Environmental Regulation and Standards, Monitoring, Inspection, Compliance, and Enforcement*

Introduction

Environmental regulation and standards refer to the set of specific rules that authorize and control a given firm’s activities so that it operates within legally and socially acceptable parameters. Monitoring the firm’s compliance with these regulations and standards is of vital importance, as this yields information for both the regulated agent and authorities. Inspection ideally should be a mere cross-check on monitoring, to confirm whether agents are in compliance. However, achieving compliance quite often requires enforcement of regulations and standards, because most firms are not always in full compliance.

Environmental regulation and standards are classical command and control instruments, but they have evolved to some extent and facilitate pollution prevention and management as long as they are well designed, appropriately applied, and their use is coordinated with other policy instruments.

Description and Application of Environmental Regulation and Standards

Environmental Regulation. This policy tool imposes specific limits on firms’ ongoing activities or to changes and expansions of existing firms. Despite the importance of fairness, limits for otherwise identical firms may be different depending on several aspects of the operation, such as health or environmental risks that depend more on the surroundings than on the firm itself. Environmental regulation adopts the form of operational permits that are often issued by different authorities in charge of particular portions of the environment. The kinds of permits that authorities, whether central or local government agencies, most often require are water permits, air permits, waste permits, and hazardous materials permits. When these permits are issued with common policy goals, they become an extremely powerful tool. However, if there is a lack of coordination between authorities, they lose most of their power, as they may not prevent pollution but merely transfer it to other media (for example, from air to water). The same

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applies to monitoring and to enforcement of the conditions set in permits, which should also be kept simple and be done in a coordinated way.

Environmental Standards. These policy tools are perhaps the oldest of environmental tools, though designed and used to control or prevent environmental health problems. Standards are categorized as either ambient or emissions standards; both are important to comprehensive environmental regulation. Setting ambient standards requires an explicit agreement on environmental quality objectives that are desirable and the costs that society is willing to bear to accept these objectives. Since ambient standards can be set at different levels for different locations, they can be used to protect valuable environments. Ambient standards also offer a simple method for setting priorities with respect to focusing efforts on pollution management, since areas that comply with ambient standards are considered to require no further intervention.

Emissions standards typically set maximum emission limits of particular pollutants to one or more media, and these limits are usually based on the best available and economically feasible technologies, thus forcing agents to move towards those technologies. Standards have typically been expressed in concentrations, but there is increasing use of load-based standards, which reflect the overall objective of reducing the pollution load on the environment, and also discouraging excessive resource use for dilution of emissions to comply with standards. Alternatively emissions standards can be established by estimating the discharges that are compatible with ensuring that receiving areas around the firm meet the ambient standards defined for the pollutant. This however requires considerable information on both the sources and the ambient environment, and varies from area to area. New source performance standards are specific emissions standards for new plants. They tend to be stricter as they assume that new plants can more easily adopt cleaner processes at the design stage.

Most standards are set on an activity basis and in terms of one or more pollutants that affect a specific medium (for example, air, water, and soil). This is done because it is deemed to be simpler and more effective, although it has many shortcomings and risks. Standards have also historically focused on simple pollutants, like BOD, and this derives from their being relatively easy to detect and measure. Attention has now moved to other more persistent pollutants (such as heavy metals and poly-carbonated biphenyls — PCBs) which may be less obvious, but which tend to accumulate and are non-biodegradable, thus resulting in more severe health impacts. Several international conventions (for example, Basel Convention2, Rotterdam Convention, and Stockholm Convention on Persistent Organic Pollutants) address some of these persistent pollutants.

If standards are not set within a clear policy framework and according to clear priorities, they may

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1 The World Bank Group has a set of good practice technical guidelines with respect to ambient and emissions standards for different industry sectors. The reader may find these useful to review in conjunction with this policy note. These Environmental, Health, and Safety Guidelines are available at http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines (IFC 2011).

result in preventing or controlling pollution in a particular medium, but at the same time may induce a transfer of pollutants to other media. Hence, not only does the policy design and framework need to be consistent and clear, but the development of standards must also take into account effects on transfers of pollution across media, in order to avoid creating new problems. There is no correct way to set standards. It requires an iterative process that allows for consideration of both environmental and economic benefits. This is one reason why it is not appropriate to import standards from other countries, and also why it is important to ensure periodic re-evaluation in order to determine if standards are responsive in furthering national environmental policy.

It has also been argued that if a standard is set to protect the environment, its sole purpose is to internalize environmental costs and avoid environmental damage. Thus, the cleaner an industry is, the lower its required investment in pollution control. This definitely creates a bias in favor of cleaner activities and cleaner firms, which in actual fact may be seen as a cost correction. Yet, standards that have been set this way face the difficulty of discouraging economic activity in the short term or worse. Quite often standards are based on a particular technology as the solution to a problem, forcing some agents to mount an undue effort and forcing others to adopt the technology which may not in practice solve the problem.

Standards, however well designed, normally impose financial and economic burdens on the agents that have to comply with them. Although it is difficult to compare environmental benefits with financial costs, an effort must be made to ensure that the cost of implementing a standard does not exceed the social benefits it creates. In this sense the regulated agents and other stakeholders within society should participate significantly in the design and development of the standard, and this must be done without favoring any party, be it the regulated agents, or authorities and civil society. Avoiding an environmental problem always seems a good objective, but sometimes the solution involves closure of plants, loss of jobs, and at times even indirect negative environmental effects. Standards must be strict, but must not go against sustainability.

**Monitoring.** The monitoring of activities or agents that have to meet environmental standards is as important as the nature and quality of the standard itself. If limits are not clearly measurable, the compliance with standards that cannot be easily monitored by the agents themselves or by authorities renders the tool virtually useless. Thus, methods to verify compliance with standards must be as clear and as simple as possible so that the agents can know how they perform vis-à-vis the standard and whether they can prevent actions that might put compliance at risk. Similarly, authorities should be able to determine accurately and rapidly if the agents are compliant.

Adequate monitoring diminishes the need for inspection and the cost of inspection itself, although here again we often find that agencies impose monitoring according to their own needs and increase costs significantly. In most countries inspection is done by the agencies themselves or in a specialized manner, focusing on particular issues. This often
leads to biased results, as some important shortcomings may be overlooked, whereas less important problems are stressed. Furthermore, in some activities where shifts can be made rapidly, pollution transfers may occur (see box 1). A coordinated monitoring process would lead to a decrease in overall costs of regulation and improve outcomes.

**Box 1. Monitoring in Mexico**

An example of pollution transfers between media is the case of water and air inspections during the Presa de Silva crisis in Mexico in 1996, where chrome discharges to water were known to be a problem. Every time water inspectors visited shoe-manufacturing plants, legal reasons compelled them to wait a day.

When the inspection took place, discharges were perfectly within limits, while air emissions created discomfort for the neighbors. When air authorities visited the same plants and inspected them a day later, their air emissions were within standards, though the water was foul.

It took the water and air inspectors about a week to accept that unless they did a joint visit, they would never find problems, and when they agreed to do it they found that both air and water parameters were out of bounds, thus reaching an adequate assessment and diagnosis. This led to clean technology projects for these shoe-manufacturers, which eventually became compliant.

**Inspection.** If there are costs that have to be faced by agents to comply with the limits set in the standard, the effectiveness of inspection is crucial. The higher the risk of being caught out of compliance for a particular agent, the more likely its behavior will effectively change, although this also depends upon the level and effectiveness of fines. In the same way as a proper balance should be sought in the development of standards, a balance between inspecting authorities is also crucial. If a certain group of standards is not adequately addressed in inspections, then there may be a perfectly designed set of standards, but they will not induce the desired changes in behavior. Current best practices tend to unify or coordinate inspection activities even if these are by different authorities.

Standards in general impose conditions that must be met by all agents and seldom take into account environmental or health risks that may require more strict limits in particular zones, though this should be common practice. In general site-specific or critical local conditions should not determine standards, as these should be dealt with in a different manner – that is, through specific environmental regulation of firms or activities in particular areas.

**Adequate enforcement.** For environmental regulation and standards to be effective, there must be strength and credibility behind the policy. Strength derives from both the likelihood of inspection and the level of fines. If the cost of compliance is higher than the fines that may be imposed and the likelihood of being caught is low, given the weakness of inspecting agencies, most agents will not seek to be in compliance, unless non-compliance has other consequences that actually increase the cost, such as closure of operations for periods of time or loss of market share or niches.

A question that has no definite answer is whether inspection and enforcement should be part of the responsibilities of the regulating authorities or carried
out by a separate agency or agencies. The preferable solution depends more on how coordinated inspection is with direct regulation and the standardization process, than on a particular institutional setting. Separating command and control reduces the discretionary power of agencies, whereas putting them together under a single management increases the likelihood of coordination. Promotion of compliance through voluntary instruments is extremely valuable both to diminish the inspection requirements and to increase compliance and best practices.

**Prerequisite Factors for Environmental Regulations and Standards**

*Adequate Timelines.* Best practices in standardization: To avoid high costs and to allow firms to adapt properly, time should be allowed for firms to change their technology, although this crucial factor may become a reason for failure if deadlines are either moved by the authority, or agents feel that they will not have to comply. Other ways of avoiding high costs of implementation of standards are to explicitly combine them with economic instruments, such as tradable permits. However, these solutions more often than not fail a sequence where the standard is set, then monitoring becomes reliable for all actors (including government), and only after that will the application of tradable permits be possible.

*Agency Coordination.* All authorities that intervene in the permitting of a specific firm should be aware of the effect their particular action has upon the firm and upon the particular conditions imposed by others, but often this is not the case. Water authorities are focused on avoiding polluting water discharges, and air authorities on avoiding air emissions. Waste is often divided between central and local government agencies, with this being a central government issue in the case of hazardous or toxic waste and a local issue for all other waste. Unless all authorities are coordinated, it is quite likely that different permits will have different degrees of strictness, and may thus induce the transfer of pollutants from one medium to another. Pollution prevention focuses on preventing the generation of pollutants, and yet if permitting is not carried out in a multi-medium manner, it may have the effect of, for example, simply transforming toxic waste into toxic gases and toxic water discharges.

The need for coordination is clear, but there are huge obstacles to achieving it in actual practice. For every government agency, the more restricted its goals are, the better; thus, the agency only requires information that concerns its subject. As a consequence, although government and environmental policy should have a global picture of a firm, it quite often has only bits and pieces, and each agency lacks the information the others have. Consequently, each agency reaches a biased assessment, based on its particular interest, rather than a coordinated view of the problems and trade-offs. This is exacerbated by the fact that firms normally react to particular permits one at a time, because they are seldom issued simultaneously. Thus, an effective instrument for pollution prevention quite often becomes an instrument for pollution transfer, where the most affected medium is the one being regulated by the weakest agency.
Coordination is the only way these transfers can be avoided, and this would foster prevention. However, coordination requires enormous political will and a clear environmental policy design. Europe had both, and since 1997 it has been unifying all permitting criteria and centering them on promoting the best available and economically feasible technology. Furthermore, this has come with differential incentives for different sizes of firms, and has been set as community law. However, not all regions or countries have succeeded in coordination.

Local Knowledge. The development of standards requires a solid scientific and technological basis as well as a good assessment of the weaknesses and strengths of the country’s productive structure and its effects on pollution. Thus, a critical mass of researchers, industry, civil organizations, and public institutions is necessary and may not often be found in developing economies, which often results in the adoption of other countries’ standards, trying to take into account plausible effects. See box 2 below.

Box 2. Water Temperature Regulations

A typical case of the adoption of imported temperature limits involves regulating water discharges. In many tropical countries, absolute limits were imposed on maximum discharge temperatures (especially in the case of hydroelectric plants), and often these imported limits were lower than the temperature of incoming water to the generating plant.

This problem was usually solved during the development of the standard, as electricity generating firms normally take part in the process of standardization, but at times this posed problems to plants using particularly warm upstream water.

Advantages and Limitations of Environmental Regulations and Standards

Certainty. A benefit of standards that is seldom acknowledged is they provide certainty to agents and enhance their ability to adapt to social demands on their behavior. Thus, although standards represent costs, which are often not negligible, they also have advantages for private firms, as their planning horizon is more clearly outlined.

Transfer Pollution Medium. A common danger to both standards and environmental regulation is that they may not induce pollution prevention in the sense of fewer pollutants, but that they may induce pollution transfers from one medium to another. This should be avoided as much as possible, and it requires that an accurate and common diagnosis of the problem be reached across all agencies. Integrated pollution prevention and control (IPPC) approaches as have been required by the EU for more than a decade address this issue. Such approaches are also becoming more widespread in developing countries, such as South Africa.

Standards should not center on one particular medium, but on the effect of the pollutant on all media, and this can be achieved either by a unified standard or through coordinated standards. Similarly environmental regulation should avoid establishing weak limits in one or more areas, as this will most likely be the source of increased pressure upon the medium with lax limits.

Strictness. Making a standard too strict will often promote unwanted results, as regulated agents may
not be able to bear the cost of meeting the standard, or are no longer allowed to do what they were doing and have to do something environmentally worse. See example in box 3.

Box 3. Regulation of Hazardous Waste in Mexico
An example of unwanted results of environmental standards in Mexico was the declaration that classified used oil as a hazardous waste and the imposition of a number of restrictions on its disposal, with poor enforcement. As a result, the cost of handling used oil according to the new regulations skyrocketed.

Most small users of oil opted to deny they generated used it, and a black market for used oil appeared where informal brickyards substituted used oil for cleaner fuels. Thus, there was both a loss of control and a host of new problems.

Scope. Another typical case where standards are not an adequate tool to achieve policy goals occurs when a single agent or a small number of them create an acute local problem. In such circumstances, direct and specific environmental regulation becomes the perfect complement for standards. If a small number of agents create a problem, a modification of their operational permits would be the best solution to the problem, making them face stricter limits than other similar agents. This may seem unfair, because it goes against the notion of a technologically level playing field, but it enables authorities to solve local problems in a more efficient way.

Interaction with other Tools and Possible Substitutions
It is very difficult to regulate, or enforce through a standard, the total number of agents operating in a given area. Thus, the number of agents may exceed the particular carrying capacity of an area even when all agents are in compliance with applicable regulations. These situations require other tools, such as land use permits, tradable emission permits, or other limitations on the number of agents. Yet, differentiated standards can significantly enhance results if combined with other instruments and if differentiated limits are set to impose a greater effort on agents in areas with higher activity density (see box 4).

Box 4. Differentiated Air Quality Standards
A good example of differentiated limits to solve a problem involving large numbers of agents are emission standards for vehicles in highly contaminated cities, where the policy objective is to improve air quality through diminished vehicle emissions. These standards state that vehicles with emissions above a certain level cannot be used every day in the particular area, but the strict standard applies only to cities with severe problems or where a trend towards these problems is present and needs to be stopped. Relatively less clean vehicles are allowed to circulate every day in other cities and towns and in rural areas, as the very strict standards are not required. This has been partially successful in Santiago de Chile and in Mexico City.

Most economic instruments entail artificial prices that require scarcity, which can be created partially through command and control; most economic instruments also require adequate monitoring. This creates situations of complementarity. In such circumstances, a good standard can be much less costly if a market is envisaged along with it than if it relies exclusively on inspection and enforcement. The best example of this is the SOx – NOx regulation of utilities in the United States, where the emission...
standard was modified and a market was created. It is important to note that more often than not, markets require standards and monitoring in place in order to operate. Likewise, voluntary instruments, used in conjunction with standards and regulations, may significantly reduce the cost of regulations and simultaneously achieve enhanced results. In addition, other tools, such as EIA, require standards to be in place to be able to assess objectively whether a project needs to mitigate its impact on the environment.

Practical Examples of Environmental Regulations and Standards

**Mexico.** The Programa de Industria Limpia (Clean Industry Program) in Mexico seeks to promote pollution prevention by creating incentives (basically public recognition and fewer inspections) for firms that adhere to a commitment to achieve environmental targets that go beyond compulsory requirements. This process has been extremely successful for large firms that seek the recognition, and has also helped inspections to target hot spots rather than large firms, given that the latter ensure compliance through the program. (PROFEPA, Programa de Industria Limpia, www.PROFEPA.gob.mx).

**United States.** The U.S.’s water emissions standards stem from the Clean Water Act and require discharges to undergo tertiary wastewater treatment regardless of the firm’s activities. The design of these standards assumes that a tertiary treatment plant for water discharges would solve most if not all water quality problems and would not bias competitiveness between industries, as firms would all face similar marginal costs regardless of their activity as a result of the standard. In practice, this has meant that firms whose discharges are relatively clean have had to face significant costs to treat the water, whereas others where tertiary treatment is not enough have been acknowledged as being in compliance with the standards. Most Latin American countries have imported the same philosophy in developing their standards (albeit only requiring either primary or secondary treatment for discharges rather than tertiary treatment). This has led to similar shortcomings.

References and Resources for Environmental Regulations and Standards