
DESIGNING MANDATORY DISCLOSURE TO PROMOTE SYNERGIES BETWEEN PUBLIC AND PRIVATE ENFORCEMENT

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SUMMARY

This article describes the role of mandatory information disclosure approaches as a remedy to limitations of traditional command-and-control regulation.

1 INTRODUCTION

The task of reducing process pollution in a community setting, where emissions from the manufacture of products negatively affect the larger community, presents a particular challenge to environmental practitioners, since there tends to be a lack of formal relationships between the polluter and those affected by the pollution (Tietenberg & Wheeler, 1998). This is especially true when industrial activity affects larger segments of society or even the global environment, as is, for example, the case with the emissions of greenhouse gases. Yet, even under a 'sustainable development scenario' of the future, it is likely that the global level of industrial production will increase relative to current levels. As the World Development Report 2003 points out, improving the quality of life for current and future generations in developing countries will require a "substantial growth in income and productivity" (World Bank, 2003, p. xiii). This growth is desirable, because industrial production has a valuable, positive impact on society through the manufacture of consumable goods and the provision of employment. However, pollution intensity has to decline at a rate commensurate with the growth of industrial output to prevent a net increase in pollution (World Bank, 2000). Thus, environmental practitioners are faced with the

challenge of reducing the negative impacts of industrial production – to the point of altogether preventing the most harmful emissions and wastes – so that they do not entirely offset the positive impacts.

The traditional approach to controlling pollution is through command-and-control regulation that stipulates a fixed, uniformly applicable environmental target, as well as rules for monitoring and, if necessary, enforcing¹ compliance with this requirement (U.S. Congress, 1995). Command-and-control regulation can be very powerful and is often employed when strict adherence to a standard is required to prevent deleterious consequences to human health. Yet, as several scholars have pointed out, in both developed and developing countries, regulatory agencies charged with monitoring and enforcing these policies frequently operate under the constraints of limited budgets and restricted maximum financial penalties, which limits the effectiveness of command-and-control regulation (Dasgupta, Laplante, & Mamingi, 2001; Foulon, Lanoie, & Laplante, 2002; Gunningham, Philipson, & Grabosky, 1999; Harrington, 1988; Hentschel & Randall, 2000; Heyes, 2000; Laplante & Rilstone, 1996; World Bank, 2000). Moreover, from an economic development perspective, uniform standards are considered inefficient if abatement cost functions differ

between the regulated firms (Lübbe-Wolff, 2001; Office of Technology Assessment, 1995). To remedy these limitations, environmental practitioners and scholars have explored a variety of court-based and market-based instruments, as well as – more recently – information-disclosure approaches.² This last type of approach, as a supplement to traditional command-and-control regulation, is the focus of the current paper.

Mandatory information disclosure approaches to pollution prevention have acquired the reputation of a promising policy instrument in developed and developing countries (Stephan, 2002; Tietenberg, 1998; World Bank, 2000, and references therein). In contrast to other environmental policy instruments, information disclosure approaches are not designed to influence pollution levels directly, but rather require firms to regularly disclose certain environmentally relevant information about their processes or products to the general public (Anderson & Lohof, 1997). This disclosure can have considerable negative or positive consequences for the disclosing firms, because civil society may choose against or in favor of a firm's products based on the information provided. Similarly, the disclosure may change a firm's market valuation if it gives rise to concerns over future liabilities or indicates precautions against such liabilities through good environmental management (Anderson & Lohof, 1997; Barth & McNichols, 1994; Blacconiere & Northcut, 1997; Garber & Hammitt, 1998; Konar & Cohen, 1997, 2001; World Bank, 2000). Empirical evidence from the U.S. Toxic Release Inventory (TRI), Indonesia's Program for Pollution Control, Evaluation and Rating (PROPER) and other disclosure programs reveals significant improvements in the participating firms' environmental performances, in some cases beyond compliance requirements, and the U.S. Toxic Release Inventory has even resulted in proactive initiatives by heavily polluting industries (Afsah & Vincent, 1997; Arora & Cason, 1995; Kappas, 1998; Khanna & Damon, 1999; Konar & Cohen, 1997; Tietenberg & Wheeler, 1998; World Bank,

2000). Judging by these examples, mandatory information disclosures, or more specifically the private efforts to enforce pollution reductions that result from this disclosure, hold the promise of reducing the need for costly regulatory enforcement – which is clearly an appealing prospect given the aforementioned restricted regulatory budgets.

The challenge at this point, though, is that the empirical evidence on mandatory information disclosure in the reduction of process pollution comes primarily from two cases (the U.S. Toxic Release Inventory and Indonesia's PROPER), and the dynamics introduced by the involvement of civil society have received only limited analytic attention (Gunningham et al., 1999; Heyes, 2000; Stephan, 2002). As such, our understanding of the circumstances in which public and private efforts to reduce pollution are indeed complementary, or “additive” (Heyes, 1998, p. 59), is insufficient to confidently generalize from the experiences of Toxic Release Inventory and PROPER. To improve our understanding of these dynamics, a recent research study considers the conditions under which the regulator's and civil society's efforts to enforce pollution reductions are complementary, and how the regulator can foster this positive interplay (Killmer, 2004). The present paper draws on the key arguments and findings from this larger study to derive a set of recommendations that are pivotal to designing mandatory disclosure approaches in ways that promote synergies between public and private enforcement.

Specifically, a systematic analysis of the dynamics introduced by the involvement of civil society in pollution prevention enforcement suggests that the design and implementation of a mandatory disclosure policy should:

- Involve careful consideration of (a) what information is presented, (b) how it is presented and distributed, (c) how civil society can be assisted in its use of the information through capacity building and other education initiatives, and (d) whether the existing legal and institu-

tional context permits the level of civil society involvement that the disclosure policy is supposed to encourage.

- Take into account that the effectiveness of different avenues for civil society involvement varies with the regulatory context as well as with the nature and number of polluting firms.
- Make provisions to allow for a greater flexibility in the regulator's behavior than is generally accommodated by traditional command-and-control regulations.

The next section introduces the analytical model that was developed by Killmer (2004) to investigate the dynamics of interest here. Section 3 presents the key insights provided by the model with respect to conditions that promote or hinder the effective involvement of civil society in the enforcement process. The final section of this paper discusses the policy implications that follow from these insights – particularly those that reveal counter-productive dynamics – and thereby arrives at the recommendations listed above.

2 AN ANALYTICAL MODEL OF CIVIL SOCIETY INVOLVEMENT

The standard theory with respect to imperfectly enforceable regulations is one of choice under uncertainty (Heyes, 1998). Much of the literature in environmental enforcement traces its roots to the classic economic analysis of crime by Becker (1968), which suggests that an individual or entity will weigh the certain cost of compliance against the expected penalty for non-compliance (Cohen, 1998; Heyes, 1998, 2000). A corollary of this theory is the principle of marginal deterrence (Shavell, 1992; Stigler, 1970), according to which the decision to comply or not depends on the *absolute* expected penalty, whereas the decision about the extent of non-compliance depends on the *marginal* expected penalty. In the context of reducing process pollution, these two theories predict that a rational firm will comply with a performance standard if and only if its cost of reducing emissions to the level of the standard is equal to or less than the expected penalty.

The theories further predict that non-compliant firms will emit at the level where the increase in the expected penalty associated with emitting one more unit of pollution equals the abatement costs foregone by emitting that extra unit. Under this traditional economic model of compliance and enforcement, the firm's objective with respect to a particular pollutant can be

$$\min_x \text{Total Cost} = \text{Abatement Cost} + p(\text{monitor}) * p(\text{enforce}) * \text{Penalty}[x-s] \quad (\text{Eq.1})$$

generically expressed as shown in Eq. 1, where *Abatement Cost*[*x*] is the expense incurred to achieve pollution level *x*, the *Penalty* is a function of the difference between actual emissions, *x*, and the legal pollution standard, *s*, and the likelihood of having to pay the penalty is dependent on the probabilities of monitoring and enforcement (which, in more complex models, are often specified to depend on *x* and/or *s*).

The theories do not specify the source of the penalty, but the theoretic models in the pollution control literature have largely focused on regulatory fines associated with command-and-control regulation and on taxes or permit costs associated with economic incentive instruments (see overview by Cohen, 1998 and reference cited therein). In these models, the regulator chooses certain parameters (e.g. the amount of the fine or tax), and these choices influence the level of compliance and hence the level of system-wide pollution abatement.

However, over the past decade, civil society has noticeably entered into the picture – though by and large not into the equation of analytical enforcement models – as a second source of pressure toward pollution reductions. The systematic publication of environmental data in a readily accessible format (such as the internet-accessible Toxic Release Inventory database in the U.S.) has greatly assisted public participation in the enforcement process by virtually eliminating the direct cost to civil society of collecting the necessary information. As such, public disclosure provides the victims of process pollution with the

$$\begin{aligned} \min_x \text{Total} &= \text{Abatement} + p(\text{monitor})\{ p(\text{enforce}) * \text{Penalty}[x-s] + p(\text{levyfine}) * \text{Fine}[x-d]\} \\ \text{Cost} & \quad \text{Cost}[x] \\ & + \{1 - p(\text{monitor})\} * \text{Penalty}[d-s] + p(\text{target}) * \text{CivilFine}[d] \end{aligned} \quad (\text{Eq.2})$$

data needed to create incentives for polluters to control their emissions (Tietenberg & Wheeler, 1998), and hence considerably lowers the transaction costs of achieving a more efficient outcome (Coase, 1960). In short, mandatory information disclosure introduces civil society as a third party into the traditional firm-regulator dyad – a change that alters the firm's cost function in several important ways, as shown in the generic objective function for firms given by Eq. 2.

The first alteration compared to Eq. 1 is that the regulator is now monitoring two aspects of a firm's performance, namely compliance with the pollution standard (as before) and accurate disclosure. If, during monitoring, the regulator finds that disclosed emissions, d , are below actual emissions, x , the firm would be fined for under-disclosure with a certain probability³, which translates into an additional expected cost of $p(\text{monitor}) * p(\text{levyfine}) * \text{Fine}[x-d]$ for the firm. Second, a firm can choose to self-disclose a violation of magnitude $[d-s]$ and incur the associated penalty for non-compliance. This behavior has an expected cost of $\{1 - p(\text{monitor})\} * \text{Penalty}[d-s]$. The third additional cost is any financial pressure brought directly by civil society (CivilFine) against polluting firms. The expected cost from such pressure is a function of disclosed emissions, d , since that is the information civil society acts on, and of $p(\text{target})$, the probability of civil society being successful in targeting a certain firm and bringing direct financial pressure to bear. Thus, combining a traditional pollution standard with a mandatory disclosure requirement can result in three additional sources for increasing costs of non-compliance to firms and hence for inducing them to abate their levels of pollution.

In making their decision, it is also crucial that firms take into account the behavioral flexibility of civil society. Unlike the regulator, whose actions are circumscribed by statutes and rules, civil society

can exert pressure toward pollution reductions through various behaviors. For the purpose of this discussion, six common types of intervention are considered:

intervention are considered:

- i. *No Action*: Civil society receives information, but does not act on it.
- ii. *Market Pressure*: Civil society exerts direct pressure on firms through markets.
- iii. *Suits Against Firms*: Civil society brings suits against certain non-compliant firms.
- iv. *Suit Against Agency*: Civil society brings legal actions against the regulator to increase the agency's monitoring and enforcement efforts.
- v. *Suit Against Agency & Market Pressure*: A combination of interventions (i) and (iv).
- vi. *Suits Against Agency & Firms*: A combination of interventions (ii) and (iv).

The No Action case is included here not only because it provides the comparison case to traditional models that do not include civil society, but also because it serves as a reminder that the mere widespread publication of data does not automatically translate into private actions. For the other intervention behaviors, it is assumed that they are carried out with the intention to have an overall positive effect on pollution reductions.

Depending on which intervention behavior civil society chooses, the firm will face a slightly different objective function. For example, the CivilFine term is likely to be significant when civil society exerts market pressure or brings suits against firms (either alone or in combination with a judicial action against the regulator), but is equal to zero in the 'No Action' case and in the pure 'Suit Against Agency' case. The latter case differs from the No Action case, in that civil society can influence the firm indirectly through a successful judicial action by inducing the regulator to increase $p(\text{monitor})$, $p(\text{enforce})$ or $p(\text{levyfine})$. Thus, firms face different objective functions depending on the behavior of civil society. Moreover, firms have only limited ability to

foretell how civil society will intervene in the process, unless civil society is a priori restricted in its choices (for example, a country's legislation may not give its citizens the necessary legal standing to bring judiciary actions). In this way, private involvement in the enforcement process reduces the predictability of interactions within the system compared to the traditional, highly codified interactions between firms and the enforcement agency.

An important question from the perspective of environmental decision makers is whether – despite or because of this reduced predictability – civil society's involvement in the enforcement process is ultimately effective⁴ in achieving pollution reductions beyond those that could be achieved by the regulator alone. This question has been addressed in some detail by Killmer (2004) through analytically solving the particular objective functions firms would face under various sets of enforcement conditions, whereby the sets of conditions differ from each other in the type of intervention chosen by civil society, the regulator's enforcement strategy, and the financial constraints imposed on the regulator and/or civil society. Comparing the solutions across the various sets of conditions reveals a number of important dynamics that policy makers should take into consideration when designing mandatory disclosure policies.

3 KEY FINDINGS REVEAL POTENTIAL CONFLICTS AND SYNERGIES

With regard to the effectiveness of civil society involvement in enforcing pollution prevention policies, the comparison of environmental outcomes under various enforcement conditions offers four key insights.

Finding 1: Under certain conditions, excluding civil society from the enforcement process through enforcing solely the performance standard (and expending no resources on enforcing the disclosure policy) leads to the most effective environmental outcome.

The dynamic described by Finding 1 can be observed when civil society exerts pressure directly on firms, through the market or legal suits, but has only limited resources at its disposal to do so. The finding is even more clearly illustrated in the No Action case, where an exclusive enforcement of the performance standard is the most effective and cost-effective⁵ strategy for a budget-constrained regulator. Thus, if civil society does not have or chooses not to expend the resources to participate meaningfully in the enforcement process, excluding civil society by not enforcing the disclosure requirement allows the regulator to focus all its resources on achieving lower pollution levels.

It is important to note, however, that Finding 1 refers to reducing pollution in an effective manner. Foregoing the monitoring and enforcement of an existing disclosure requirement is clearly not the most desirable strategy from a public access perspective. Thus, Finding 1 also serves to illustrate that achieving the most effective pollution reduction and the best public access to information are not invariably compatible objectives, even though both are generally considered socially desirable.

The dynamics just described indicate that the effectiveness of civil society's involvement depends on its resources for such an involvement. In addition, civil society's effectiveness depends either directly or indirectly on the regulator's resources. The direct link is apparent in the dynamics associated with legal actions against the regulatory agency:

Finding 2: Suits brought by civil society against a social-cost-minimizing regulator, either solely or in combination with direct pressure on polluting firms, will increase the effectiveness of enforcement if and only if the regulator is not bound by a budget constraint.

Finding 2 emphasizes that civil society actions against a social-cost-minimizing regulator do not have a positive effect unless the regulator is able to increase enforcement efforts in response to those actions⁶. In this latter case, civil soci-

ety intervention can lead to more effective pollution control because judicial actions can induce the regulator to enforce pollution abatement beyond the social-cost minimizing level. (It is worth noting that, while abating pollution beyond the social-cost minimizing level may be effective, it is not, economically speaking, efficient.) On the other hand, if the regulator is unable to increase its enforcement effort due to a binding budget constraint, judicial actions that prescribe a change in regulatory behavior invariably mean that the available resources have to be reallocated, for example to an increase in enforcement at the expense of monitoring. Yet, a social-cost-minimizing regulator would be expected to choose the highest level of pollution control feasible within the binding budget constraint, and hence a reallocation of resources would not lead to a more effective outcome. Moreover, bringing legal actions against a budget-constraint regulator is likely to reduce overall cost-effectiveness compared to the No Action alternative, since the same amount or less pollution is reduced but at a higher cost, due to the cost incurred by civil society.

An indirect link between civil society's effectiveness and the regulator's budget resources is illustrated by the third finding:

Finding 3: Private enforcement through market pressure creates a disincentive for firms to disclose, particularly for firms with high levels of emissions.

Under a combined performance standard/disclosure policy, the firm is faced not only with penalties from the regulator for non-compliance with the policy requirements, but also with the possibility that civil society will penalize it for any disclosed emissions. Firms can evade the pressure from civil society to some extent by under-reporting their emissions.⁷ As modeled for the purposes of the present analysis, the mandatory disclosure policy anticipates this behavior and includes a regulatory fine on under-reporting, but (consistent with reality) this fine is not levied with certainty. Thus, in making their disclosure decision,

firms have to weigh the expected cost of inaccurate disclosure against the cost of revealing their true emissions, which consist of the regulatory fine for non-compliance with the standard and the penalty from civil society. Since this combined penalty from regulator and civil society tends to increase with a greater extent of non-compliance, firms that know themselves to emit above the standard have an increasing incentive to under-report the higher their levels of emissions.

At the same time, civil society's interventions are based on the disclosed information, and it is reasonable to assume that civil society is particularly interested in reducing pollution from firms that are emitting considerably above the standard. Hence, by creating incentives for firms to under-disclose, civil society inadvertently limits its own involvement in the enforcement process – unless the regulator counteracts the deterioration in data quality through more stringent enforcement of the disclosure requirement⁸. This in turn requires the availability of regulatory resources and hence establishes an indirect link between civil society's effectiveness and the regulator's budget.

It is important to note that an increasing demand on regulatory resources as a result of civil society involvement is diametrically opposed to one of the commonly cited benefits of involving civil society in the enforcement process, namely that it reduces the need for costly regulatory enforcement. Finding 3 illustrates that mandatory disclosure requires some form of enforcement to ensure that the requested information is disclosed – and disclosed accurately. Yet, it is in large part the paucity of good information about actual emissions that limits the regulator's ability to enforce pollution standards and other traditional command-and-control regulations that demand continuous compliance. Moreover, it is similarly difficult for the regulator to gain access to complete and accurate pollution data, regardless of whether the data are used to satisfy a performance standard or a disclosure require-

ment. Thus, mandatory information disclosure does not circumvent the acquisition of reliable information on which to act – and hence does not resolve one of the fundamental problems the regulator faces in enforcing pollution control.

Yet, despite the countervailing dynamics mentioned in conjunction with the first three findings, the regulator's and civil society's enforcement efforts can work synergistically under certain conditions and lead to more effective pollution control than could be achieved by the regulator alone.

Finding 4: Public and private enforcement is most likely to be complementary when the regulatory budget is binding and civil society exerts a reasonable level of direct pressure on firms, either through markets or through citizen suits.

Given a binding regulatory budget, the enforcement agency by itself is not in a position to induce firms to reduce pollution to the social-cost-minimizing level. However, if civil society has the necessary resources to create incentives for firms to reduce pollution (see also Finding 1), the regulator's best strategy is to focus on enforcing the disclosure requirement and hence provide civil society with good-quality information about actual emissions, which are then best used to exert direct pressure on firms through the market or through citizen suits (see also Finding 2). The regulator's task of obtaining reliable information will be slightly complicated by the fact that civil society levies a penalty on disclosing information about pollution, rather than on the pollution itself, when it exerts pressure on the disclosing firms (see also Finding 3). Nevertheless, under these conditions, the positive effects of civil society's involvement can be sufficiently large to outweigh any counter-productive changes in firms' behaviors as well as the constraints imposed on the regulator through its budget. Judging by the empirical evidence available, this situation is in fact given in the context of both the U.S. Toxic Release Inventory and Indonesia's PROPER, and it is presumably the situation envisioned for similar programs, such

as the ones in Canada, Mexico, the European Union, and the Philippines (Environment Canada, 2005; European Commission, 2004; Nauman, 2003; Presencia Ciudadana, 2004; World Bank, 2000).

4 RECOMMENDATIONS FOR EFFECTIVE DISCLOSURE POLICIES REVISITED

The analysis of the economic model reveals three countervailing dynamics that suggest, at least in theory, that the success of the Toxic Release Inventory and Indonesia's Program for Pollution Control, Evaluation and Rating may be the exception rather than the rule. However, as revealed by the fourth finding, these countervailing dynamics do not occur invariably – indeed, they can be largely avoided by paying due attention to their possible occurrence during policy design and implementation.

As such, the findings presented here have three major policy implications. First, it is important to establish that there is a demand from civil society for the information provided, and that civil society has the ability to become meaningfully involved in the enforcement process. (Establishing demand accurately is unlikely to be feasible, but already active participation by the intended target audience in the design and implementation of the policy will be very helpful in gauging demand.) While non-governmental organizations, shareholders and competing firms in various countries are adept at leveraging funds and taking advantage of legal provisions that grant them access to the environmental policy process, neither the demand for information, nor the skills or legal provisions necessary to act on it can be taken for granted. Therefore, the design and implementation of a mandatory disclosure policy should involve careful consideration of (a) what information is presented, (b) how it is presented and distributed, (c) how civil society can be assisted in its use of the information through capacity building and other education initiatives, and (d) whether the existing legal and institutional context permits the

level of civil society involvement that the disclosure policy is supposed to encourage.

Second, not all avenues for civil society involvement are equally effective in a given context. For example, while judicial actions against the regulatory can certainly be effective to achieve certain goals, Finding 2 illustrates that they can also be ineffective or even counter-productive in some contexts. Similarly, citizen suits against firms tend to be limited by the existing pollution standard, since they usually require evidence that a firm is out of compliance with an existing regulation. Nor can it be presumed that it is always feasible for shareholders, consumers or competitors to exert effective market pressure; a small number of polluters, publicly-traded firms, and those that produce products or services which are directly traded to consumers are more easily targeted effectively through stock markets or consumer boycotts than large numbers of polluters, privately-held firms, or those that produce raw materials or intermediate goods. Therefore, the design and implementation of a mandatory disclosure policy should take into account that the effectiveness of different avenues for civil society involvement varies with the regulatory context as well as with the nature and number of polluting firms.

Third, introducing a mandatory disclosure approach (and hence civil society as a third party to the traditional regulator-firm dyad) fundamentally changes the role of the regulator. In this new context, the regulator is not only charged with maximizing compliance by the polluting firms within the usual budget and maximum-penalty constraints. The regulator also has to strategically respond to changes in firms' behaviors arising from civil society's involvement (which itself may vary in type and intensity), as well as operate under any constraints imposed through legal actions against the enforcement agency. Therefore, the design and implementation of a mandatory disclosure policy should make provisions to allow for a certain flexibility in the regulator's behavior. Given such flexibility, the regulator will be in a better posi-

tion to effectively adapt its behavior to these new demands.

Thus, systematic analysis of the dynamics introduced by civil society involvement in the enforcement of pollution prevention policies reveals important countervailing dynamics. Yet, these dynamics can be forestalled through circumspect policy design and implementation, and environmental practitioners can thereby foster a positive interplay between the regulator's and civil society's efforts to enforce pollution reductions.

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- ¹ Monitoring is here defined as the process of verifying a firm's emission data and compliance with the standard, and enforcement as the undertaking of actions (e.g. imposing a penalty) to compel a non-compliant firm into reducing its emissions. Both public and private actors can enforce compliance, yet governmental regulatory agencies are bound by any enforcement rules specified in the associated regulations for the standard.
- ² As used in this paper, *court-based instruments* include tort law cases, citizen suits and statutory liability claims, *market-based instruments* include pollution charges and taxes, as well as tradable permits and pollution credits, and *information disclosure approaches* refer to policies that require the systematic disclosure of information by firms. Thus, the latter term does not include voluntary or ad hoc publications of information, such as may occur through participation in voluntary eco-labeling schemes, corporate reports, court cases or 'leaks' to the press.
- ³ Small infractions are unlikely to be pursued, but, for example, the U.S. EPA can levy up to US\$27,500 per violation for failure to report the mandated information for the Toxic Release Inventory on time.
- ⁴ *Effectiveness* in the current context refers to the amount of pollution reduced, specifically the difference between the total amount of pollution in the absence of

the policy (counter-factual case) and the total amount of pollution actually emitted by the firms in the system under a certain set of enforcement conditions.

- ⁵ *Cost-effectiveness* is here defined as the amount of financial resources expended per unit of pollution reduced.
- ⁶ This finding applies in the short- to medium-term. In the medium- to long-term, successful judiciary actions may be used by the regulator to make its enforcement processes more efficient, to lobby for an increase in its budget or to leverage the pressure from civil society into obtaining other additional resources.
- ⁷ Incidentally, the model used in this analysis assumes that civil society can exert some market pressure on targeted firms even in the absence of information, mirroring, for example, reputational effects on firms in 'dirty industries'.
- ⁸ In the United States, the regulator often has access to self-reporting or monitoring-based data through other sources, but this situation is atypical, particularly in developing countries.

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