improvement of municipal sewage systems including wastewater treatment plants is the key to reducing the pollutant load from households. The central government provides subsidies to local governments for the construction of major pipelines and wastewater treatment plants, while the operation and maintenance fall under the responsibility of municipalities.

Figure 2. Pollution Sources in Total Pollutant Load Control Areas



Source: Annual Report on the Quality of Environment in Japan (1980-2000)

2.5 Effluent Standards Compliance Monitoring

The enforcement of effluent regulations is delegated to prefectures and designated cities. Each prefecture or designated city has appointed officials to be in charge of monitoring and inspection. According to the national report on the Implementation of Water Pollution Control Law and Other Laws, there were only 40 cases in which improvement orders were issued to facilities that reported new installation or modification of facilities in fiscal year 2002, in contrast to 8 400 issues of administrative guidance to facilities. Local regulatory authorities made a total of 55 000 visits for on-site inspection to facilities, of which 660 were night inspections as shown in Table 2.

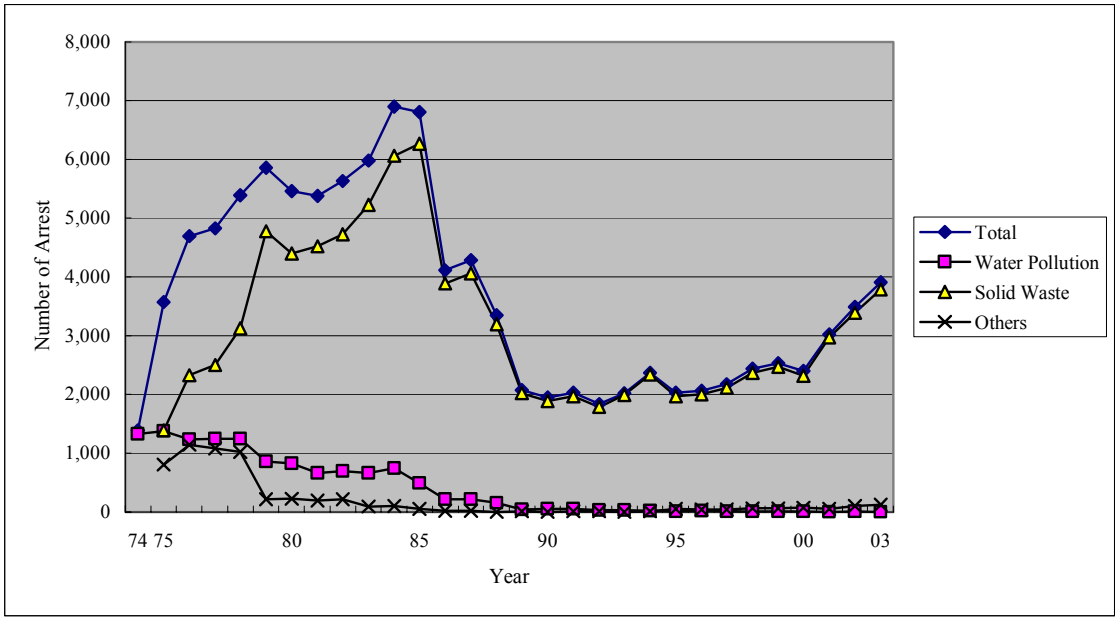
Table 2 Number of Issuance of Improvement and Stoppage Orders, and On-Site Visits for Inspection in 2002

		47 Prefectures	96 Designated Cities	Total
Issuance of Improvement Order		33	7	40
Issuance of Stoppage Order		2	0	2
Administrative Guidance	Public Water Bodies	6,497	1,937	8,434
	Ground Water	28	57	85
On-site Inspection	Daytime	41,247	13,425	54,672
	Nighttime	106	554	660
	Total	41,353	13,979	55,332

Source: Ministry of the Environment: Report on the Implementation of Water Pollution Control Law and Other Laws 2002

Figure 3 demonstrates the change in number of arrest by police for violation of environmental laws since the mid-1970s until the early 2000s. In the 2000s, the number of arrest for violation of water pollution control regulation is very few: only five in 2003. During the 1970s and the early 1980s, however, the situation was quite different: 1 374 arrests were recorded for violating water pollution control regulation in 1975. The number decreased sharply after 1985 as the law was enforced strictly and control technology disseminated.

Figure3. Number of Arrests for Violating Environmental Laws (1974-2003)



Source: Annual Report on the Quality of Environment in Japan (1975-2004)

The number of arrests for violating solid waste disposal regulation such as illegal dumping is constantly high as it is very difficult to monitor the generation, transport and disposal of solid waste. The number showed a decline in the late 1980s, but it turned to increase again as tighter regulation was enforced in the 1990s. Illegal dumping of industrial waste in mountains, forests, and other remote areas has become a big social issue in the country.

3. Evaluation of the Japanese Regulatory System

The Japanese model of environmental control can be characterized as a "decentralized approach" and "co-operative regulation" based on the network of regulatory authorities and the industries which are pollution sources.

In environmental control, the national government formulates basic policy, and implementation is delegated to local governments. In the case of water pollution control, 47 prefectures and 96 designated cities oversee 300 000 facilities that discharge effluent, including small sources. They receive reports when new installation or modification of facilities takes place, and they provide proper guidance to the facilities so that they can comply with the standards. Each prefecture or city has a relatively small team of experts who conduct inspection and monitoring. The size of a team varies depending on the size of the city or prefecture. In a typical case in medium-sized prefectures, a team consists of about 5-10 persons. In this way, a relatively small number of officials in local governments oversee the large number of sources dispersed all over the country. This decentralized enforcement system operated by prefectures and municipalities proved effective and efficient, and most of the technical know-how of law enforcement has been stored in local government offices.

The rate of non-compliance with effluent standards in the 2000s is very low as mentioned above, as local regulatory authorities provide administrative guidance to facilities requesting the application of precautionary measures so that standards are not violated. This is very contrasting to the situation in the 1970s when more than 1 000 arrests for violation of Water Pollution

Control Law were recorded every year. Strict enforcement of the law by means of monitoring, on-site inspection and administrative guidance by local government gradually proved effective in the 1980s, and the number of non-compliance decreased to almost zero in the 2000s.

For industrial sources, engineers were behind the development of technical solutions to policy mandates. The Law Concerning the Improvement of Pollution Prevention Systems obligated companies to establish effective organizational structures for pollution control in their factories and plants to ensure compliance with regulations. The law required that factories and plants with facilities designated as polluting facilities have a "pollution prevention general manager" and a "pollution control manager" to be in charge of practical management of technical matters regarding pollution control. For water pollution control, factories which discharge more than 10 000 cubic meters of wastewater should have such persons. Would-be pollution control managers must pass a national examination. The network of these engineers provided a basis for the law enforcement.

Sanjaya Lall states that countries with strong social capital are able to function better: members interact more closely with each other, spend less effort on formal methods to enforce contracts, reach greater consensus on common aims, and are able to implement joint actions more efficiently. In enforcing environmental laws, Japan developed an "environmental social capital" or a network of regulatory authorities and firms based on their day-to-day communication and improved public awareness and scientific information. Such network building was also facilitated by the system of pollution control managers.

We can distinguish two main types of environmental policy instruments that have been used in the United States and many European countries as well as Japan: command and control, and economic instruments. In water pollution control, Japan relied heavily upon command and control, but its approach has found more co-operative ways to set and implement regulations and standards. Bureaucratic guidance and regulations proceed through careful negotiations and attempt to solicit voluntary compliance. The practical method to exercise this "co-operative regulation" has been the use of administrative guidance and "pollution control agreements" (PCAs)[2]. PCAs were used to reduce the discharge of pollutants from factories far below the level required by law when there was strong concern from the local residents about the deterioration of water quality due to the construction of a new factory. PCAs were also used to regulate hazardous chemicals such as trichloroethylene discharged from factories and to control ground water pollution when proper regulations were not applied.

Japan did not make use of taxes and charges as disincentives to firms, and even provided financial and technical assistance mechanisms to support small- and medium-sized enterprises (SMEs). At the national level, the government established the Pollution Control Service Corporation (later renamed the Japan Environmental Corporation) in 1965, which provided both technical and financial assistance to SMEs and local governments for addressing pollution control problems. For example, it constructed suburban industrial parks equipped with collective wastewater treatment plants and promoted the relocation of SMEs that had been located in downtown areas. Many prefectures and municipalities also created similar assistance systems targeting SMEs. In recent years, however, the need of public assistance to SMEs for pollution control has declined.

[1] Water Environment Department, Environment Management Bureau, Ministry of the Environment (2002) Water Environmental Management in Japan

[2] OECD (1999) Voluntary Approaches for Environmental Policy, pp.68-76.

GOVERNING APPROACHES ENSURING ENVIRONMENTAL COMPLIANCE: A BRAZILIAN PERSPECTIVE

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1. Introduction

The need to address environmental protection while providing for economic growth is the unequivocal challenge of our times, in particular for developing countries. However this quest must be understood from a historical and empirical perspective in which those countries are faced with the most operative part of it and in which the necessity to develop can not be overlooked.

Economic and social development constitutes a baseline issue in medium to lowly-developed countries. Poverty and underdevelopment are no doubt the worst impact on the environment and the deforestation rates in megabiodiverse countries is one of many examples of poverty-induced devastating impacts.

In such a context, governing approaches ensuring environmental protection are better applied when the entail ways to perceive the private sector as a partner in a sustainable development construction process. For numerous reasons our experience demonstrates that not many practices are put in place with this view. We attempt to discuss some of these issues in this note.

2. Beyond Command & Control

There is a significant difference between governing approaches to ensure environmental compliance in developed countries and in developing countries. In the first case, most of the natural resources are already known and used in industrial processes. The environmental impacts of this exploitation are largely acknowledged and in place. In this context, pollution control is the key instrument to managing the negative outputs of industrialization both on society and the environment.

Added to that, the transfer of the development base from the use of raw materials to other sources of revenue, i.e. by-products with added value, services, etc., can be an effective way to reduce the need for direct and potentially damaging natural resources exploitation. An important consequence of this process is that most rich countries apply command and control measures with success.

As a result, economic authorities can combine the degree of economic growth and of the per capita consumption of goods and services to maintain the same standards of life quality. The main goal of developed countries´ societies is the search for equilibrium between high levels of life quality (measure by consumption) and for environmental protection (measure by air and water pollution conditions).

However, the same paradigm is not easily proven in developing countries with crucial social problems and abundant natural resources such as Brazil.

Those countries are faced with the challenge of creating opportunities on a large scale for a poor society. They need, at the same time, to stimulate new physical infrastructure of roads, railroads, ports, and energy facilities; to stimulate the creation of new quality jobs such as in building and agricultural activities; to recover and extend the social infrastructure of hospitals, schools, water and sanitation treatments, among other things, and to improve economic routes, in particular in what concerns industrialization.

Innovative technology, in this case, plays a central role in providing a key tool to solve such conflict. Creating new products and services and transforming industrial processes using technology may allow the achievement of production, at the same time, less damage to the environment. New technologies can also facilitate changes in standards of consumption and production, substitution of some raw materials and inputs, and the adoption of new industrial processes.

For countries with these characteristics, controlling the sustainable use of natural resources via the implementation of regulatory measures based on command and control techniques cannot be used in isolation. If so they are sure to be counterproductive and unsuccessful.

This is so because command and control instruments tend to be a one way imposing system, which is certain to affect most industries without necessarily preventing environmental harm or inducing cost-effective results. This happens because such measures are not unusually conceived without a more grounded and thorough consultative procedure with the productive sector entailing realistic and possible solutions for stakeholders.

In fact, most of the time the Brazilian private sector is only "*welcome on board*" in the competent environmental authority premises at the time when a particular licensing procedure is to be started or when it is to be renovated. Other than that corporations are demanded to report on the activities in effect and to face fines, compensations, redress and sanctions when things are not working accordingly, i.e. the classical command and control blue print.

This is not to say that a regulatory framework should not include a command and control baseline. But selecting these instruments as a main way to protect and prevent environmental degradation has proved fruitless and frequently hostile to the industrial sector.

Modern regulation strategies must consider the private sector with a different perception: as a precursor of sustainable development, preceding and indicating the approach in which it should be realized. Doubtless the direct or indirect exploration of natural resources is the corporations´ core profession. Importance must be given to the predicate that going beyond the command and control baseline means a far more flexible, creative, and realistic approach to environmental regulation than that usually adopted.

In this respect, we are currently endeavouring to prompt the realization of development plans that would facilitate regional developments in which the use of scientific instruments would address the vocation of areas so as to orientate Public Power decisions on what is needful for the country. It is our objective to bring at least a minimum level of long-term certainty for private sector initiatives based on clear-cut indicators able to reduce eventual misuse claims.

Planning instruments are in great need of inclusion in the policy maker's agenda. It is central importance that the private sector, among other interested parties, have helpful inputs and trustworthy long-term information to deliberate upon. Besides with proper planning the idea that the productive sector can be a significant partner in the attainment of economic growth as well as the challenge of sustainable development becomes better illustrated and at hand.

Other governing approaches ensuring environmental compliance as it relates to the private sector should comprise:

- Demarginalisation of the private sector within the government environmental agenda. Government focusing more on industry/private sector when devising policies and more cooperation with private sector in devising policies;
- Cost-effectiveness: inducing voluntary compliance via, for instance, informal reports, self-audit procedures resulting in spending less time, less money and less effort;
- Reduction of bureaucracy in licensing procedures based on the perception that enterprises are potential partners both to economic growth and to the challenge of sustainable development;
- Consistent methodologies applicable to the analyses of licensing procedures;
- Economic incentives for cleaner production systems;
- Market induction for sound environmental products via certification or alike;
- Scale generation aiming at the introduction of sound environmental products in market niches both domestically and overseas.

3. Conclusion

Governing approaches ensuring environmental compliance in developing countries means quite another thing than it usually does for most developed countries. While the former are faced with meeting crucial challenges, namely, reducing poverty, tackling unemployment, assuring the implementation of health systems and social justice as a whole, all aiming at delivering such countries the possibility of economic growth that leads to better opportunities and to life quality for their citizens, the latter no longer are expected to deal with these issues from scratch.

In this context, a regulatory baseline mainly built on command and control mechanisms does not suffice to attend to the economic development needs of the majority of mildly to highly unprivileged developing countries. A more realistic regulatory base in these countries should focus on the perception that industries can be a major partner in the quest for sustainable development. Modern instruments put in place with such a view would be able to go beyond command and control inducing, e.g. voluntary compliance practices, economic incentives, self-audit reports and other potentially cost-effective procedures.

Overall, planning instruments are in great need of inclusion in the government's agenda. By With these the government would highlight the necessity to stimulate the use of sound scientific information that would address, for instance, the natural vocation of areas so as to guide Public Sector decisions on what the country's priorities are. Such planning would allow every interested party to deliberate upon clear-cut and trustworthy information for the long term, and it would

feature ways in which the private sector can make better partnership, which aim at sustainable development, entailing economic growth, social inclusion, and environmental protection.

DESIGNING SMART REGULATION

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One of the crucial issues of our time is how to avoid serious, and perhaps cataclysmic, damage to the natural environment. The causes of such damage are both complex and controversial, and arise from a wide variety of social and economic pressures. The results, however, are more readily apparent. The evidence that pollution, land degradation, de-forestation, ozone depletion, climate change, and the loss of biological diversity are inflicting serious and in some cases irreversible damage to the planet that sustains us, is increasingly compelling. Indeed, it is arguable that the window of opportunity for averting major ecological disaster is a rapidly shrinking one, and that, in some cases, it may already be too late to prevent ongoing environmental degradation.

For policy makers, a variety of strategies are available that might, subject to political and economic constraints, enable serious environmental damage to be slowed down, halted, or ideally reversed. This article is about one of the most important of those strategies: environmental regulation. We use this term, deliberately, in the broadest sense, to include not just conventional forms of direct (command and control) regulation but also to include much more flexible, imaginative, and innovative forms of social control which seek to harness not just governments but also business and third parties. For example, we are concerned with self-regulation and co-regulation, with utilising both commercial interests and non-government organisations, and with finding surrogates for direct government regulation, as well as with improving the effectiveness and efficiency of more conventional forms of direct government regulation.

Regulation - even broadly defined - is not the only means of addressing environmental problems but will, in the very large majority of cases, undoubtedly be a crucial one. However, most existing approaches to regulation are seriously sub-optimal. By this we mean that they are not effective in delivering their purported policy goals, or efficient in doing so at least cost, nor do they perform well in terms of other criteria such as equity or political acceptability.

The major task of this article is to demonstrate how environmental regulation could be designed so that it would perform successfully in terms of those criteria (or at least come a lot closer to it). The central argument will be that, in the majority of circumstances, the use of multiple rather than single policy instruments, and a broader range of regulatory actors, will produce better regulation. Further, that this will allow the implementation of complementary combinations of instruments and participants tailored to meet the imperatives of specific environmental issues. By implication, this means a far more imaginative, flexible, and pluralistic approach to environmental regulation than has so far been adopted in most jurisdictions.

Towards Principle-based Regulatory Design

Because threats to the environment take many forms, the appropriate strategies to address environmental degradation are likely to be context-specific.[1] What sorts of policies work will be highly dependent upon the characteristics of the environmental issue under consideration. The strategies most effective in addressing point-source pollution from manufacturing are likely to be very different from those most suited to remedying land degradation or to over-fishing, as are the likely array of available instruments and institutional actors, and the political and economic contexts in which policy mixes must be designed. As a result, it would be futile to attempt to construct a single optimal regulatory solution that would be applicable to a wide variety of circumstances.

Does this mean that nothing of value can be said at a general and abstract level and that the most we can ever do is focus on solutions to particular types of problems (point-source pollution, land-clearing, soil degradation etc.) with little hope of learning any wider lessons or of extrapolating from one policy area to another? We believe that such a conclusion is too bleak, and that notwithstanding the context-specific nature of most environmental problems, it is possible to build a "principle based framework" for designing environmental regulation in any given circumstances. By this we mean an approach that, while falling short of providing determinative regulatory solutions, leads policymakers to assess their decisions against a set of design criteria that form the basis of reaching preferred policy outcomes.

In the remainder of this article, we address two elements we believe are crucial to successful regulatory design. First, and comprising the bulk of the article, we identify a series of "regulatory design principles". We argue that adherence to these principles is at the very heart of successful policy design. Not least, we argue that policy makers should take advantage of a number of largely unrecognised opportunities, strategies, and techniques for achieving efficient and effective environmental policy. These include:

- the desirability of preferring complementary instrument mixes over single instrument approaches while avoiding the dangers of "smorgasbordism" (*i.e.* wrongly assuming that all instruments should be used rather than the minimum number necessary to achieve the desired result);

- the virtues of parsimony: why less interventionist measures should be preferred and how to achieve such outcomes;

- the benefits of an escalating response up an instrument pyramid (utilising not only government but also business and third parties) so as to build in regulatory responsiveness, to increase dependability of outcomes through instrument sequencing, and to provide early warning of instrument failure through the use of triggers;

- empowering third parties (both commercial and non-commercial) to act as surrogate regulators, thereby achieving not only better environmental outcomes at less cost but also freeing up scarce regulatory resources that can be redeployed in circumstances where no alternatives to direct government intervention are available; and

- maximising opportunities for win-win outcomes, by expanding the boundaries within which such opportunities are available and encouraging business to go "beyond compliance" with existing legal requirements.

Second, we stress the importance of "instrument combinations" and discuss how such combinations might be inherently complementary, inherently counterproductive, or essentially context specific in nature. In recent years, policy makers have begun to explore a much wider range of environmental policy instruments. However, there has been little systematic enquiry into how conceptually different instruments might interact with each other. Overall, there remains a tendency to treat the various policy instruments as alternatives to one another rather than as potentially complementary mechanisms.[2] As a result, policy analysts have tended to embrace one or other of these regulatory approaches without regard to the virtue of others.

It is important to earmark the issues we do not address in this article. First, we are not directly concerned with the debate on compliance. The extent to which different instruments are capable of being, or under a particular enforcement approach likely to be, effectively enforced, is obviously an important consideration in relation to their effectiveness and efficiency.[3] However, it is not necessary to enter into this debate in order to address our central concerns identified above. Second, we do not find it necessary to enter the debate concerning the prevailing regulatory culture of different jurisdictions and their relative effectiveness although this too, is likely to influence regulatory outcomes.[4] As we will see, our design principles can be applied successfully against the backdrop of a variety of enforcement practices and across a range of cultures.

Regulatory Design Principles

In this section we identify the core principles that should underpin regulatory design. Although these do not purport to prescribe specific solutions to specific environmental threats, our principles provide the guidelines and roadmaps that will enable policymakers to arrive at those solutions. The five principles described below are intended to be addressed sequentially.

Principle 1: Prefer policy mixes incorporating instrument and institutional combinations

There are very few circumstances where a single regulatory instrument is likely to be the most efficient or effective means of addressing a particular environmental problem. Certainly such circumstances exist. For example, a ban on the manufacture of certain highly toxic substances may be a highly effective way of preventing their use, without the need to invoke additional instruments. In the majority of circumstances, however, individual instruments have both strengths and weaknesses and none are sufficiently flexible and resilient to be able to successfully address all environmental problems in all contexts.

Command and control regulation has the virtues of high dependability and predictability (if adequately enforced), but commonly proves to be inflexible and inefficient. In contrast, economic instruments tend to be efficient but, in most cases, not dependable. Information-based strategies, voluntarism, and self-regulation have the virtues of being non-coercive, unintrusive and (in most cases) cost-effective, but also have low

reliability when used in isolation. Their success also depends heavily on the extent of the gap between the public and private interest.

Our general conclusion is that the best means of overcoming the deficiencies of individual instruments, while taking advantage of their strengths, is through the design of combinations of instruments. Similar arguments for regulatory pluralism apply with regard to regulatory participants. In most jurisdictions, the regulatory process has been artificially restricted to government and industry. This reinforces outmoded notions of government as an omnipotent source of regulatory authority. A greater range of actors, including commercial third parties, such as banks, insurers, consumers, suppliers and environmental consultants, and non-commercial third parties, can assist in taking the weight off government intervention. Thus government can redirect its limited resources to those companies that are genuinely recalcitrant, and increasingly assume the mantle of facilitator and broker of third party participation in the regulatory process. An additional benefit is that a multiplicity of regulatory signals have the potential to be mutually reinforcing.

If one accepts this general approach of using combinations of instruments and participants, then there may be a temptation to succumb to a "kitchen sink" approach to policy design[5], throwing in every conceivable policy combination on the assumption that the severity of the environmental problems we confront, and their likely consequences for humankind, are such as to justify almost any level of resource input. However, this approach is likely to be seriously sub-optimal for a variety of reasons. First, there are practical limits to the capacity of industry to comply with a large range of regulatory and quasi-regulatory requirements (regulatory overload is now a well recognised phenomenon[6]). Second, the imposition on the public purse and the demand on public resources would also be excessive. Third, and finally, not all combinations of instruments or institutions are likely to be complementary. On the contrary, a considerable number of combinations are either inherently or in particular contexts, counterproductive, duplicative, or sub-optimal (this issue is explored below).

Principle 2: Prefer less interventionist measures

Intervention has two principal components: **prescription and coercion**. Prescription refers to the extent to which external parties determine the level, type, and method of environmental improvement. Coercion, on the other hand, refers to the extent to which external parties or instruments place negative pressure on a firm to improve its performance. By way of example, it may be argued that industry self-regulation is higher in terms of its prescriptiveness than its coercion. That is, firms may be required to address specific issues and adopt certain behaviours, but there is little by way of external enforcement to ensure that their obligations are met.

In contrast, some economic instruments such as taxes and charges, are high on coercion and low on prescription. That is, coercion is exercised through a price signal, which firms by and large cannot avoid. How they respond to that price signal, however, is independent of outside influence: they may choose to pay the higher tax or change their behaviour so as to limit its impact. If they choose the latter, then they also have total control over the type of remediation implemented. Ranking instrument categories according to the level of intervention therefore requires a balancing or assessment of the respective contributions of the two constituent components, prescription and coercion.

There are a variety of reasons why less interventionist approaches should be preferred to more interventionist ones. In terms of **efficiency**, highly coercive instruments usually require substantial administrative resources for monitoring and policing, without which they are likely to be ineffective. Highly prescriptive instruments lack flexibility and do not facilitate least cost solutions. They may also result in the unnecessary deployment of resources to policing those who would be quite willing to comply voluntarily under less interventionist options. Good performers may be inhibited from going beyond compliance with such regulation.

High intervention is unlikely to be as **effective** as alternative approaches essentially because conscripts generally respond less favourably than volunteers. Highly coercive measures may cause resentment and resistance from those who regard them as an unjustifiable and intrusive intervention in their affairs, rather than the constructive resolution of environmental problems. Unsurprisingly, high intervention also tends to score very badly in terms of **political acceptability**. This is particularly the case in sectors with a history and culture of independence from, and a strong resentment of, government regulatory intervention.

In contrast to the problems of high interventionism described above, low interventionist options, to the extent that they are viable, have the considerable advantages of providing greater flexibility to enterprises in their response, greater ownership of solutions that they are directly involved in creating, less resistance, greater legitimacy, greater speed of decision-making, sensitivity to market circumstances, and lower costs.[7] From a regulator's perspective, a focus on less interventionist approaches also has the attraction of freeing up scarce regulatory resources, which may be redeployed against those who are unwilling or unable to respond to such measures and against whom there is no viable alternative to the deployment of highly intrusive instruments.

Implicit in this principle of "starting with the least interventionist policy measure" is the assumption that the measure **actually works**. That is, the instrument must be capable of delivering the identified environmental outcomes. In some cases, this will mean that "what works" requires a relatively high level of intervention, but even in such cases it should still be possible to apply the principle.

In applying the principle of least intervention, policy makers should bear in mind the capacity to raise the level of intervention, if and when required, with various instruments and/or instrument combinations. That is, it is not necessarily a matter of choosing one instrument in preference to another in a static sense, but rather that of invoking a temporal sequence of instruments, as described in the next principle below. Alternatively, firms may be segregated into different streams of regulatory intervention, for example, one might introduce a "green track" of low intervention regulation for leading edge environmental performers, while retaining a more interventionist track for those firms that are merely complying with minimum standards or are recalcitrant.

Principle 3: Escalate up an instrument pyramid to the extent necessary to achieve policy goals

We asserted in the previous principle that preference should be given to the least interventionist measure(s) that will work. However, it is not always apparent to policy designers whether a particular measure they contemplate using will work or not,

principally for two reasons. First, a given instrument may be effective in influencing the behaviour of some, but not of others (suggesting the need for regulation to be responsive to the different behaviour of different regulatees). Second, a particular instrument which, prior to its introduction, seemed likely to be viable in its entirety, may in the light of practical experience, prove not to be so (suggesting the need for instrument sequencing to increase dependability).

A window into solving the first problem is provided by John Braithwaite, whose "enforcement pyramid" conceives of responsive regulation essentially in terms of dialogic regulatory culture in which regulators signal to industry their commitment to escalate their enforcement response whenever lower levels of intervention fail.[8] Under this model, regulators begin by assuming virtue (to which they respond with cooperative measures), but when their expectations are disappointed, they respond with progressively punitive/coercive strategies until the regulatee conforms.

Central to Braithwaite's model is the capacity for gradual escalation from low to high intervention, culminating in a regulatory peak which, if activated, will be sufficiently powerful to deter even the most egregious offender. It is possible to reconceptualise and extend this enforcement pyramid in two important ways. First, beyond the state and business, it is possible for third parties to act as quasi-regulators. Similarly, second parties in the business may themselves perform a (self) regulatory role. In our expanded model, escalation would be possible up any face of the pyramid, including the second face (through self-regulation), or the third face (through a variety of actions by commercial or non-commercial third parties or both), in addition to government action.

To give a concrete example of escalation up the third face, the developing Forest Stewardship Council (FSC) is a global environmental standards setting system for forest products. The FSC will both establish standards that can be used to certify forestry products as sustainably managed and will "certify the certifiers". Once operational, it will rely for its "clout" on changing consumer demand and upon creating strong "buyers groups" and other mechanisms for institutionalising green consumer demand. That is, its success will depend very largely on influencing consumer demand. While government involvement, for example through formal endorsement or through government procurement policies which supported the FSC, would be valuable, the scheme is essentially a free standing one: from base to peak (consumer sanctions and boycotts) the scheme is entirely third party based. In this way, a "new institutional system for global environmental standard setting" will come about, entirely independent of government.[9]

Second, Braithwaite's pyramid utilises a single instrument category, specifically, state regulation, rather than a range of instruments **and parties**. In contrast, our pyramid conceives of the possibility of regulation using a number of different instruments implemented across a number of parties. It also conceives of escalation to higher levels of coerciveness not only within a single instrument category but also across several different instruments and across different faces of the pyramid.

A graphic illustration of exactly how this can indeed occur is provided by Joe Rees' analysis of the highly sophisticated self-regulatory program of the Institute of Nuclear Power Operators (INPO), which, post-Three Mile Island, is probably amongst the most impressive and effective such schemes worldwide.[10] However, even INPO is incapable of

working effectively in isolation. There are, inevitably, industry laggards, who do not respond to education, persuasion, peer group pressure, gradual nagging from INPO, shaming, or other instruments at its disposal. INPO's ultimate response, after five years of frustration, was to turn to the government regulator, the Nuclear Regulatory Commission (NRC). That is, the effective functioning of the lower levels of the pyramid may depend upon invoking the peak, which in this case, only government could do. As Rees puts it: "INPO's climb to power has been accomplished on the shoulders of the NRC".

This case also shows the importance of integration between the different levels of the pyramid. The NRC did not just happen to stumble across, or threaten action against recalcitrants, rather there was considerable communication between INPO and the NRC which facilitated what was, in effect, a tiered response of education and information, escalating through peer group pressure and a series of increasingly threatening letters, ultimately to the threat of criminal penalties and incapacitation , the latter being penalties government alone could impose, but the former being approaches which in these circumstances at least, INPO itself was in the best position to pursue. Thus, even in the case of one of the most successful schemes of self regulation ever documented, it was the presence of the regulatory "gorilla in the closet" that secured its ultimate success.

We do not wish to give the impression, however, that a coordinated escalation up one or more sides of our instrument pyramid is practicable in all cases. On the contrary, controlled escalation is only possible where the instruments in question lend themselves to a graduated, responsive, and interactive enforcement strategy. The two instruments which are most amenable to such a strategy (because they are readily manipulated) are **command and control and self-regulation**. Thus it is no coincidence that our first example of how to shift from one face of the pyramid to another as one escalates, and of how to invoke the dynamic peak, was taken from precisely this instrument combination. However, there are other instruments that are at least partially amenable to such a response, the most obvious being insurance and banking.

A combination of government mandated information (a modestly interventionist strategy) in conjunction with third party pressure (at the higher levels of the pyramid) might also be a viable option. For example, government might require business to disclose various information about its levels of emissions under a Toxic Release Inventory,[11] leaving it to financial markets and insurers (commercial third parties) and environmental groups (non-commercial third parties) to use that information in a variety of ways to bring pressure on poor environmental performers.[12]

In contrast, in the case of certain other instruments, the capacity for responsive regulation is lacking, either because an individual instrument is not designed to facilitate responsive regulation (*i.e.* its implementation is static rather than dynamic and cannot be tailored to escalate or de-escalate depending on the behaviour of specific firms) or because there is no potential for coordinated interaction between instruments. For example economic instruments have both these characteristics. In essence, either an economic instrument is in place and must be responded to, or it is not. An environmental tax (or the level of tax), for example, cannot be imposed depending upon whether or not an enterprise has responded positively to less intrusive instruments, but rather, is intended as a uniform price signal that will apply to all members of the target group equally, irrespective of their past behaviour. By the same token, there are significant limits to the extent to which

broad-based economic instruments, such as pollution taxes and tradable emission permits, can be designed to interact in a coordinated and complementary fashion with other instruments, except by means of temporal sequencing as described below.

Another limitation for those aspiring to a coordinated and gradual escalation of instruments and coerciveness is the possibility that, in some circumstances, escalation may only be possible to the middle levels of the pyramid, with no alternative instrument or party having the capacity to deliver higher levels of coerciveness. Or a particular instrument or instrument combination may facilitate action at the bottom of the pyramid and at the top, but not in the middle levels, with the result that there is no capacity for gradual escalation. For example, lender liability gives banks and other financial institutions a considerable incentive to scrutinise the environmental credentials of their clients very closely before lending them money, and at this stage they may counsel a client towards improved environmental performance. However, subsequent to providing the loan, the only available sanction may be to foreclose, without credible intermediate options. In any of these circumstances, our proposed dynamic instrument pyramid still has some value but it will operate in a less than complete fashion.

In the substantial range of circumstances when coordinated escalation is not readily achievable, a critical role of government will be, so far as possible, to fill the gaps between the different levels of the pyramid, seeking to compensate for either the absence of suitable second or third party instruments, or for their static or limited nature, either through direct intervention or, preferably, by facilitating action or acting as a catalyst for effective second or third party action, as described in design principle five. In effect, a major role for government is thus to facilitate second and third parties climbing the pyramid.

Finally, there are two general circumstances where it is inappropriate to adopt an escalating response up the instrument or enforcement pyramid, irrespective of whether it is possible to achieve such a response. First, in situations that involve a serious risk of irreversible loss or catastrophic damage, then a graduated response is inappropriate because the risks are too high: the endangered species may have become extinct, or the nuclear plant may have exploded before the regulator has determined how high up the pyramid it is necessary to escalate in order to change the behaviour of the target group. In these circumstances a horizontal rather than a vertical approach may be preferable, imposing a range of instruments, including the underpinning of a regulatory safety net, simultaneously rather than sequentially.[13] Second, a graduated response is only appropriate where the parties have continuing interactions. It is these that make it credible to begin with a low interventionist response and to escalate (in a tit-for-tat response) if this proves insufficient. In contrast, where there is only one chance to influence the behaviour in question (for example because small employers can only very rarely be inspected), then a more interventionist first response may be justified, particularly if the risk involved is a high one.

Instrument sequencing to increase dependability

In the event that an instrument (or instrument combination) that seems viable in its entirety turns out not to be so, our proposed solution is to introduce instrument sequencing, enabling escalation from the preferred least interventionist option, if it fails, to increasingly more interventionist alternatives. For example, a particular industry sector may be allowed to conduct a voluntary self-regulation scheme **on the proviso** that if it fails to meet the agreed objectives, mandatory sanctions will be introduced. Such a solution is not only consistent with design principle 3, above, it also avoids a slide into "smorgasbordism": rather than using all instruments and participants simultaneously, it is only when the least interventionist (viable) instrument(s) have demonstrably failed that one escalates up the pyramid and invokes a broader range of instruments and parties, and even then, only to the extent necessary to achieve the desired goal.

The precise nature of sequencing arrangements will be determined by the level of discretion that is associated with their implementation. That is, some sequencing arrangements will entail the automatic application of more interventionist measures if and when earlier measures fail, thus reducing the level of discretion, while others will require some further action by first, second, or third parties prior to their implementation, thus increasing the level of discretion. Minimising the amount of discretion, once certain defined parameters have been breached, sends a powerful message to industry to deliver on less interventionist forms of regulation. Of course this does not preclude lobbying by business, but this is less likely to succeed if government has already publicly committed itself to a specified course of action. The following scenarios illustrate how the level of, for example, government discretion can be varied to address different environmental problems.

- The United States Climate Action Plan aims to reduce the level of greenhouse gas emissions. The plan is based on a series of low intervention voluntary agreements with industry. Implicit in the plan is a commitment to legislated targets if industry does not deliver on its promises. This redundancy provision contains a high level of discretion because the threat is: (a) implicit not explicit; (b) undefined; and (c) linked to a particular administration.

- The New Zealand government has made similar voluntary arrangements with industry to reduce greenhouse gas emissions. It has, however, implemented a sequencing provision with far less discretion. If industry fails to achieve pre-specified reduction targets, a carbon tax will be introduced. This provision contains far less discretion because (a) it is explicit; and (b) it is defined. It is, however, still linked to a particular administration.

- The Australian response to phasing out the use of the ozone depleting hydro chlorofluorocarbons (HCFCs) is similarly based on an industry-wide voluntary self-regulation scheme. The sequencing provision in this case is in the form of a legislated tradable quota scheme. If industry fails to meet pre-specified HCFC reduction targets, the tradable quota scheme automatically comes into effect. This provision contains even less discretion than either of the previous two examples because: (a) it is explicit; (b) it is defined; and (c) it is included in legislation, thus reducing opportunities for further political discretion. It would still be possible for

a subsequent government to amend the relevant legislation. However, this is likely to require the expenditure of considerable political capital.

Triggers and buffer zones

Our proposed methods of sequencing are dependent on **triggers** to warn the authorities when less interventionist measures have failed. For example, under a scheme of self-regulation, the industry itself may invite government intervention. Alternatively, government and industry may agree to defined performance benchmarks. A failure to comply with these benchmarks would automatically trigger tougher regulations. Or it may be that public interest groups are able to identify serious breaches that would warrant intervention from governments or other third parties, possibly insurers.

In order to increase the dependability of sequencing provisions, several possible triggers would be preferable, though precisely which ones are most appropriate will depend upon the particular context. In broad terms, appropriate triggers might include: random government inspections; independent auditors; mechanisms for industry association reporting; in-house "whistle blowers"; community oversight; and compulsory firm reporting.

In relying on triggers to invoke sequencing, it is important that the triggers pre-empt unacceptable levels of environmental harm. That is, there needs to be a **buffer zone** between the point at which a trigger is set off and the level of environmental harm that is being monitored. For example, with Australia's self-regulatory scheme to phase out the use of HCFCs, the level at which mandatory quotas kick-in is well below that which is required to meet our international commitments under the Montreal Protocol, creating an effective buffer zone. The greater the degree of effectiveness that is required for a particular environmental issue, the greater the size of the buffer zones. This is similar to the concept of "precautionary regulation", where tougher regulation acts as a safety net if and when other policies fail. The regulation is enacted, but the expectation is that it will not be used.

Circuit breakers

Another strategy, related to that of sequencing, is the use of **circuit breakers**. A circuit breaker is an instrument that is introduced as a short term measure (and ultimately withdrawn), the purpose of which is to pre-empt the anticipated failure of another instrument. Circuit breakers tend to be low intervention instruments introduced in anticipation that certain high intervention instruments, introduced in isolation, have a high probability of failure. For example, a ban on land clearing in South Australia was regarded as essential to halt widespread environmental degradation, but was also politically unacceptable and largely unenforceable in the absence of some complementary positive inducement. Compensation was introduced for those who were refused a permit to clear, in order to overcome both these problems and to facilitate the cultural change that was needed in the long term *(i.e.* from a belief that all landowners had an unencumbered right to clear, to a sustainable land use). Once this had been achieved (or at least that opposition to clearing bans had been largely overcome), the right to compensation was withdrawn.[14]

Circuit breakers are similar to sequencing in that there is an ordering of policy responses, beginning with less interventionist and then moving up to more intrusive

regulations. The difference is that with sequencing, escalation up the enforcement pyramid occurs only when lower policies fail, whereas with circuit breakers, there is an expectation that they are only a short-term measure, eventually to be replaced by other more conventional policy responses. It is important to recognise that the use of circuit breakers is a direct violation of the polluter pays and/or user pays principles (it may, nevertheless, be consistent with the precautionary principle). In some circumstances, however, this pragmatic approach may be necessary to achieve real progress in areas where regulatory resistance is high and external monitoring is difficult.

Principle 4: Empower participants which are in the best position to act as surrogate regulators

We argued earlier that there are a range of second and third parties, both commercial and non-commercial, that may play valuable roles in the regulatory process, acting as quasi-regulators. These range from industry associations (administering self-regulatory programs), through financial institutions to environmental and other pressure groups. All too often, however, policy makers have avoided or ignored the potential contributions of such parties, treating government as the sole regulatory provider. Yet by expanding the regulatory "tool box" to encompass additional players, many of the most serious shortcomings of traditional regulatory approaches may be overcome.

There are several reasons why the recruitment of third parties into the regulatory process may provide for improved outcomes. First, in some instances, third party quasi-regulation may be far more potent than government intervention. For example, the threat of a bank to foreclose a loan to a firm with low levels of liquidity is likely to have a far greater impact than any existing government instrument. Second, it may be perceived as more legitimate. For example, farmers are far more accepting of commercial imperatives to reduce chemical use than they are of any government mandated requirements. Similarly, participation by non-commercial third parties, in particular, may well be crucial in terms of political acceptability. Third, government resources are necessarily limited, particularly in an era of fiscal constraint. Accordingly, it makes sense for government to reserve its resources for situations where there is no viable alternative but direct regulation. The potential for Responsible Care to supplement government regulation of the chemical industry is a case in point.[15] Finally, even if resources were more readily available, governments are not omnipotent. There are many areas of commercial activity that impact on the environmental performance of industry where direct government influence is impractical. For example, where there are a myriad of small players, such that it is impossible even for government to identify, let alone regulate all of them.

Applying the principle of empowerment

The participation of second and third parties, particularly commercial third parties, in the regulatory process is unlikely to arise spontaneously, except in a very limited range of circumstances where public and private interests substantially coincide.[16] Such parties may have little existing interest in environmental performance, lack the necessary information even if they did, or indeed may have a commercial interest in maintaining or accelerating environmental degradation. For example, banks are unlikely to promote the conservation of remnant vegetation on farms where they perceive the clearing of land to provide increased earnings, nor are they likely to oppose the running of extra stock where this

increases the ability to repay loans. There remains, therefore, a significant role for government in facilitating, catalysing, and commandeering the participation of second and third parties to the cause of environmental improvement.

One powerful illustration of this principle can be drawn from Mitchell's work on pollution by oil tankers at sea.[17] Mitchell demonstrates how the imposition by the state of penalties for intentional oil spills (pursuant to an international treaty) was almost wholly ineffective, due in no small part to difficulties of monitoring, and, in some cases, to a lack of either enforcement resources or political will. Nor, in the absence of government intervention, did third parties have incentives to contribute significantly to the reduction of oil spills. However, all this changed when a new regime was introduced, requiring tankers to be equipped with segregated ballast tanks. Despite the increased cost of the new equipment, this regime has been extremely successful, a fact owed substantially to the role played by a range of powerful third parties. First, the new regime facilitated coerced compliance by three powerful third parties, namely non-state classification societies, ship insurers, and ship builders. As Mitchell demonstrates, none of these parties had any interest in avoiding the new regime yet ship owners were critically dependent upon each of them.[18] Together, and in conjunction with state action, they achieved far more than state action alone was ever likely to.

There are a variety of mechanisms through which government may seek to engage second and third parties more fully in the regulatory process. Most of these will require government to seek out lateral means of extending its reach through innovative market orderings. An obvious starting point is the provision of adequate information. Without reliable data on the performance of industrial firms, those third parties which may be in a position to exert influence, for example in the commercial sphere (*e.g.* investors and banks), will be unable to make objective judgments about preferred company profiles. For example, it was only when government mandated collation and disclosure of toxic releases that financial markets were able to factor this information into share prices, thereby rewarding good environmental performers and disadvantaging the worst performers.[19]

Some strategies for empowering third parties will be specific to particular target groups. For example, government may facilitate the activities of non-commercial third parties such as NGOs through the provision of funding support, the enactment of community right to know legislation, and the provision of legal standing. In seeking to target banks, government might increase lender liability for a range of environmentally destructive behaviours. Insurers, as regulators may be invoked by making insurance a condition of license, or a condition of authorisation to engage in activities that have a high environmental risk.

Governments could also harness the very considerable power of supply chain pressure. For example, governments may make it a condition of regulatory flexibility that firms over a certain size not only adopt environmental management systems (a form of process-based regulation) but also ensure that their major suppliers conform to a simplified version of the system. Alternatively, such a condition could be included in an industry-wide self-regulation program, as is already the case under the Product Stewardship code of practice of the chemical industry's Responsible Care initiative.[20] Thus the use of supply chain pressure by large firms to improve the environmental performance of smaller firms may be

enhanced by a complementary combination with process-based regulation or self-regulation.

Consistent with our design principles, the preferred role for government is to create the necessary preconditions for second or third parties to assume a greater share of the regulatory burden rather than engaging in direct intervention. This will also reduce the drain on scarce regulatory resources and provide greater ownership of environmental issues by industry and the wider community. In this way, government acts principally as a catalyst or facilitator. In particular, it can play a crucial role in enabling a coordinated and gradual escalation up an instrument pyramid (described in principle 3), filling any gaps that may exist in that pyramid and facilitating links between its different layers.

This role can be illustrated by example. Insurance has the potential to be a useful instrument in the middle layers of the pyramid. Insurers have the capacity to conduct site visits, engage independent auditors, vary the size of premiums, and if necessary, withdraw their services altogether. Insurers are, however, dependent on the availability of reliable information on which to make their initial and subsequent assessments of firm performance, but commonly have great difficulty obtaining relevant information over and beyond that required to be disclosed by their clients.[21] As a consequence, there is a necessary role for government (at the bottom layers of the pyramid) to ensure that this information is accessible, for example, through the provision of compulsory pollutant inventory reporting by industry. It may also be that insurers lack the necessary muscle at the top of the pyramid to deal with unrepentant recalcitrants. In such circumstances, insurers may advise government regulators of a firm's transgression and invite the full force of the law to be applied (whether they choose instead simply to cancel the insurance policy may depend substantially on the competitiveness of the market). Thus we have a combination of third party and government regulation coordinated between the different layers of the pyramid to provide the opportunity for coordinated enforcement escalation.

Principle 5: Maximise opportunities for win/win outcomes

A major criticism of conventional regulation is the lack of incentives for firms to continuously improve their environmental performance (for example an emission standard of 100 parts per million (ppm) gives no rewards for companies to substantially exceed this level) and the failure to encourage firms to adopt pollution prevention measures over end-of-pipe solutions (the same standard can be met by putting scrubbers on the chimney rather than developing cleaner technology).

The opportunities for both continuous improvement and pollution prevention will be considerably enhanced to the extent that firms can achieve higher levels of environmental performance at the same time as increasing productivity and/or profits: the classic win/win scenario. A key challenge for policy makers, therefore, is to ensure that regulatory solutions optimise the opportunity for win/win outcomes and facilitate and reward enterprises for going "beyond compliance", while also maintaining a statutory baseline.

Will firms voluntarily go beyond compliance?

It is increasingly argued that it is in business's own self-interest to move **beyond compliance** with existing legislative requirements and adopt a "proactive" stance on the environment, voluntarily exceeding mandated minimum performance standards. According to its proponents, firms going down this path may (in addition to improving profitability) enhance their corporate image, position themselves to realise new environment-related market opportunities, generally improve efficiency and quality, foster a greater consumer acceptance of their company and products, and reduce potential legal liability. Moving beyond compliance also gives firms the incentive to develop new environmental technologies that can be sold into the rapidly growing and lucrative global market for environmental goods and services.[22]

And yet, despite the apparent benefits that may flow from improved environmental performance, the large majority of enterprises in the large majority of jurisdictions have taken very few steps to take advantage of them or to position themselves as environmental leaders. Assuming that considerable win/win opportunities do indeed exist (that is, even if proponents of this position may overstate the benefits, their basic position is sound), why have the majority of enterprises adopted a position that is, on the face of it, irrational? The most plausible answers are an emphasis on short-term profits, and bounded rationality.

The former is probably the single largest impediment to improved environmental performance.[23] Crucially, most environmental investments will only pay off in the medium to long term, while the up-front investment is primarily short term. Because corporations are judged by markets, investors, and others principally focussing on short-term performance, if they cannot demonstrate tangible economic success in the here and now, there may be no long term to look forward to.

Bounded rationality may also explain business' failure to adopt proactive environmental policies even when it is in their economic interests to do so. Bounded rationality assumes not that people are irrational (although they sometimes are) but rather that they have neither the knowledge nor the powers of calculation to allow them "to achieve the high level of optimal adaptation of means to ends that is posited by economics".[24] For example, it is widely accepted that there are substantial energy efficiency improvements that industry could profitably adopt. And yet, most firms fail to take advantage of them. Only where energy is a large component of business input costs, have substantial investments in energy efficiency been made. In the least energy efficient industries where energy costs are only a minor component of overall business costs, energy efficiencies have been almost entirely ignored. This is bounded rationality at work: management focuses on core business functions and ignores lesser costs, even though these costs could be reduced through environmentally beneficial behaviour.

The role of government

Based on this analysis, the market, unaided, cannot be relied upon to deliver win/win outcomes. That is, a number of opportunities that would yield such outcomes are not, under present conditions, being taken up. Arguably, there is a role for government intervention to increase the uptake within firms of existing economically rational environmental improvements: in effect, seeking to compensate for both the inadequacy of

markets (unaided) and of business rationality in order to maximise both the public (environmental) and private (economic) benefits.

But what form should this intervention take? Of course, government could simply mandate improved levels of business environmental performance. However, because there is a coincidence between self-interest and environmental improvement, other less interventionist measures should have a high chance of success, rendering prescriptive forms of intervention unnecessary or even counterproductive (see principle 2, above). Accordingly, the most appropriate role for governmental regulation lies in nudging firms at the margin towards cleaner production, heightening their awareness of environmental issues, and encouraging the re-ordering of corporate priorities in order to reap the benefits of improved environmental performance.

One way of increasing the chances of win/win outcomes is through the provision of information (*e.g.* cleaner production demonstration projects, technical support, databases, and clearinghouses). A related strategy would be to encourage full cost accounting, on the assumption (for which there is much support) that unless business knows the costs and benefits, in environmental terms, of its current practices, it is unlikely to change them. Such strategies may be particularly important in addressing the problem of bounded rationality. Not only can government provide information to industry, but other non-government sources of information can also be harnessed and, in some cases, may be more effective.

Sometimes, because of institutional inertia, even when firms are made aware of potential cost savings they still will not exploit win/win opportunities. In such cases information alone is not enough, but is a necessary prerequisite. Here, information strategies can be supplemented by other voluntary promotional schemes that attempt to elicit and formalise a commitment from management to cost-effective environmental improvement. Examples include government sponsored schemes such as Golden Carrots and Green Lights in the United States, and the PRISMA project in the Netherlands.

Governments might also consider some form of financial inducements to "nudge" firms in the right direction, so overcoming narrow short-termism and bounded rationality. For smaller firms, which may not have the internal resources and expertise to identify and implement win/win outcomes, government may subsidise the cost of external consultants preparing an environmental audit and management plan that seeks to exploit profitable environmental improvements. Again, once firms become aware of how to achieve win/win outcomes, and can easily access the consulting expertise and internal systems necessary to achieve them, they are far more likely to take action. Smaller firms may also require some assistance to cover up front costs and to more easily access capital.

However, it makes sense to target any financial inducements at those firms that are genuinely achieving beyond compliance rather than those firms that merely intend to comply with minimum standards. One way of achieving this is via a two-track, parallel regulatory system that provides incentives to those firms committed to higher levels of environmental performance that go substantially beyond compliance, e.g. increased flexibility, autonomy and public relations benefits less demanding administrative requirements, reduced license fees, preferential purchasing etc. The intention is to attract as many firms as possible to the "green track", but to maintain the conventional track as a

fall-back mechanism. Under this scenario it is not necessary for government to know the level of win/win opportunities available to each firm. Ultimately, it is up to each firm to determine whether financial benefits of minimal compliance are outweighed by the benefits of being a "green track" firm with higher levels of environmental performance. Firms should be able to move between tracks, but if they are placed on green track first, then deliberately fail to meet expectations, they should be regulated more harshly than if they had started off on the conventional track.

Moving the goal posts: turning win/lose into win/win

It is inevitable that even the most progressive companies will eventually reach a point at which win/win is no longer a viable option, and where any further spending on environmental protection will directly threaten corporate profits. Specifically, there are many circumstances under which the economic benefits of investing in environmental protection are tenuous or non-existent, and where the costs to business of implementing environmental protection measures will not be offset by any resulting savings from improved economic performance.[25]

At this point, two strategies are available to government. The first is to recognise the tension between environment protection and corporate profit, and to design policy instruments and enforcement responses accordingly. Here we simply restate the importance of a pyramidal enforcement response such as we advocated at principle 3 above. Regulators start at the bottom of the pyramid, assuming that business is willing to comply voluntarily. However, they also make provision for circumstances where this assumption will be disappointed, by being prepared to escalate up the enforcement pyramid to increasingly deterrence-orientated strategies. Critically, at the peak of the pyramid will be a deterrence-orientated approach that makes it no longer economically rational for firms to avoid their environmental responsibilities.

A second strategy is for government to push back the point at which win/win becomes win/lose.[26] Michael Porter suggests that countries that have the most rigorous environmental requirements often lead in exports of affected products.[27] While such markets may evolve in the absence of government intervention, their scope and success can be influenced by such action. For example, Germany has had perhaps the world's tightest regulations in stationary air pollution control, and German companies appear to hold a wide lead in patenting - and exporting - air pollution and other environmental technologies. Conversely, those who weaken their regulations will fall behind in environmental exports. Thus as the United Kingdom's environmental standards have lagged, so too has its "ratio of exports to imports in environmental technology fallen from 8:1 to 1:1 over the past decade".[28]

However, Porter is at pains to emphasise that not all standards will lead to desirable trade outcomes, and that we need regulations that aim at outcomes rather than methods (that is, performance-based rather than technology-based standards), that are flexible and cost effective and which encourage companies to advance beyond their existing control technology. It must also be acknowledged that Porter's views have been strongly challenged from a variety of sources[29] and that empirical support for his position is somewhat tenuous.[30]

We agree with Porter that there is much that governments can and should do to encourage firms to develop environmental technologies and to harness environmental services markets. However, we disagree that more stringent regulation is necessarily the only or indeed the best means of achieving this outcome. Rather, there are a variety of other, less intrusive policy options than regulation, utilising not just government, but also second and third parties, that could also serve to drive environmental technological innovation and serve to create or expand global opportunities and markets for environmental services. As we argued earlier, such less-interventionist solutions have considerable attractions in terms of costs, effectiveness, and legitimacy. Accordingly, in our view, the Porter solution (since it comes at the peak of an instrument pyramid) should be regarded as a last, rather than a first, resort.

Take for example, the issue of pollution from the chemical industry. While it would certainly be viable, following Porter, to mandate tough standards, it would also be possible to adopt a self-regulatory scheme, as is the case with Responsible Care (with a proviso that if the scheme was not demonstrably achieving certain performance outcomes within a given period, government would intervene more directly). Such a scheme might be coupled with external audit, and government might itself require disclosure of results, enabling commercial third parties and to a lesser extent consumers and public interest groups to bring pressure on those who were achieving the poorest results. Besides being less interventionist than the Porter solution, co-regulation has the additional advantages of providing greater flexibility, giving industry ownership of the solution, and of avoiding much of the culture of resistance that may accompany government regulation.

Instrument Combinations

In this article we have highlighted the importance of utilising combinations of instruments and parties to compensate for the weakness of stand-alone environmental policies. It cannot be assumed, however, that all instrument combinations will automatically be complementary. Some instrument mixes may indeed be counterproductive, while the outcome of others may be largely determined by the specific contexts in which they are applied. Unfortunately, the practical task of identifying which particular combinations are complementary, which counterproductive, and which context specific, is an especially daunting one. Not only is there an extremely large number of potential instrument combinations, but the answers to the question "which ones are complementary or otherwise, and why?" are themselves both complex and qualified. To engage in the encyclopaedic task of exploring the full implications of all instrument combinations would not only be impractical but would not, we suspect, make for riveting reading. Instead, we have chosen to provide a brief overview of potential instrument interactions with some selective examples in order to sensitise policy makers to the importance of selecting judicious policy mixes.*

Inherently complementary combinations

Certain combinations of instruments are inherently complementary. That is, their effectiveness and efficiency will be significantly enhanced by using them in combination, irrespective of the circumstances of the relevant environmental issue being addressed. As such, policy makers can be confident in choosing these combinations over others. An illustrative example can be drawn from the combination of voluntarism (in which

individual firms without industry-wide coordination voluntarily seek to improve environmental performance) and command and control regulation.

Voluntarism will complement most forms of command and control regulation, particularly where levels of environmental performance "beyond compliance" are desired. In the case of performance-based command and control regulation, a minimum performance benchmark is established, with voluntary-based measures encouraging firms to achieve additional improvements. The United States EPA's 33/50 program is a good example of this approach.[31] Under the 33/50 program, firms are encouraged to reduce the levels of their toxic chemicals releases, often at substantial cost, on a purely voluntary basis. Existing command and control regulations that apply to toxic chemical releases remain in force, with the 33/50 program delivering additional benefits.

The combination of the two instruments means that participating firms go beyond the command and control baseline, but that non-participating firms must still comply with this baseline. If voluntarism were introduced alone, then there would be no guarantee that non-participating firms would not increase their levels of toxic chemical releases, thus free-riding on those committed to higher standards. The combination of voluntarism and performance-based command and control (which defines environmental outcomes, but does prescribe particular solutions), in this instance has produced environmental improvements additional to that which could have been achieved if either were employed in isolation. It is important to note that, in contrast to beyond compliance activities, if voluntarism and performance-based standards were targeting the **same** level of behaviour then at best they would be a duplicative combination, and at worst, counterproductive.

Voluntarism may also work well with process-based command and control regulation (where firms are required to adopt internal decision-making processes designed to enhance environmental performance, but not guarantee it), for example, where the adoption of environmental management systems such as ISO 14001 have been mandated.[32] Because process-based prescriptions tend to be qualitative in nature, and therefore more difficult to measure quantitatively than performance or technology-based standards, their full potential is difficult to enforce externally unless the regulated firm is committed to the concept. Voluntary-based measures that seek to change the attitude of managers and the corporate culture may serve to reinforce a commitment to process-based standards.

In contrast, technology-based command and control regulation (which prescribes particular technological solutions) is unlikely to produce complementary outcomes when used in combination with voluntary measures. This is because technology-based standards are highly prescriptive: firms can either comply or not, resulting in little room for beyond compliance achievements. In effect, technology-based standards restrict the way in which firms respond to an environmental imperative in terms of the method of environmental improvement, whereas voluntary measures are, in principle, designed to provide additional regulatory flexibility.

Inherently counterproductive instrument combinations

Certain combinations of instruments are either inherently counterproductive or, at the very least, sub-optimal. That is, their efficiency and effectiveness is significantly diminished when they are employed in combination. The example of command and control regulation and economic instruments is illustrative. Most command and control

instruments, specifically performance-based standards (performance standards define a firm's duty in terms of the problems it must solve or the goals it must achieve) and technology-based standards, seek to impose predetermined environmental outcomes on industry. That is, even if the standards are not uniform (in that different requirements apply to different sectors or indeed different firms), individual firms are not free to make independent judgments as to their preferred method of environmental improvement (in the case of technology-based standards) or their overall level of environmental performance (in the case of performance standards). Economic instruments, in contrast, seek to maximise the flexibility of firms in making such decisions: government influences the overall level of environmental performance by providing a price signal relative to the level of pollution or resource consumption, or by creating a purchasable right to pollute or consume resources.[33]

If a command and control instrument were to be super-imposed on an economic instrument that targets the same behaviour, or vice versa, then to the extent that the command and control instrument limits the choice of firms in making individual decisions, the economic instrument would be compromised. That is, there will be a sub-optimal regulatory outcome. This is because economic instruments are designed to exploit differences in the marginal cost of abatement between firms. It makes economic sense for those firms that can reduce their levels of pollution most cheaply to carry a greater share of the abatement burden, and for those where it is most expensive, to carry a lesser share of the same burden. The result is that the net cost of reducing the overall level of pollution (or resource consumption) will be lessened, or, for a given level of expenditure, a greater level of pollution reduction will be achieved. By simultaneously applying a prescriptive command and control instrument, for example a performance standard that mandates levels of energy efficiency for firms in tandem with a broad based carbon tax, free market choices would be artificially restricted thus undermining the basic rationale of the economic instrument.

There is, however, an extenuating circumstance that may justify the sub-optimal outcome in regulatory efficiency resulting from the combination of broad-based economic instruments with prescriptive command and control. Where pollutants have highly localised impacts, through for example differences in assimilative capacities or proximity to local communities, effectiveness and equity issues may override the efficiency considerations. Localised impacts can be contrasted with global pollutants such as ozone depleting substances, greenhouse gas emissions, and to a lesser extent, sulphur dioxide emissions. In the case of highly localised pollutants, such as the run-off of agricultural chemicals into local river systems, it may be necessary to impose minimum levels of performance on firms/individuals in highly sensitive regions, or indeed a variety of different levels tailored to local conditions, even if there was a more general economic instrument in place. Although this would reduce the overall efficiency of the economic instrument, through the restriction of free market choice, this loss of efficiency may be justified on the grounds of effectiveness or equity.

One way of avoiding potentially dysfunctional results that can arise when applying incompatible instruments simultaneously (and of expanding the operational possibilities of compatible combinations) is to sequence their introduction. That is, certain instruments would be held in reserve, only to be applied if and when other instruments demonstrably fail to meet pre-determined performance benchmarks. One type of sequencing is when an

entirely new instrument category is introduced where previous categories have failed. Another version is when only the enforcement component of a pre-existing instrument is invoked to supplement the shortcomings of another. Logically, and consistent with design principle 2, such sequencing would follow a progression of increasing levels of intervention. The benefit of this approach is that considerable utility can be derived from otherwise counterproductive instrument combinations, and in the process, the overall dependability of the policy mix can be improved.

Combinations where the outcome will be context-specific

In addition to inherently compatible and inherently incompatible combinations, there will be other instrument combinations where it is not possible to state in the abstract, whether the outcome will be positive or negative. Rather, much will depend on the particular context in which the two instruments are combined. For example, this is the case with combinations of voluntarism and self-regulation. These two instrument categories overlap to a substantial extent, and indeed the borderline between them is significantly blurred - the main distinction for our purposes being that self-regulation entails social control by an industry association, whereas voluntarism is based on the individual firm undertaking to do the right thing unilaterally, without any basis in coercion. There is no inherent reason why these two instrument categories should be used in combination with each other, but equally no compelling reason why they should not.

In light of this, it is important for policy makers to distinguish between different instruments combinations that are inherently antagonistic, and those instruments combinations that are dysfunctional essentially as a result of the contextual features surrounding their application. In many cases, the **latter** will arise because of the existence of competing policy goals (rather than any inherent incompatibility of the instrument combinations themselves). For example, in the case of biodiversity conservation in Australia, the introduction of policies to preserve biodiversity have historically been undermined by incentives for clearing native vegetation on private land. Also in Australia, the introductions of a voluntary agreement with industry to reduce greenhouse gas emissions are compromised by the existence of generous tax subsidies for the use of diesel fuel. Where such conflicts exist, a priority for policymakers is the removal of such perverse incentives.

Multi-instrument combinations

So far we have confined our discussion to bipartite mixes. There is of course, no reason why mixes should not be multipartite, and they commonly are. The benefit of our examination of bipartite mixes has been to identify complementary and counterproductive mixes, with the result that we know, in the case of multipartite mixes, what combinations to avoid, and which complementary combinations we might build upon. The possible permutations of multipartite mixes are very large indeed, and it is not practicable to examine such combinations here.

Conclusion

Our general conclusion is that not only is it desirable to use a broader range of policy instruments, but also to match those instruments: with particular environmental problems; with the party or parties best capable of implementing them; and with other compatible

instruments. That is, it is in using complementary **combinations** of instruments and actors that policy makers can build on the strengths of individual mechanisms, while compensating for their weaknesses. And it is with government actively facilitating second and third party involvement that their potential as quasi-regulators is most likely to be realised. Thus the crucial policy questions became: how, in what circumstances, and in what combinations, can the main classes of policy instruments and actors be used to achieve optimal policy mixes?

We have argued that successful regulatory design depends crucially upon adhering to a number of **regulatory design principles,** which have hitherto not featured prominently in the policy agenda. In particular, we counselled policy makers not only to prefer combinations of instruments to "stand alone" instrument strategies, but stressed the importance of preferring the least interventionist measures **that will work**. We also introduced the heuristic device of a three-dimensional pyramid, as a means of escalating regulatory responses, and consistent with the pursuit of pluralistic regulatory policy, argued the importance of harnessing resources **outside** the public sector. We further addressed the extent to which it is possible to design environmental policy in such a way as to encourage and facilitate industry in going "beyond compliance" with existing regulatory requirements.

Finally, we argued that, as not all regulatory instrument combinations are equal, it is incumbent upon policy makers, in seeking to introduce a broader range of regulatory solutions, to carefully select the most productive instrument combinations. We recognise that not all will necessarily agree with the precise conclusions we have arrived at, either in terms of design principles, or preferred instrument mixes. Nevertheless, our intention is, in the first instance, to move the debate forward, and in the longer term, assist policy makers to introduce various forms of "smart regulation".

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COMPLIANCE, ENFORCEMENT AND INNOVATION

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This paper explores government approaches to ensuring environmental compliance. In particular, it explores a variety of approaches with the greatest capacity: (i) to achieve compliance (as distinct from enforcement), (ii) that are easily enforceable (administrative efficiency and effectiveness), and (iii) which promote innovation on the part of regulatees.

1. A Context: The Shifting Regulatory Landscape

In the continuing trend of lower taxation regimes in economically advanced states, many regulatory agencies have suffered budgets cuts since the 1980s. The resultant diminished power and resources of government regulators, has seen others move into the vacated regulatory space. Environmental NGOs, commercial third parties, and business and industry self-regulators have become important players in environmental regulation. For example, environmental NGOs have become stronger and more effective and have sought not only to lobby governments and to pressure industry directly, but also to influence consumers and markets through strategies such as orchestrating consumer boycotts or preferences for green products. And in the realm of commercial third parties the example is the banks and insurance companies who seek to minimise their financial risk by scrutinising more closely the environmental credentials of their clients.

What has evolved is not a retreat of the regulatory state and a return to free markets but rather a regulatory reconfiguration that requires a continuing government role. What are the implications for compliance, enforcement, and innovation? This question cannot be answered in the abstract. Much depends upon the nature of the environmental challenge, upon the sorts of entities being regulated and upon the political, economic, and social contexts. In the time available, three different types of environmental problem are examined to illustrate how compliance, enforcement and innovation challenges might best be addressed in different contexts.

2. Regulating Large Companies

Most large companies have long-term business plans and complex systems of controls designed to manage business and legal risks, including environmental management systems (EMSs). Equally important are large companies' deep pockets and sensitivity to adverse publicity. Therefore in most industry sectors (some large laggards remain) many large companies operate “beyond compliance” (Gunningham, Kagan, Thornton, 2003). Strategies for regulating large enterprises in ways that maximize compliance, minimize the costs of enforcement, and encourage innovation on the part of the regulated enterprise, must take account of the crucial characteristics of such organizations.

2.1 Instruments and strategies

Based on research in North America and Australia (see Gunningham and Sinclair 2002, Ch. 6 for an overview) it is suggested that the most promising options include:

Load based licensing and other Market Based Instruments. Traditional licensing, which focuses on pollution concentrations, does not reward "beyond compliance" nor does it reward innovation. In contrast, load-based licensing focuses on the total amount of pollution emitted each year. The annual license fee is calculated on the potential environmental impact of that pollution, not on concentration levels. The result: the lower the potential for environmental impact, the lower the fee, giving polluters continuing incentives for innovation and for reducing pollution. Compliance costs are modest since the system is based substantially on continuous monitoring and self-reporting together with external audits.

Environmental Improvement Plans involve: (i) a process-based approach in which an enterprise is encouraged to examine systematically its environmental impact and means of reducing it, and to commit itself to an improvement plan, and (ii) a tripartite approach in which the local community is directly involved (together with the regulator and perhaps local government) in the negotiations that result in the enterprise committing itself to environmental targets under the Plan. This approach has been very successful in engaging industry directly and in improving environmental performance. It may also reduce the regulatory resource burden since the community is actively involved in "policing" the agreement. Since the agreement is a negotiated one, industry itself has an incentive to develop least cost solutions and "win-win" outcomes (Gunningham and Sinclair, 2002, Ch. 8).

Regulatory Flexibility*:* A trend, most evident in regulatory flexibility initiatives and proposals for two-track regulation (in the US: Project XL, Performance Track, etc.) is to reward and facilitate large enterprises for going beyond compliance, by providing them with considerable autonomy and flexibility and other incentives, but subject to certain safeguards. Rather than the state policing and enforcing directly, the latter involve attempts to "lock in" continuous improvement and cultural change by requiring "green track" firms to implement an environmental management system, the use of third party independent auditors rather than government regulators to monitor that system, and transparency and community dialogue requirements that facilitate community and environmental groups also playing a role both in critiquing and monitoring firm performance.

While this approach has considerable attractions in terms of rewarding "beyond compliance" behaviour in minimizing the enforcement burden, and encouraging innovation, the results of the USA regulatory flexibility initiatives have so far been disappointing. Whether this is due to inherent flaws in this approach or more to design faults remains unclear. Are the sceptics correct in questioning why so many resources are being devoted to making the top 20% (or perhaps only the top five per cent) even better, rather than concentrating on the most serious problems or on under-performers?

Sustainability Covenants facilitate and encourage large corporations which are already comfortably discharging current regulatory requirements, to achieve sustainable production. They are voluntary agreements that companies, industry associations, and

other organizations can enter into with the Victorian Environment Protection Authority (VIPA) in Australia to identify the means by which the business can improve its resource use efficiency and reduce its ecological impact. It is only if a proposed covenant is, or is likely to be, effective in meeting one or other of these aims that VEPA will become a signatory to it. Sustainability covenants, according to the VEPA, are intended to take advantage of "paradigm shift in thinking about the environment [which] is now often a catalyst for commercial innovation rather than a barrier for economic development". Given this shift, the role of the regulator is to be a facilitator and foster the intellectual capacity and motivation on the part of industry to implement dynamic and flexible solutions to environmental problems and to embrace the broader sustainability challenge.

Operator and Pollution Risk Assessment A risk-based approach is another means of rationally allocating resources. The UK Operator Pollution Risk Appraisal (OPRA) approach, for example, involves the agency in ranking a site in terms of both the risk it poses to the environment and also for the management systems that are in place to control the risk. The total of these scores make up the site's OPRA score, which indicates the overall risk it poses to the environment. By comparing OPRA scores the agency is able to take a risk-based approach to prioritising the regulation and monitoring of sites.

Enforceable Undertakings are an Australian innovation successfully utilised in the areas of consumer protection and corporations. Enforceable undertakings are the result of negotiations, where an organization that is believed to be in breach of the law, offers to the regulator an undertaking to take certain action, and if accepted by the regulator, the undertaking is enforceable in court. This process allows for innovative, flexible, and efficient solutions to breaches, and introduces restorative justice to regulation – empowering the regulatee as well as the regulator (Parker 2004). The broad types of obligation provided in enforceable undertakings apply well to environmental regulation: i) promise to cease the unlawful conduct, ii) measures to protect against recurrences of the misconduct, and iii) remedial action to address any harm caused (Longo 2000).

2.2 Frameworks and Lenses

Below we examine two frameworks, or lenses, that may enrich our understanding of individual policy instruments and what they might achieve.

Corporate Environmental Behaviour and the License Model

The License Model (Gunningham, Kagan and Thornton, 2003) views business enterprises as simultaneously motivated and constrained by a multi-faceted "license to operate," that includes not only the terms of their regulatory permits and legal obligations, but also an often-demanding "social license," and a constraining "economic license," which represent the demands of social and economic actors, respectively.

These regulatory, economic, and social license requirements are monitored and enforced by the stakeholders who generate them, and who commonly seek leverage by exploiting a variety of license terms. For example, environmental groups not only enforce the terms of the social license directly (e.g. through shaming and adverse publicity) but also seek to influence the terms of the economic license (e.g., generating consumer boycotts of environmentally damaging products) and of the regulatory license (e.g. through citizen suits or political pressure for regulatory initiatives). Thus the **interaction** of the

different types of license often exceeds the effect of each alone. The terms of some legal license provisions extend the reach and impact of the social license by directly empowering social activists or by giving them access to information or a role in the permit-granting process, which they can use to pressure target enterprises. Conversely, a company that fails to respond appropriately to social license obligations risks a tightening of its regulatory license, as frustrated community activists turn for help to politicians and regulators.

Policy insights emerging from this work include: (i) technology-based regulation, at least in this industry, was very effective in reducing pollution and arguably efficient in doing so, since a "one size fits all" approach was appropriate to the circumstances of the industry. The anticipation of tougher regulation also provided incentives to search for innovation and to minimise costs; (ii) social license was very important and its effect can be amplified by government intervention to empower communities, provide information, and otherwise strengthen the reach of civil society.

The role of Meta-Regulation

The capacity of the regulatory state to deal with increasingly complex social issues has declined dramatically. There is a limit to the extent to which it is possible to add more and more specific prescriptions without this resulting in counterproductive regulatory overload (Teubner, 1983). To give a concrete example, one cause of the Three-Mile Island nuclear accident and near melt-down, was that operators simply followed rules, without any capacity for strategic thinking, and as events unfolded that were not covered by a rule, they had no capacity to read the situation and respond appropriately.

In contrast, reflexive regulation, which uses **indirect** means to achieve broad social goals, has, according to its proponents, a much greater capacity to come to terms with increasingly complex social arrangements. This is because it is procedure-oriented rather than directly focused on a prescribed goal, and seeks to design self-regulating social systems by establishing norms of organisation and procedure. Such a strategy can also be viewed as a form of "meta-risk management" whereby government, rather than regulating directly, risk-manages the risk management of individual enterprises. For example, the safety regime established for the nuclear power industry, post Three-Mile Island, ceased to be primarily about government inspectors checking compliance with rules, and more about encouraging the industry to put in place safety management systems, which were then scrutinised by regulators, and in this case, by the industry association in the form of the Institute of Nuclear Power Operations.

Under this approach, which is most developed in Christine Parker's "The Open Corporation": "…the role of legal and regulatory strategies is to add the 'triple loop' that forces companies to evaluate and report on their own self-regulation strategies so that regulatory agencies can determine if the ultimate objectives of regulation are being met." Such a government role is crucial because, while companies may have the potential for effective self-regulation, they do not necessarily have either the incentive to engage in this approach nor the systems in place to ensure that it is effective. The role of safety and environmental management systems and of risk management, subject to accreditation and oversight by skilled regulators, is central to such regimes, for instance, the EU regime regarding Major Hazard Facilities (COMAH 2).

3. Regulating Small and Medium-Sized Enterprises (SMEs)

The effective regulation of SMEs is a substantial policy challenge for environmental agencies in all jurisdictions, not least because this group has a number of characteristics that inhibit the application of conventional regulatory measures. These include: a lack of resources (exacerbated by higher compliance costs, a shortage of capital and economic marginality); a lack of environmental awareness and expertise (many are ignorant of their environmental impact, technological solutions to their environmental problems, or their regulatory obligations); and a lack of exposure to public scrutiny and adverse publicity. Moreover, the sheer numbers of such enterprises lead to very infrequent inspections.

In the case of SMEs, there is more scope for negative incentives through environmental regulation than through positive incentives (Gunningham and Sinclair 2002, Ch. 2), though here it is important to identify mechanisms that are not overly demanding of government resources, and targeted to the specific circumstances of SMEs. In this context, three instruments have particular merit.

Self-inspection and self-audit: Self-inspection and self-audit has considerable potential in the context of SMEs. Briefly, this entails a SME manager applying a pre-set checklist of measures (usually tailored to different industry sectors) to determine if their premises are achieving a basic level of environmental good practice. The aim is to foster a basic level of regulatory compliance and good environmental behaviour as opposed to continuous improvement and excellence. In order to minimise the burden involved and motivational fatigue, the list is confined to a limited range of issues (for example, the top four pollution issues in a particular sector).

The potential benefit of self-audit and self-inspection is demonstrated in the case of the printing industry of Minnesota, in the United States. Here, SMEs are encouraged to self-inspect and to report results to the regulator by being afforded limited statutory protection from enforcement action. Participating firms are also awarded a "green star" on the completion of an audit. In addition, the relevant industry association has taken the approach a step further by providing auditing services to its members in order to develop site-specific compliance plans. A failure to commit to the plan results in removal from the scheme. A crucial inducement to participate in the self-audit is a preceding letter sent by the regulator, which implies that non-participants will be a high priority for inspection and, in the event of breach, enforcement action. In Massachusetts, this inducement to participate and take the self-certification seriously was added to by making owners or managers personally responsible for complying with environmental regulations.

Harnessing Supply Chain Pressure: In many sectors there are massive disparities of commercial power along the supply chain that can be harnessed in the interests of environmental protection. Larger firms, in particular, may be able to impose product and process preferences on other firms, using their market power to influence the behaviour of upstream suppliers and downstream buyers. Supply chain pressure thus offers a valuable means of influencing the environmental behaviour of SMEs, and given the difficulties government faces in regulating SMEs directly, it may prove to be an important and effective complementary strategy.

There are a variety of roles that government can play in encouraging, facilitating, and rewarding large companies to be more proactive in exerting pressure on the SMEs that are their customers. It might for example: exert its own supply-chain pressure through its procurement policies; make this a condition for the granting of regulatory flexibility; encourage larger firms to form partnerships with smaller buyers and suppliers, and provide public recognition to those who do so; hold this out as an important feature of environmental best practice models; insist upon such a requirement directly in legislation; or require such efforts to be articulated in corporate environmental reporting.

Using surrogate regulators: Sometimes government's capacity to regulate SMEs is very limited but there is a credible third party that may be harnessed to play a surrogate regulatory role. For example in the Australian State of Victoria, vehicle repairers (that, in aggregate, cause extensive pollution) have been encouraged to engage in voluntary initiatives (EMS and "Clean Green Body Shop") but these have had limited success. However, when the State's major vehicle insurer was persuaded to insist that it would only contract with vehicle repairers that complied with the EMS/Clean Green Shop initiatives, then substantial compliance was achieved.

Neighbourhood Environmental Improvement Plans: NEIPs (introduced in the Australian state of Victoria) are designed to foster local community involvement in, and control over, environmental issues relevant to their neighbourhood. NEIPs involve a series of steps, including: (i) a process of public consultation; (ii) identifying a shared vision of the most important environmental issues; (iii) establishing a steering group to oversee the NEIP; (iv) engaging partners, such as business and community groups, and landlords of industrial estates to build consensus and commitment; and (v) preparing a draft proposal. Key requirements include, *inter alia*, that it must: specify the area covered; be consistent with relevant environmental protection policies; provide for the monitoring, compliance and reporting of agreed outcomes; include consultation with affected parties; and provide for review and evaluation.

NEIPs are deliberately broad in scope in that they can apply to a range of environmental issues, and they are designed to facilitate the engagement of both residents and businesses. They may be particularly useful when there are multiple sources of pollution and where a joint effort is required to develop and implement solutions. For example, stream water quality may be affected by litter, the impacts of erosion from building sites, or householders or businesses putting wastes into drains (EPA Victoria, 2002).

4. Regulating Agricultural Non-Point Source Pollution

Non-point source pollution is one of the most serious water quality problems confronting many jurisdictions, and agriculture is the most substantial contributor to it. Controlling such pollution presents a very considerable policy challenge because, by definition, pollution from diffuse sources cannot be readily identified and measured as it leaves a landholder's property. Moreover, it is caused by a diversity of different practices and land uses, it enters the water system in a number of different ways, and its impact is mitigated by weather conditions, soil type, and a variety of other factors, not all of which are fully understood. Against this backdrop, how should environmental law and policy address non-point source pollution from agriculture.

Perhaps because of its complexity and political sensitivity, policy makers have chosen to address this issue largely through voluntarism and other forms of exhortation. However, while politically acceptable, such approaches have been manifestly unsuccessful in achieving change. Elsewhere, it has been argued that what is required is not only the establishment of credible pollution targets, time frames, and assessment criteria, but also the development a range of policy instruments that are demonstrably effective, and deliver acceptable trade-offs in terms of efficiency, equity and political acceptability (Gunningham and Sinclair, 2004).

This implies matching the type of standard with the context in which it is to be applied, and developing a blend of positive and negative incentives, underpinned by coercive mechanisms in some circumstances. There is value in applying a **range** of policy instruments under each of three broad categories: farm management practices, landscape changes, and land use patterns, in order to engage with different facets of the problem. There are particular virtues in the use of process-based standards under the first of these categories (environmental management systems, farm management plans, Best Management Practices, etc.), specification standards under the second (*e.g.* buffer zones by waterways 50 metres wide, limits on fertiliser application) and of broad scale planning and development control strategies under the third.

Dealing with the inevitable trade-offs between cost-effectiveness, equity and political acceptability raises a particular challenge, which might be dealt with through a phased approach, engaging a diversity of mechanisms to deal with different aspects of this complex environmental challenge. In the first instance this relies on a complementary package of measures based on positive inducements (e.g. subsidies and auctioned grants) in recognition of the political and cultural difficulties in achieving the desired change and of imposing it on a resistant and politically powerful rural constituency. Ultimately, however, if these measures demonstrably fail to meet agreed performance outcomes at catchment and sub-catchment level, then a more interventionist mix of measures is demonstrably justified, including the use of negative incentives and direct regulation. (*Source:* Gunningham and Sinclair, 2004).

5. Conclusion

The limitations of each of the major policy innovations, and of the conceptual frameworks that drive next generation regulation, lead to a plea for pragmatism and regulatory pluralism. Notwithstanding some encouraging results, none of the policy instruments or perspectives examined above work well in relation to all sectors, contexts, or enterprise types. Each has weaknesses as well as strengths, and none can be applied as an effective stand-alone approach across the environmental spectrum. In part, such a conclusion suggests the value of designing complementary combinations of instruments, compensating for the weaknesses of each with the strengths of others, whilst avoiding combinations of instruments deemed to be counterproductive or at least duplicative. This indeed was the central message of our previous work, embedded within the pluralist perspective (Gunningham and Grabosky, 1998; Gunningham and Sinclair, 1999; and Gunningham and Sinclair, 1999a). From this perspective, no particular instrument or approach is privileged. Rather, the goal is to accomplish substantive compliance with regulatory goals by any viable means using whatever regulatory or quasi-regulatory tools

that might be available, in ways that facilitate compliance, at least administrative cost, and in a manner that encourages innovation.

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PROMOTING INNOVATIVE, COST-EFFECTIVE APPROACHES TO COMPLIANCE ASSURANCE

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In today's society, if an environmental regulator is to make a real difference, regulation means solving problems with others. It means using incentives and rewards just as much as the threat of tough action.

Promoting innovative and cost-effective approaches to compliance assurance should not be an excuse for de-regulation. Streamlining regulation has a role in the modernising agenda, but it is more important and innovative to focus on the better use of resources, and working with business and industry to deliver environmental outcomes. As the environmental regulator for England and Wales, we do not want to remove the foundations on which we are able to have this discussion, and the environmental outcomes must be at least the same or even better than those delivered by traditional regulatory approaches.

There are many ways to promote new approaches to compliance assurance, and perhaps the most interesting, but often least discussed, is ensuring that legislation is appropriate in the first place. In Europe, there have been far too many cases of legislation that over-regulates, increasing costs to the regulator, business, and industry, without clear environmental benefit. New and revised European legislation also tends to be written in isolation, with no common framework. Seemingly minor differences in terminology between different legislation can lock time and resources into the process of understanding what this actually means for compliance assurance and is confusing for the regulated business or industry. Standard terminology and transparency of legislation can drive cost effectiveness for compliance assurance.

Therefore, how can environmental regulators find cost-effective approaches to compliance assurance? The Environment Agency's approach is that of the UK government's Better Regulation Task Force.

Any approach must be **transparent, accountable, consistent**, and more importantly, **proportionate or risk-based**. Also, our regulation must be **targeted**, with the environmental outcomes central to planning and **assessing our own performance**.

The Environment Agency added a sixth principle: **practicability**. It is essential that regulators be involved in policy-making in order to achieve this.

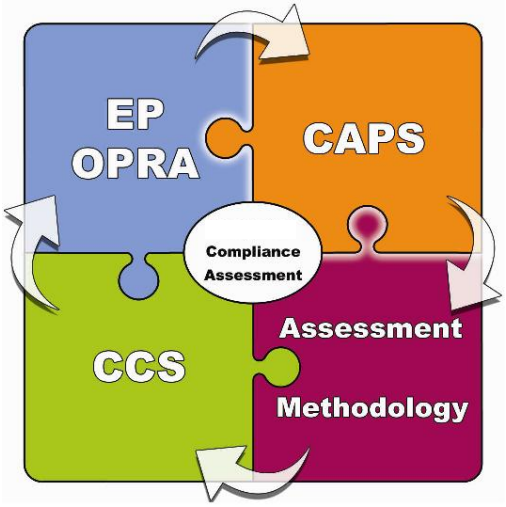
By consistent application of these principles the Environment Agency is already realising financial and resource reduction benefits to our conformance and enforcement activities.

In addition, it is essential that all these principles are applied to the whole regulatory cycle to be able to benefit from the greatest opportunities of innovation. By including all aspects of this cycle - legislation and policy development, permitting, compliance assurance, enforcement and prosecution - we ensure that an integrated, holistic approach is taken, providing greater regulatory, financial, and environmental benefits. We have also had to be clear about the cost-effectiveness of modern approaches and to whom the cost/benefits will accrue from each approach.

Hand in hand with the approaches taken by a regulator, businesses must also be challenged to respond in kind. Business needs to be proactive and to go beyond the minimum necessary to comply with the law.

Turning to specific Environment Agency innovations, there has been an innovative and integrated approach to all our compliance assurance activities that will deliver efficiencies both to us as the regulator and those we regulate. Our approach is moving from a system biased towards achievement of set numbers of inspections or other numerical targets, to a system that is more proportionate and risk based, focuses on achieving environmental outcomes, and enhances the link between environmental risk, regulatory costs, and permit compliance.

The four elements of the package are the Environment Protection Operator and Pollution Risk Appraisal (EP OPRA), Compliance Assessment Plans (CAPs), Compliance Assessment Methodology, and the Compliance Classification Scheme (CCS).



EP OPRA is a way of assessing pollution risk posed by an activity to the environment. It provides consideration of environmental outcomes, financial incentives for improved operator performance, allows benchmarking of operator performance, gives recognition to EMSs, ISO 14 000 series, and EMAS in our regulation. This approach has been used for water management, and in future will be used for other regulatory regimes such as pollution prevention and control (PPC), abstraction licensing, water quality, and the nuclear industry.

Compliance Assessment Plans (CAPs) are the second strand of this model. A CAP assigns resources to the various types of compliance assessment work that our environment protection that staff carry out by sector. This is an appropriate mixture of site visits, audits,

procedure review, check monitoring and sampling, and review of submitted data and reports. The total amount of resources allocated to a CAP will be proportional to an installation's risk derived from the EP OPRA score and the variable permit fees.

The third strand of this integrated approach is Compliance Assessment Methodology, which provides a standard method for undertaking compliance assessment on a site to ensure a more consistent approach to regulation. This methodology is based on auditing techniques rather than tick-box inspection.

Under the fourth strand, the Compliance Classification Scheme (CCS), all breaches of permit conditions are classified according to the potential the breach has to cause an environmental impact. This classification also determines the enforcement action to be taken. At the end of each year, information from the CCS will be fed back into the EP OPRA profile for an installation. Sites that have experienced high levels of permit breach will see their EP OPRA score increase, with an increase in annual permit fees and regulatory resource. Sites that have good compliance records benefit from reduced EP OPRA scores, reduced charges, and regulator oversight. This approach ensures that the costs of extra compliance assessment work associated with the breach of condition(s) are recovered from poorly performing operators.

Shareholders and the general public can also be key players in improving environmental performance. However, it is important that there is easy access to information and data that will help inform the debates.

The Environment Agency produces an annual public report on the worst and best environmental performers, including their OPRA scores and compliance histories, allowing shareholders to make decisions on their financial holdings, and the public the ability to benchmark companies locally or nationally.

We also make this information available on the Internet through a section "What's in my backyard?" along with any prosecutions and fines. What is also of interest is that industry is also starting to publish this data in its own environmental reports, and benchmarking its own sites against its industrial sector. In addition, some ethical investment institutions are using the data for their own decision-making processes.

We recently produced a research report on the environmental disclosures of the FTSE All Share companies. We found that the vast majority of companies produce disclosures lacking in depth, rigour, and quantification. Environmental disclosures need to be clear, consistent, comparable and compulsory, as is the case for financial information. Only when these criteria are met can the public, shareholders and customers fully influence the regulatory cycle and compliance assurance.

Prosecution, fines, and penalties are usually the last of the tools we use to improve compliance performance. The Environment Agency has a broad range of criminal powers including formal prosecutions.

One penalty against a company is the imposition of a fine, although we have secured jail sentences. In general, we regard the sums imposed by courts as far too low to deter non-compliance. Average fines for corporate offenders have recently been falling. At £8 412 in 2003, and £6 500 in 2004, the average is less than in 2002 and falling.

It is important that where we provide regulatory recognition for companies, for example where they have ISO14 001 or EMAS, that the companies themselves accept that this must be balanced with heavier fines and penalties when they are not compliant. Therefore, we are pushing for new alternative and innovative forms of sentence to punish and change behaviour. We would like the power to calculate and impose administrative penalties, as are used most effectively by some other regulators and in other jurisdictions.

In summary, there are a variety of ways in which we are creating new and innovative approaches to regulation and compliance assurance. These approaches must be considered in an integrated way, with all aspects of the regulatory framework used to achieve the best results. It is not a choice between modern instruments, such as reporting and emissions trading instead of traditional approaches, rather these are all tools to choose from a "toolbox". Often you need more than one tool to do a job. This provides challenges that can be difficult to address but, if we get it right, there are major benefits for government, business, regulators, and the public.

PUBLIC DISCLOSURE SYSTEM AS AN EFFECTIVE TOOL FOR POLLUTION CONTROL IN INDONESIA: THE IMPLEMENTATION OF PROPER

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1. Background

The population in Indonesia rapidly increased over the period 1970-2000 with a growth rate of 1.6 to 2.4% per year. As a consequence, there has been an increase in the need for products and services, which then has encouraged industrial activity to grow at a rate of 10% annually. This has given rise to economic growth over the past few decades with seven per cent annual growth, and for that reason Indonesia was considered as one of "the East Asia Miracle" countries.

Indonesia's geographically strategic position with around 17 500 islands spread out between two oceans and two continents has also enhanced the growth of industries, both domestic and international.

Even though, on the one hand, such a phenomenon has brought about remarkable effect on economic growth, on the other hand, negative impacts resulting from this issue have been acknowledged. One of these is the imbalance between environmental aspects and industrial activities. Such activities have contributed to environmental pollution and degradation, and even more natural disasters. The worsening of environmental quality in Indonesia is indicated by the increasing of marginal land (to 21 969 430 hectares); acid rain caused by decreasing air quality; water pollution, which has led to the dwindling of clean water resources (estimated at up to 15-30%, annually (SoER 2003).

This paper focuses on environmental pollution control of industrial activities undertaken by the Ministry of Environment (MOE) through a conventional approach and alternative instruments *i.e.* the implementation of public disclosure system.

2. Problems in the Traditional Environmental Policy Approaches in Indonesia

Various policies and programs in environmental pollution control have been arranged and implemented by the government to attain a better and healthier environmental quality. Environmental pollution control programs such as the Clean River Program (PROKASIH), Blue Sky Program, Hazardous Waste Management, and Environmental Impact Assessment (EIA) are intended to be the monitoring instruments for industries to comply with existing regulations. Consequently, capable and qualified human resources to implement those programs is needed.

However, some problems have been faced by the government in carrying out the above issues, such as:

- Lack of monitoring system caused by lack of quantity and quality of human resources. As an illustration, there are many inspectors who do not have enough apprehension of effective monitoring, information on industrial production processes and pollution control technology;

- Limited budgets to undertake monitoring on industrial activities due to the large number of industries scattered throughout Indonesia. As environmental issues have not yet been a priority for government, the objective of environmental management cannot be effectively attained;

- Lack of coordination among related institutions;

- Lack of environmental knowledge, therefore training courses are needed for stakeholders;

- Since the year 2000, The Ministry of Environment has launched specialized investigators, however, due to the small number of specialized investigators compared to the enormous number of activities that can cause environmental problems; the task of controlling cannot be optimally carried out by those specialized investigators.

Those problems, along with weak law enforcement in Indonesia, have been identified as the factors that cause ineffectiveness in environmental management.

Moreover, the long period of time needed to resolve an environmental case in Indonesia is another reason that means environmental management cannot be optimally implemented. It needs approximately two years to be able to settle an environmental case, mostly due to long processes of providing scientific evidence. The common procedures in resolving an environmental case are as follows:

- investigation, which includes the activity of data and information collection, laboratory analysis, and coordination meeting;

- investigation for collecting evidences regarding pollution and environmental degradation, consisting of operational budget, laboratory analysis, and coordination meeting;

- legal brief;

- trial;

- appeal to the high court;

- appeal to the Supreme Court.

3. Alternative solutions in environmental pollution cases

3.1. Role of the public

Social Capacity for Environmental Management (SCEM) is the capacity to manage environmental problems as a whole society by the interaction of three main actors, namely: government, industries and community both at the national and local level (Matsuoka, 2000). In the SCEM scheme, the community plays very important roles in environmental management. It functions as a watch dog for industrial activities as well as a government controller.

Public complaint on industrial pollution is a case in point. The number of public complaints has been ever-increasing recently. This seems to be an indicator of the rising of the public role and awareness in environmental problems. Based on the data of public complaints from MOE, there are many environmental cases considered to be biased and susceptible.

3.2. ISO 14 000

The implementation of ISO 14 000 series certification for companies is one endeavour to ease environmental pollution and degradation. The principle is "continuous improvement" meaning that a company must perform enhancement in environmental investments to attain certain environmental standards stipulated in a specified period of time. However, the term of "continuous improvement" does not necessarily mean compliance. In some cases, companies that obtain ISO 14 000 certification, do not comply with regulations, but they have plans to improve their environmental management system. Such contracts are awarded when a company is committed to making an Environmental Management System (EMS) plan. However, since this is a voluntary program, there is no penalty if the company does not follow the plan. This makes ISO 14001 more a ceremonial award than a factual indicator of a company's state.

4. Public Disclosure System

The efforts to have industries comply with environmental laws and regulations based on their own initiative, have not been effectively achieved. Therefore, the Ministry of Environment of Indonesia has introduced the Program for Pollution Control, Evaluation and Rating (PROPER) as a response to some obstacles in implementation of the conventional system. PROPER is one of instruments to control pollution based on the sustainable development principle: through environmental compliance and companies' performance in improvement of environmental management; and through the introduction of disincentive and incentive reputation, by disclosing environmental performance of industries to public and stakeholders.

In addition PROPER is aimed at promoting awareness and compliance of industries towards environmental law and regulations; at improving compliance with environmental impact management through active public participation; and at reducing adverse impacts from industrial activities.

Environmental performance of industries is evaluated based on various sources of data, namely: self monitoring data, local government monitoring data, third parties data,

and PROPER team data. Combination of this data is converted into a colour rating system in which the level of industries' environmental performance is categorized into five colour criteria (Table 1).

Table 1. Five colour criteria of industries environmental performance

Rating	Description
Gold	Pollution level exceeds significantly legal standards and there is near zero emission. Company implements 3R (reuse, recycle, and recovery) and community development programmes.
Green	Better than legal standards by 50%, use of clean technology, waste minimization, pollution prevention, and resource conservation, and community relation.
Blue	Efforts meet minimum legal standards
Red	Efforts do not meet legal standards
Black	• No pollution control efforts • Serious environmental damage

The first introduction of PROPER was in the year 1995; the second programme was implemented in 2002. Unlike PROPER 1995, which covered only water pollution control, PROPER 2002 methodology includes water, air, and hazardous waste and, as expected, reflects industries' environmental performance comprehensively. Environmental ratings are based on industrial performance in seven areas:

- Compliance with water pollution regulations;
- Compliance with air pollution regulations;
- Compliance with hazardous waste management regulations;
- Compliance with AMDAL (EIA requirements);
- Quality of environmental management system;
- Resource management and use;
- Community development and relationship.

As mentioned above the huge number of industries spread out across Indonesia, limits human resources and financial support to evaluate industries' performance. Therefore the assessment is not conducted as one step, but as many. Industries are selected based on the following criteria:

1. The activities should potentially damage the environment;
2. High impact to the environment of medium and large-scale industries in their production capacity and waste;
3. Listed companies either in domestic or international stock market;
4. Export oriented.

In its implementation, PROPER uses four main principles, namely:

1. Fairness: sources of data are not only from the PROPER inspection team but also from local government, self-monitoring, by industries and valid data from third parties. In addition, data used is a time series so that industries' environmental performance can be demonstrated;

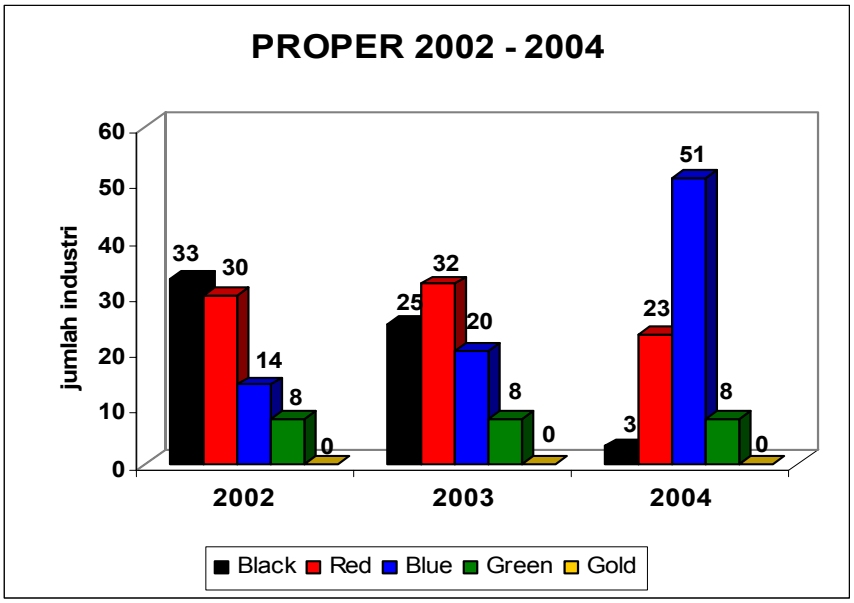
2. Accountability: qualitative and quantitative data is used to evaluate the performance of industries;

3. Transparency: community and stakeholders have access to obtain information on industries evaluation;

4. Public participation: the society functions as a "watch-dog" of industries activities.

Between 2002 and February 2004, 85 industries consisting of manufactures, agriculture, forestry, mining, and energy and gas were rated. Figure 1, below shows performance of those 85 industries.

Figure 1. PROPER rating for 85 industries



The table depicts improvement in environmental performance of industries. It can be seen that the number of industries that comply with the regulations improved by 43.51%. In 2002, out of 85 enterprises there were only 22 (or 25.9%) that complied with standards. This number increased to 59 industries (69.41%) that met or went beyond standards by 2004. Therefore, PROPER has effectively motivated industries to improve their environmental performance.

5. Response of Industries to PROPER

Within the period 2002-2004, there was a significant increase in industrial compliance (to 43.15%), with environmental standards. Largely, big-scale industries have been

positively responsive toward such policy and have made efforts to enhance their environmental performance. This is owing to large-scale industries reliance on a good image. Below are factors that have motivated industries to participate in PROPER:

- Strong commitment of the industries to carry on their environmental policies;
- The industries are trying to comply with the EIA;
- The industries' awareness of their environment;
- PROPER can create a benchmark for each sector of industry;
- As an anticipation of the discontented stakeholders;
- PROPER can be a media of information for the industries in enhancing industrial performance with regard to pollution control.

Through PROPER, the managers' awareness notably increased, which is indicated by larger budgets allocated for environmental activities and Community Development programmes.

6. Administration Cost

The comparison of administration cost to execute the law enforcement system (conventional approach) versus PROPER (alternative instrument) is described below:

Table 2. Administration Cost of pollution control programs

No	Litigation *)		PROPER **)	
	Description	US$	Description	US$
1	Surveillance	4,000	Inspection and laboratory analysis	38,000
2	Investigation	8,000	Coordination meeting	
3	Verdict plan	2,800	PROPER council	5,600
4	Trial	11,000	Peer Review	5,600
5	Appeal to high court	2,800	Press briefing	1,100
6.	Appeal to supreme court	2,800		5,500
	TOTAL	**US$ 31,400 / case**		**61,400 / 43 industries = US$ 2,362/ case**

*) Cost needed for litigation for one environmental case
**) Cost needed for PROPER to evaluate 43 industries

From the above table, we can see that PROPER required US$61 400 to monitor 43 manufacture industries during 2002-2004. An increase in industrial performance was obtained by 60% of the total 43 industries. Thus, the cost needed to be provided by the government to increase the performance of environmental management of one industry is approximately US$2 362.

Meanwhile, a budget of US$ 31 400 must be provided in order to resolve only one environmental case of non-compliance in a traditional way, not to mention the long procedure period. A further problem, here, is that most verdicts are light punishment,

usually with a probation period. This approach has no significant deterrent effect on industries.

7. Limitation

Based on the experience from PROPER implementation, it has been found that the approach is only effective for large-scale companies. The reason for this is that most large-scale industries are concerned with the image they lend to their market both internationally and domestically, Meanwhile, small and medium-scale enterprises are not as concerned as large-scale industries. Therefore, PROPER cannot be applied to all industries, especially those of micro, small and medium scale.

8. Summary

Bearing in mind the above details, it can be concluded that PROPER is a more effective program than traditional law enforcement.

Further, PROPER is especially effective in the short term in increasing industrial performance in environmental management. PROPER is also an instrument that can develop environmental public awareness through involving the community as the controller of industrial activities.

Finally, PROPER is a complementary instrument to other environmental law enforcement activities, so therefore Indonesia still needs strong environmental agencies.

MEETING AGENDA

2 December, 2004, Thursday	
9:30 – 10:00	***Opening Session***
	Welcome Remarks ***Kiyo Akasaka***, Deputy Secretary General, OECD
	Presentation of the Agenda ***Brendan Gillespie***, Head, Non-Member Countries Division, Environment Directorate, OECD
10:00 – 13:00	**Session 1: Incentive Framework for Firms to Comply with Regulations**
	Chair: Hermien Roosita, *Ministry of Environment, Indonesia*
	Session 1 will aim to identify the main factors that influence environmental performance and the behaviour of firms vis-à-vis environmental policies and regulations. A better understanding of such factors could help to identify policy mixes that could better stimulate firms' constructive response to regulations. The session will examine: ❖ First, an economic perspective which suggests that, all things being equal, firms will compare compliance with non-compliance costs (including sanctions) and choose the least costly alternative. This would include discussion of the nature of firms' management (risk aversion/risk taking), type of firms (size/sector), management/ technical/ technological capacities; time-frame, etc. ❖ Second, findings that suggest that it is not only the regulator that influences non-compliance costs, but also community pressure. Market participants can also create non-compliance costs for firms (negative market or stock-market reactions, reputational losses, etc.) ❖ Third, sociological approaches that suggest that firms might also be motivated to apply environmental measures and/or react in line with

	prevailing social norms when making environment-related decisions. These theory-based perspectives will be examined in relation to empirical findings and be complemented by information on possible further factors that affect environmental behaviour of companies. The session will also attempt to assess whether, and to what extent, there are differences between specific types of firms (e.g. between public and private, small and large, national, local and multinational) and their responses to regulations
10:00 – 11:00	**Panelists:** ***Mark Cohen***, Owen Graduate School of Management, Vanderbilt University, United States ***Annemiek Roessen,*** Head of the North-West Regional Inspectorate, the Netherlands ***Dirk Hazell***, Chief Executive, UK Environmental Services Association, BIAC Environment Committee ***Nick Johnston***, Environment Directorate, OECD
11:00 – 11:30	*Coffee/Tea Break*
11:30 – 13:00	OPEN DISCUSSION
	Issues for discussion: 1. Which factors have the greatest impact on regulatory compliance and non-compliance? 2. Are there clear differences between firm types (public-private, small-large, local-national-multinational) or firm location (developed-developing economies, economies in transition) both with respect to factors driving their compliance behaviour?
13:00 – 15:00	*Lunch Break*
15:00 – 18:00	**Session 2: Government Approaches to Ensuring Environmental Compliance**
	Chair: Antonio Benjamin, *Law for a Green Planet Institute, Brazil*
	From an economic perspective, regulators would aim to maximise welfare when enforcing a regulation and aim to balance administrative and compliance costs with the environmental benefits from reduced pollution. In practice,

	however, enforcers are often subject to political pressures, or they may just follow different strategies, such as trying to maximise compliance with environmental legislation. The objective of Session 2 is two-fold: ❖ First, it will analyse regulators' actions from the perspective of economic and political economy-based literature and assess their relevance in practice. ❖ Second, it will suggest the types of regulatory approaches that are best suited to induce compliance, are easy to enforce and that promote innovation. During this session, as in Session 1, the administrative costs associated with ensuring compliance with environmental policy measures will be discussed. It will also include their impact on compliance costs for industry. The characteristics of an efficient regulatory system that promotes compliance and innovation will also be discussed. As this session will consider the systems for personnel management and capacity building to encourage inspectors to carry out their job effectively, it will aim to make suggestions regarding provisions to limit corrupt regulatory behaviour.
15:00 – 15:45	**Panelists:** ***Neil Gunningham,*** Regulatory Institutions Network, Australian National University, Australia ***Phyllis Harris***, Deputy Assistant Administrator, Office of Enforcement and Compliance Assurance, US EPA, United States ***Mauricio Mendonça Jorge***, Coordinator of Industrial Competitiveness Unit, Brazil National Confederation of Industry, Brazil
15:45 – 16:15	*Coffee/Tea Break*
16:15 – 18:00	OPEN DISCUSSION
	Issues for discussion: 1. Which are the key elements of an incentive framework that would best encourage firms to comply with, and go beyond, regulations? 2. How should the discretion of local regulators be structured so as to achieve efficient, effective and equitable enforcement action in practice? 3. Can better performance management of enforcement agencies help in strengthening compliance assurance? How to limit the opportunities for rent-seeking activities?

18: 00 – 20:00	Cocktail for the Participants (lobby of the Conference Room)
3 December, 2004, Friday	
9:30 – 13:00	Session 3: Optimising Compliance Monitoring and Enforcement
	***Chair: Phyllis Harris**, US EPA, United States*
	The key objective of Session 3 will be to examine how the use of the main, traditional instruments of environmental inspectorates - monitoring and enforcement – can be optimised and to assess their impacts on administrative and firms' compliance costs. On the basis of empirical evidence, this session will address several inter-related issues: ❖ how inspectors allocate their limited enforcement budgets between monitoring (inspections) and enforcement (sanctions); ❖ what kind of enforcement measures they apply according to which rules; ❖ on which criteria they base penalties; and the extent to which "deregulatory strategies" are pursued (e.g. regulatory relief in return for the application of environmental management systems and publication of environmental performance information).
9:30 – 10:15	Panelists: ***Antony Heyes***, University of London, United Kingdom ***Hidefumi Imura,*** Department of Urban Environment, Graduate School of Environmental Studies, Nagoya University, Japan ***Anita Akella***, Conservation International
10:15 – 10:45	*Coffee/Tea Break*
10:45 – 13:00	OPEN DISCUSSION

	Issues for discussion: 1. How can enforcement approaches be optimised with respect to environmental goal attainment, the effectiveness of administrative implementation and firms' compliance costs? What obstacles need to be overcome? 2. How can 'sticks' and 'carrots' be used in a mutually supportive way? When they work against each other?
13:00 – 15:00	**Lunch Break**
15:00 – 17:15	**Session 4: Promoting Innovative, Cost Effective Approaches to Compliance Assurance**
	Chair: Hidefumi Imura, *Nagoya University, Japan*
	Session 4 will examine experience with the application of new and emerging instruments that can reduce the administrative costs of monitoring and enforcement. It will also assess the limits to administrative cost savings and the effects of these instruments on firms' compliance costs. Some of the approaches that will be addressed include the role of market forces in compliance assurance (e.g. the role of shareholders and consumers); information provision and role of the public (self-monitoring and self-reporting as a complement to state monitoring, compliance promotion by the regulating agencies, performance rating and information disclosure schemes); and the role of the courts (including, for example, personal liability for non-compliance, complaint procedures, class actions, access to litigation); and possibly others.
15:00 - 15:45	**Panelists:** ***Christopher Howes,*** Compliance Assessment and Enforcement Policy Manager, Environment Agency of England and Wales ***Antonio Benjamin***, Senior Advisor to the President of the Brazilian Senate and Director, Law for a Green Planet Institute, Brazil ***Hermien Roosita,*** Assistant Deputy of Manufacturing, Infrastructure and Service Affairs, Ministry of Environment, Indonesia
15:45 – 17:15	**OPEN DISCUSSION**

	Issues for discussion: 1. Can "non-classical" approaches result in lower administrative costs overall? What are their impacts on firms' compliance costs? And what are their limits? 2. Do penalty schemes allowing for personal liability improve regulatory compliance?
17:15 – 18:00	**Summary of the Discussion and Closing Statement**
	Chair: Kenneth Ruffing, *Environment Directorate*
	Summary of the Discussion ***Invited representatives of Government, Industry and NGOs***
	Closing Statement ***Kenneth Ruffing,*** Deputy Director, Environment Directorate, OECD

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