ENVIRONMENTAL POLICIES CHOICE

AS AN ISSUE OF INFORMATIONAL EFFICIENCY

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Field of research: environmental law and economics

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1. Choosing between different environmental policy instruments

We can say that the problem of the choice of environmental policy instruments is an old issue since the early contribution of Pigou (1932) analyzing the need for an intervention by the state, when private costs diverge from social costs, and suggesting the solution to internalize through taxes the externalities. Critically with the proposed state intervention, Coase (1960) affirmed that "there is no reason to suppose that governmental regulation is called for simple because the problem is not very well handled by the market or the firm". The key feature is the presence of transaction costs that makes a policy better than other.

So the debate over this problem has been conducted following these two opposite views: on one hand the supporters of the idea that the choice of policy instruments coming from a market failure is a public matter and the state, as a policy designer, has to select the optimal instrument and to care about its imposition in the public interest. On the other hand the supporters of market based instruments, trying to fight a battle against a sort of "anti-market" mentality based on a kind of reluctance in applying market-oriented instruments (Lewis, 1996).

So if we want to follow this direction the problem would be to compare the efficiency of instruments that can be considered "public-oriented" and instruments that can be considered "market oriented", where the first are characterized by a public agency with a public definition of conduct rule and a public enforcement system; the second kind are instruments based on market mechanism stimulating indirectly the conduct of the firm and characterized by a private administration and a private enforcement system[1].

Given this premise, the definition of a superior and not ideological line to be followed in the choice between different environmental policy instruments seems as a very difficult task.

But looking at this problem through a law and economics perspective, we can try to move from the theoretical definition of the efficiency of different instruments to their practical, and so direct, potentiality to reach concrete objectives. Particularly three objectives emerge as relevant to judge the practical efficiency of environmental policies: the first is the compensation, in the case of an accident, to the victims; the second is the prevention, in the sense of the incentive for firms to improve safety standards; the third is connected with technological change in the sense to encourage firms to adopt lower risk technologies.

Given these three objectives, we are going to analyze the efficiency of environmental policies focusing on the imperfections that can emerge in their practical applications. Particularly in this contribution we will concentrate on informational problems that can characterize the activities of the agencies and private firms in relation with the efficient implementation of the different environmental policy instruments.

As a matter of specification and to precisely define the instruments, we present in Figure 1 a scheme on the different environmental policy instruments that we are going to consider in the

[1] For what concerns the contrast between private and public enforcement: see Cooter (1984).

choice. Particularly in the Figure the first choice is between liability and regulation, where the latter includes a subdivision between, on one hand, "command-and-control" form of regulation based on the definition of standards while, on the other hand, market-based instruments as indirect form of incentive for private firms. Another subdivision can be considered at this point: typically "command-and control" regulation can be technology based standards or performance standards. Also market based instruments can be of different kinds: taxes or tradable permits. On the opposite side, liability is an instrument based on the judiciary system. Liability can be assigned on the base of a negligence or a strict liability regime. Finally the limit of "judgment proofness", that can arise from the application of a liability system when the resource of the responsible party are lower than the damage amount, can be solved in two ways: the first one is a compensation fund and the second is a financial responsibility system.
Before defining specifically regulation, liability and the other instruments in the following paragraphs, we must say that in practice it is difficult to speak about the use of a specific policy instrument given that actually it can be noticed that the environmental policy choice is usually addressed to combine a mix of these instruments.

2. Regulation versus liability

"Regulation and tort law are alternative methods (though often used in combination) for preventing accidents. The former requires a potential injurer to take measures to prevent the accident from occurring. The latter seeks to deter the accident by making the potential injurer liable for the costs of accident should it occur." (Landes and Posner, 1984, p. 417). But before dealing with the problem of the comparison between the two instruments we are going firstly to define their main features.
As a definition, a regulation system is typically characterized by a centralized structure in the sense that it is a system based on an authority or an agency that uses a number of tools to control environmental damages. With the term "regulation" we intend "a directive to *individual* decision-makers requiring them to set one or more output or input quantities at some specified levels or prohibiting them from exceeding (or falling short of) some specified levels" (Baumol and Oates, 1975). Usually the regulation system takes the form of the setting of standards: in this case under a mandatory technology or abatement standard, the regulator can order the firms to reduce their emissions by a certain percentage, to emit no more than a specified amount of a pollutant, and/or to install a particular abatement technology. As alternative, there are incentive market-based instruments, as marketable permits and taxes (Backhaus, 1999).
First of all, we can affirm that in a world with perfect or at least complete information, following a law and economics approach, the policy instrument consisting in a regulatory system is efficient in solving the problem of internalizing the potential effects of environmental accidents. In fact, implementing this instrument, *ex ante* the firm receives the proper incentive to take the efficient level of precautions. But "problems of measurement and the breakdown of second-order conditions (among other things) constitute formidable obstacles to the determination of truly first-best environmental policy" (Copper and Oates, 1992).
In fact, in an incomplete information context many problems can arise that will be analyzed in the following paragraph in connection with the different forms of regulation.
On the other hand, we consider a liability system for environmental damages as a policy instrument in the sense that a liability system provides protection for the victims against the consequences of

an environmental accident and gives incentives to the actors in a potential accident setting for an efficient adoption of preventive measures (Calabresi, 1970; Shavell, 1987). We consider the typical liability system applied to risks created by hazardous activities: in this case the victim files an action against defendants for all injuries caused by their conduct claiming a causal link between the defendant's conduct and the plaintiff's injury.

A liability system can be applied using a negligence regime or a strict liability regime. Generally the question of whether liability should be based on strict liability or on a negligence regime was addressed by the law and economics literature with the conclusion that both regimes provide a potential polluter with incentives to take an efficient level of preventive measures. But problems arise if we consider the practical application of the regimes and the presence of informational issue.

Regarding the specific case of environmental accidents, it is particularly difficult to determine the standard to assign liability on the base of negligence: pollution for example has many sources and many victims and it is an hard work to prescribe efficient pollution standard based on a calculus of the abatement cost and the external harm of every source of pollution.

In fact, the regime more often applied in the case of assignment of liability for environmental accident is the strict liability one. In US the CERCLA (Comprehensive Environmental Response, Compensation and Liability Act 1980, 1985, 1996) type of liability is typically a strict, joint and several liability, on the owners and operators of the firm that is responsible of an environmental accident. Also in EC, in the *White Paper on Environmental Liability*[2] the liability system is essentially a strict (no-fault) and non-retroactive liability system for damage caused by inherently dangerous activities[3].

Looking at the two policy instruments, regulation and liability, we can see that they may present different informational issue, as in Rose-Ackerman (1991), "Statutory regulation, unlike tort law, uses agency officials to decide individual cases instead of judges and juries; resolves some generic issues in rulemakings not linked to individual cases, uses nonjudicialized procedures to evaluate technocratic information, affects behavior ex ante without waiting for harm to occur, and minimizes the inconsistent and unequal coverage arising from individual adjudication. In short, the differences involve who decides, at what time, with what information, under what procedures, and with what scope".

Trying to compare the two, we can consider the contribution of Shavell (1984a). Particularly the author considers as a first determinant in the comparison the difference in know-how between private parties and the regulatory authority related to the benefits of activities, the cost of reducing risks, and the probability and the severity of accidents. It clearly could happen that the nature of the activities carried out by the firms is such that the private parties have better knowledge of the benefits, of the risks involved and of the cost of reducing risks. In such a case a liability system is better because it makes the private parties the residual claimants of the control of risks. But it may

[2] Commission of European Communities, "*White Paper on Environmental Liability"*, COM (2000), 66 final, Brussels, 9 February, 2000.

[3] In the words of the European Commission: "Strict liability means that fault of the actor need not be established, only the fact that the act (or the omission) caused the damage. At first sight, fault-based liability may seem more economically efficient than strict liability, since incentives towards abatement costs do not exceed the benefits from reduced emissions. However, recent national and international environmental liability regimes tend to be based on the principle of strict liability, because of the assumption that environmental objectives are better reached that way. One reason for this is that it is very difficult for plaintiffs to establish fault of the defendant in environmental liability cases. Another reason is the view that someone who is carrying out an inherently hazardous activity should bear the risk if damage is caused by it, rather than the victim or society at large. These reasons argue in favour of an EC regime based, as a general rule, on strict liability" (Note above, par. 4.3, under the title "The Type of Liability, the Defences to Be Allowed and the Burden of Proof").

also happen that the regulator has better knowledge because of the possibility of centralizing information and decisions, in particular when knowledge of risks requires special replicable and reusable expertise. In such a case, direct regulation is likely to be better.

A second determinant is the limited capacity of private parties to pay the full costs of an accident, either because of limited liability or of insufficient assets. In the words of the author a traditional liability regime does not provide private parties with proper incentives for care. A regulatory system can impose directly or indirectly the proper decisions on the firms. So, the greater the probability or the severity of an accident are and the smaller the assets of the firm are relative to the potential damages, then the greater the appeal of regulation. But we will see below that public funds and financial responsibility can be applied.

The third determinant is the likelihood with which the responsible parties would face a legal suit for harm caused. This problem is particularly present in environmental risks: in many cases the victims are widely dispersed with none of them motivated to initiate a legal action, harm may appear only after a long delay, and specifically responsible polluters may be difficult to identify. Compared with a regulatory system, the liability system is more uncertain and provides lower incentives for risk control.

The fourth determinant is the level of administrative expenses incurred by the private parties and the public. The cost of a liability system includes the cost of efforts, the legal expenses, the public expenses for maintaining legal institutions. The cost of the regulatory system includes the public expenses for maintaining the regulatory agencies and the private costs of compliance. In this case the advantages of the liability system is that legal costs are incurred only if a suit occurs and, if the system works well, in the sense that there are incentives for choosing the efficient level of care, the suits are few and therefore the costs are low. On the other hand, under regulation, the administrative costs are incurred whether or not the harm occurs because the process of regulation is costly by itself and the regulator needs to collect information about the parties, their activities and the risks.

Considering the four determinants, Shavell concludes that administrative costs and differences in knowledge favour liability, while incapacity to pay and escaping suit favour regulation. In general, a liability system is more efficient when private parties possess better information and when accident has a low probability to occur. Regulation is better when harm is usually large, is spread among many victims or takes a long time to show up, when accidents are not very rare events, and when standards or requirements are easy to find and control.

Another contribution of Shavell (1984b) deals with the characterisation of the relationship between the regulation systems, as complements or substitutes in providing incentives to reduce the level of risk, showing that no regulation system alone leads the parties to exercise the socially desirable level of care. This is due to different factors: on the one hand, the agency suffers from lack of information problems and, on the other hand, a liability system presents the possibility that the parties would not pay fully for harm and might not even be sued. Shavell first of all considers the case where only the *ex post* regulation system or the *ex ante* one can be used and then the case where both systems can be used jointly so that the parties must satisfy *ex ante* standards and are also subject to *ex post* liability. The conclusion is that it is generally socially advantageous to use both *ex ante* and *ex post* regulation systems.

In another contribution, Kolstad, Ulen and Johnson (1990) stress that the two policies may be complementary. They claim that even if the phenomenon of complementary use of *ex ante* and *ex post* systems is widespread, the economic literature has mainly studied the two separately, characterizing each of them by different inefficiencies. In addition to the four above mentioned

determinants in the comparison by Shavell (1984a), the authors consider the imperfection in the definition of legal standards which may lead the firms to choose a level of precaution different from the socially optimal one. They conclude that the liability system, applied jointly with *ex ante* regulation, can correct the above inefficiencies, at least in part.
Another kind of contributions try to include in the analysis of the comparison between *ex ante* and *ex post* regulation systems informational issue. In this sense the paper of Schmitz (2000) presents a critical evaluation of the above papers suggesting the use of the two systems as complementary instruments to overcome the limited efficiency of liability due to enforcement errors and to injurers escaping suits. The author proposes the comparison between *ex ante* and *ex post* system as imperfect instruments through a formal model of the way by which the imperfections affect the outcome: the extension of liability to private financiers is imperfect insofar as the private financier maximizes its own profit rather than social welfare; the regulatory agency may be captured by the parties who may cause environmental accidents; an asymmetric information framework is considered where the level of precautionary activities is private information of the firm. The author shows that if injurers cannot escape suit and if the magnitude of liability is set at the optimal level, it can never be socially advantageous to employ both the systems as complementary instruments if all injurers face the same wealth constraints. But the joint use can be valuable if wealth varies among injurers and in the latter case, the regulatory standard can be set at a level that is lower than the one corresponding to the social optimum obtained when *ex ante* regulation is used alone[4].
With this analysis of the contributions about the comparison between *ex ante* and *ex post* regulation systems we have showed some results in terms of the choice of environmental policies including informational issue. In the next paragraphs we are going to analyze separately different instruments included in the general definition respectively of regulation and liability.

3. Analyzing different forms of regulation

Generally the implementation of any form of environmental regulation requires to determine the quantity of polluting emissions and the monetary costs of the damage connected with an eventual accident. This implies a monitor procedure and then a regulatory tools that can be or setting a standards or distributing the cost to the firms through a tax or through permits based on their polluting emissions.
In each case informational problems can derive from monitoring the firm conduct at a detailed level, for example the emission levels, and these problems can lead to an inefficient level of enforcement and to over deterrence. But these informational issues need to be analyzed in connection with every single different regulatory instruments.
There exist different forms of regulation: on one side public-oriented "command-and-control" instruments, which require the use of a particular technology or the observation of a performance standards, prescribing the maximum amount of pollution that a source can emit; on the other side, market-oriented instruments that are essentially pollution taxes or a system of tradable permits. Fans of command and control technology requirements has wrestled with devotees of incentive-based approaches such as taxes and tradable allowances (Wiener, 1999).
Under highly restrictive conditions, it can be shown that both the environmental policy instruments share the desirable feature that any gains in environmental quality is obtained at the lowest possible

[4] The comparison between liability and regulation can be modelled also using a fomal economic approach base on a principal-agent kind of rapresentation. See Boyer and Porrini (2001, 2002).

cost (Baumol, Oates, 1975). “Theoretically, the government could achieve such a cost-effective allocation of the pollution control burden among sources if it could ensure by some means that all sources controlled at the same marginal cost. However, such an approach would require the government to have detailed information about the cost functions of individual firms and sources – information that the government clearly lacks and could obtain only at great cost, if at all” (Hahn, Stavins, 1991).

For what concerns command and control instruments, generally regulatory measures are defined and imposed by agencies that prescribe what measures a firm should take to prevent harm. So it is assumed the existence of an agency charged with meeting this objectives. The essence of the agency activity is to control the actions of many individuals and independent actors (firms, households, other government units), and to induce to take actions contrary to their narrow self-interests with constraints (Bohm, Russell, 1985). These measure can be imposed by general rules or individual licenses, taking the form of emissions standards based on a particular quality or quantity of emissions in the environment. Non compliance with such standards is usually enforced by administrative or criminal sanctions.

Command-and-control instruments set uniform standard for firms. So, if, on one hand, such instrument forces all firms to shoulder identical shares of the mitigation burden, regardless the relative costs of this burden to them even if the same firms can adopt preventive measure at much less cost than others. On the other hand, the command-and-control are direct instruments to effectively limit the dangerous emissions.

In its application, this regulation system has shown the advantage to be well suited to set policies regarding the definition and implementation of standards. The centralized search facilities, the continual oversight of problems and a broad array of regulatory tools can make the regulation system capable of systematically assessing environmental risks and of implementing a comprehensive set of policies. But, regulatory agencies may be not very flexible in adapting to changing conditions and centralized command structure relying on expert advice may be subject to political pressure as well as to collusion and capture by the regulated firms.

We can distinguish between different kind of standards: technology standards or performance standards. In the first case the firm is not free to choose the measures to reach a certain environmental quality, this is literally a command and control instrument that imposes a certain technology that has to be used by the firm. In the second case there is some degree of freedom for the firm in the sense that the standard determines the amount and the quality of substances that the firm can emit but then the firm can choose the technology to do it.

Considering the distinction between technology based standard and performance standard, the second one does not identify a particular equipment to comply with a regulation attempt to achieve a specific ecological goal giving to private parties a flexible way to do it. This feature can be an advantage in relation with the informational problems connected in general with the use of command and control instruments: the agency activities are not costless, checking the behavior of the actors against applicable regulatory orders, or determining what is owed by way of emission charges implies some expenses; also the activity of monitoring is another cost for the agencies; there is also the problem so called “capture”, and public agencies can be motivated by paychecks and promises of promotion or there can be a connection between their interests and the firms interest given they are vulnerable to bribery from third parties or from the class of offenders they are supposed to monitor.

We can now analyze other kind of regulatory instruments, such that they do not directly prescribe, differently from command and control, what the behavior of potentially polluting firms should be.

A Pigouvian tax for example is a way to attribute a price to pollution that will be calculated by the firm in the price of its products, but the incentive to the adoption of abatement techniques relies on the market mechanism because the firm that does not apply the optimal techniques will produce more pollution paying more taxes and selling the products to an higher price than its competitor.
Market-based instruments as regulatory devices that shape behavior through price signals rather than explicit instructions on pollution control levels or methods, are often described as "harnessing market forces" because they can encourage firms and individuals to undertake actions that serve both their own financial interest and public policy goals (Stavins, 1998).
By these instruments, in respect to traditional command-and-control ones, there is a dynamic incentive for technology innovation. They accomplish this by allowing the firms to share the burden of pollution control more efficiently through encouraging the firms to achieve reductions in pollution more cheaply. So market-based instruments such as taxes and tradable permits should be generally preferred to technology requirements and fixed emissions standards because the incentive-based instruments are typically far more cost-effective and innovation generating than their alternatives (Keohane, Revesz, Stavins 1997). Particularly these instruments could provide continuous dynamic incentives for adoption of superior technology, since under such instruments it is always in the interest of the firms to clean up more if sufficiently inexpensive clean-up technologies can be identified (Jaffe, Stavins, 1995).

4. Compensation funds versus financial responsibility

A very important problem connected with liability policy instrument is the limit of firm financial resources compared with the amount of the damages that could derive from an environmental accident. This problem arises when identified polluters result to be judgment -proof and so not able to pay for the total damages. Moreover, given that they do not pay the full cost connected with the environmental damage they are not stimulated to the adoption of the efficient level of preventive measure (Shavell, 1986; Summer, 1983).
This problem emerged dramatically in US in cases of reduced size firm operating in risky production activities (Ringleb, Wiggins, 1990). On a economic point of view, this is a problem of internalization in the sense that it causes the fact that some of the losses of the victims may go unclaimed under conventional strict liability; moreover in some cases firms facing considerable liability risks may reduce their capital using "judgment proofness" as an evasion strategy (Van't Veld, Rausser, Simon, 1997).
As instrument of internalization we can mention first of all the one that consists in the use of a compensation fund. Usually funds are created in connection with a regulatory system to cover environmental damage, contaminated sites costs, and victim compensation amount. The fund can be financed by a taxation system or by a firms' contribution system.
The most important application of this instrument is the one by CERCLA, that afforded the *Environmental Protection Agency* (EPA) to directly clean up contaminated waste sites by utilising funds from the *Hazardous Substances Response Trust Fund*, commonly known as the *Superfund*. The *Superfund* was created to provide the federal government with the financial resources necessary for cleaning up contaminated sites and facilities. The fund is financed through a combination of federal appropriations, industry taxes and judgements entered against responsible parties. CERCLA authorised EPA to target specific contaminated sites across the country and to

rank those sites through a National Priority List (NPL), which generally determines the order in which the various sites will be cleaned.
So on one hand, as in the US experience, compensation funds as environmental policy instruments show up to be an efficient kind of emergency tool when a quick intervention is necessary. On the other hand, in the implementation of this kind of public-oriented kind of instruments many problems can arise on a distributional point of view because the existence of a public fund generates social costs connected with taxation source that makes income distribution problem relevant (Lewis, 1996). Moreover on a law and economic point of view, literature outlines that this system can have the effect to not stimulate the firms to the adoption of preventive measures (Porrini, 2001).
On the other hand, we can analyze another kind of instrument as an alternative to solve the judgment proof problem: financial responsibility.
With the expression "financial responsibility" we consider all the tools that require polluters to demonstrate *ex ante* financial resources adequate to correct and compensate for environmental damage that may arise in the activities of a firm. In its common application, financial responsibility implies that the operations of hazardous plants and other business are only authorised if firms show proof that future liability claims will be covered by financial sources, such as letters of credit and surety bonds; cash accounts and certificates of deposit; self-insurance and corporate guarantee. Letters of credit and surety bonds are purchased from banks or insurance companies: they require paying a third party beneficiary, often the government, under some circumstances as the failure of the purchaser to perform certain obligations. Cash accounts and certificates of deposit place cash or some other forms of interest-bearing security into accounts that are made payable to or assigned to a regulatory authority. Self-insurance is made by the companies with relatively deep pockets to satisfy coverage requirements by demonstrating sufficient financial strength. A corporate guarantee allows another firm, such as a parent corporation, to satisfy the coverage requirement and financial guarantors must themselves agree to cover the liabilities of the firm (Boyd, 2002).
Financial responsibility is widely applied in the United States since the 1980's within the framework of the liability assignment system for environmental damage[5].
While given the legal provisions a market for assurance coverage has developed in US to provide a wide variety of financial instruments tailored to individual firms and regulatory needs, in EC this kind of instrument has a corresponding importance but a relatively little diffusion[6]. This does not exclude, however, that financial responsibility instruments have been already provided within the individual Member States, and in fact some national enforcement has occurred[7].

[5] Financial responsibility is provided for by CERCLA, by the Safe Drinking Water Act (SDWA), by the Outer Continental Shelf Lands Act (OCSLA), and by the Surface Mining Control and Reclamation Act (SMCRA). Moreover in the Resource Conservation and Recovery Act (RCRA) and in the Oil Pollution Act (33 U.S.C. §2716 of 1990).
[6] In fact, in § 4.9 of the White Paper, on "Financial security", we can find the statement: "When looking at the insurance market – insurance being one of the possible ways of having financial security, alongside, among others, bank guarantees, internal reserves or sector-wise pooling systems – it appears that coverage of environmental damage risks is still relatively undeveloped, but there is clear progress being made in parts of the financial markets specialising in this area". And the enforcement of such instrument seems to be delayed in time, according to the statement that "Moreover, the EC regime should not impose an obligation to have financial security, in order to allow the necessary flexibility as long as experience with the new regime still has to be gathered. The provision of financial security by the insurance and banking sectors for the risks resulting from the regime should take place on a voluntary basis."
[7] For example, in Italy, the Ministero dell'Ambiente, with a decree of October 8, 1996, defined the method for granting of the financial guarantees in favour of the State by companies that carry out waste transportation activities related to reclaiming, restoration of site conditions, waste transportation and disposal, as well as the reimbursement of any further damage caused to the environment. Another example is the Flemish experience and more particularly the proposals of

These experiences show that financial responsibility may be complementary, sometimes necessarily, to the legislation on liability assignment of environmental damage. It is usually needed, as an integral part of some kind of ex ante regulation, to ensure that the damaged natural resources are reclaimed. In its different applications, it has a common motivation: to ensure the future internalisation of the costs caused by the polluter in order to indemnify the victims and discourage different forms of environmental deterioration.
In the presence of informational issue, financial responsibility can be seen also as a solution for asymmetric information problems that can arise in the relationship between the firms and the financiers (Porrini, 2002). First of all, given the contractual relationship between the financial institutions and the firms, there exists a strong incentive for the financial institutions, insurance companies or banks, to monitor that the firm is taking an efficient level of preventive measures (Feess, Hege, 2000). Secondly, the firm itself is stimulated to take care because financial responsibility ensures that the expected costs of environmental risks appear on the firm's balance sheet and its business calculation.

5. Concluding remarks

In this contribution we have analysed on a law and economic point of view the efficiency of different environmental policy instruments on the base of the achieved targets and taking into account informational problems.
The literature about the choice between regulation and liability has been reviewed outlining an increasing interest in informational issues.
About other forms of environmental policies inside the two main categories of regulation and liability, as a general rule we can say that whenever the nature of the activities carried out by the firms is such that the private parties have better information about the benefits and costs of reducing risks, in such a case market-based system has to be preferred. The advantage of making the private parties directly responsible for the control of risks is clear but also indirect form of involvement, such as through a tax system or through financial responsibility, could have positive effects.
Moreover when we have large differentials in abatement costs of pollution among the firms, relying on market-based instruments provides the advantage of economize on the need for the public agencies to acquire information. But it may also happen that a public agency has better knowledge of those risks because of the possibility of centralizing information and decisions, in particular when a better knowledge of the risk factors requires a special expertise to be shared through different cases and situations.
Finally, an important advantage emerges in the analysis of the enforcement of financial responsibility because through this instrument financial institutions, such as banks or insurance companies, can play an important role using the capital market to create guarantees in favour of companies operating in risky sectors.

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the Interuniversity Commission for the revision of environmental law in the Flemish region, which has provided for elaborate provisions concerning financial guarantees (Faure, Grimeaud, 2000).

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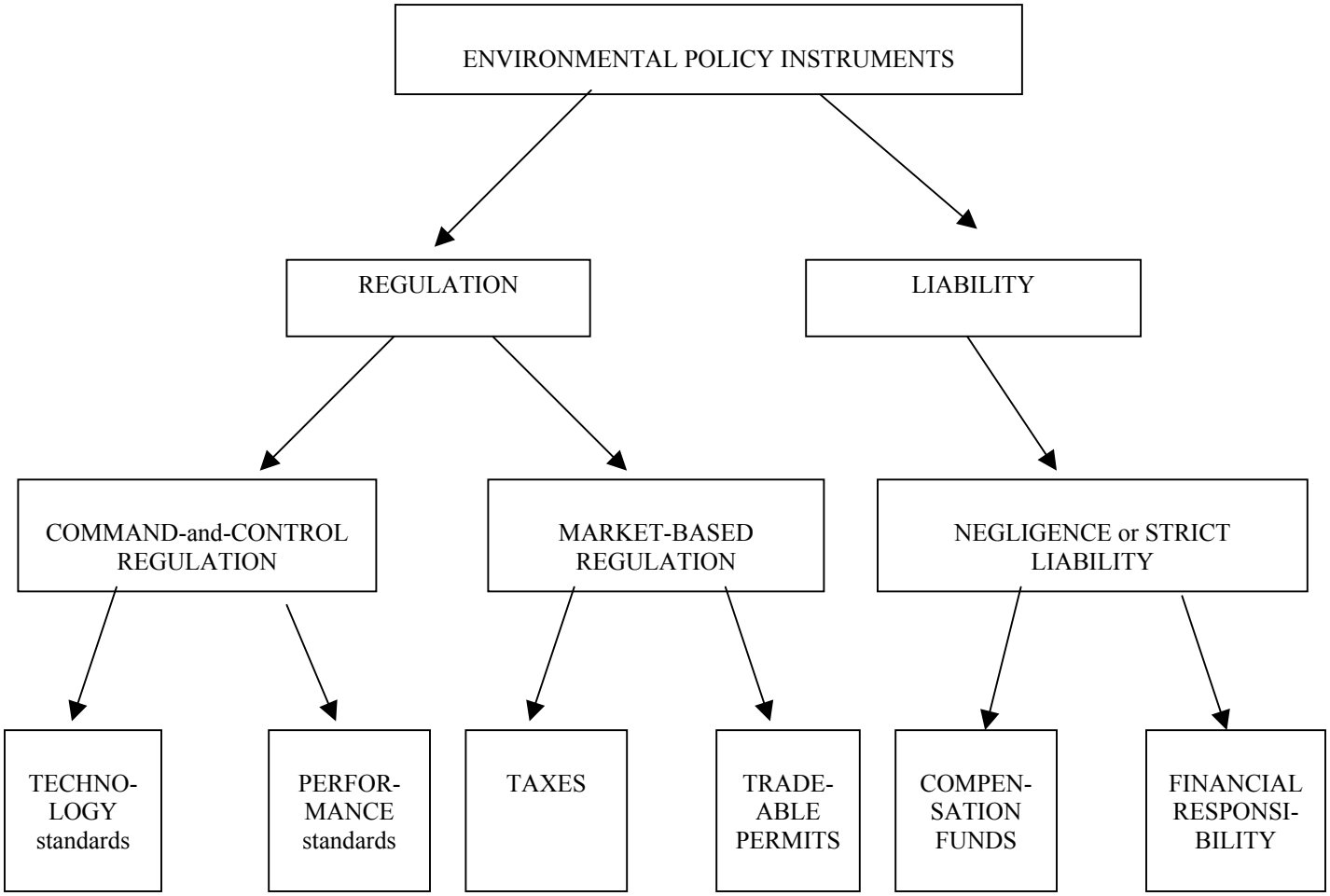
FIGURE 1


ENVIRONMENTAL POLICY INSTRUMENTS
REGULATION
LIABILITY
COMMAND-and-CONTROL REGULATION
MARKET-BASED REGULATION
NEGLIGENCE or STRICT LIABILITY
TECHNO-LOGY standards
PERFOR-MANCE standards
TAXES
TRADE-ABLE PERMITS
COMPEN-SATION FUNDS
FINANCIAL RESPONSI-BILITY