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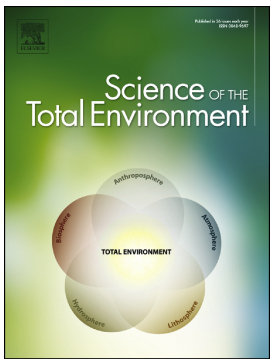


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# A Classification of Information-based Environmental Regulation: Voluntariness, Compliance and Beyond

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## ABSTRACT

Alternative approaches to environmental regulation have gained much attention in recent years. Information-based regulation is an increasingly popular type of instrument that refers to the use of ratings, rankings, labels, online inventories and similar public disclosure practices by regulators. Such schemes vary in their design, disclosure formats, mechanisms to influence behaviour and performance. Theoretical and practical questions remain about whether and how regulators can use voluntary and/or beyond compliance disclosures. The article develops a classification of information-based schemes based on whether the scheme is mandatory or voluntary, and whether the disclosures reveal compliance or beyond compliance performance behaviours. The classification is used to show how the different schemes (traditional, assurance, performance and proactive) work in practice with their associated risks, benefits and mechanisms. While regulators are experimenting with this new frontier of regulation, it is not yet clear whether all types of schemes will be sufficiently robust to deliver on the promise they hold for enthusiasts of smart regulation. We conclude with implications and future research questions on the nature of voluntariness and compliance in information-based regulation.


**Keywords**: environmental regulation; self-regulation; information disclosure; performance disclosure; voluntary compliance



## 1. INTRODUCTION

In many developed countries, government regulators have experienced pressure on their budgets and an ideological shift towards smarter, better and alternative regulation (Baldwin, 2010; Lodge and Wegrich, 2009; Sunstein, 2013). Reforms such as the Better Regulation agenda have challenged regulators to deliver ‘more for less’ by using new instruments to achieve their intended outcomes (Baldwin, 2010; Gouldson et al., 2009; Radaelli and Meuwese, 2009). These

new instruments include a range of more effective, efficient and flexible alternatives to complement the more established command-and-control and economic approaches (Taylor et al., 2012, 2015).

Information-based regulation is often considered an effective alternative when information disclosure is used as a primary mechanism to stimulate behaviour change and drive more sustainable business practices (Fung et al., 2007; Tietenberg, 1998). Information-based regulation has been particularly relevant in the environmental domain – in seeking to address air pollution quality, reduce energy use, improve bio-monitoring and assessment, and agricultural practice – in forms such as ratings, certification schemes, rankings, pollution inventories and other similar schemes based on releasing information to the public. The popularisation of information-based regulation in environmental regulation has its origins in the Toxic Release Inventory of the US Environmental Protection Agency and other Pollutant Release and Transfer Registers that were implemented from the 1980s (OECD, 2000). Due to the longevity and availability of data from Pollutant Release and Transfer Registers, studies have widely researched the effects, effectiveness and economic impacts of toxic release disclosures (e.g. Doshi et al., 2013; Gamper-Rabindran, 2006; Hamilton, 2005; Kim and Lyon, 2011).

Traditionally, information-based regulation schemes such as the Pollutant Release and Transfer Registers have required firms to disclose that they are complying with mandatory obligations by releasing specific information at specific times. Classic examples include publishing data on chemical releases or displaying safety or environmental permits. However, we can now observe a much wider variety of schemes that tap into more diverse disclosure formats and behavioural mechanisms. Schemes like the US Environmental Protection Agency's Audit Policy offer firms reduced penalties and other incentives through voluntary self-disclosures of

compliance (Short and Toffel, 2008). Other voluntary schemes facilitate collaboration with state regulators via trusted third-party certification stakeholders and can be used to inform regulatory decisions (Lange and Gouldson, 2010; Lim and Prakash, 2014). In some cases, information-based regulation schemes entail opportunities for firms to signal their better performance through disclosure beyond a basic legal compliance level (Santos et al., 2006; Taylor et al., 2015; Wang et al., 2004).

Furthermore, the nature of regulatory involvement in information-based regulation has been taking new forms beyond mandating disclosure and setting the information standards (Bowen and Panagiotopoulos, 2018a; Lange and Gouldson, 2010). Regulators are increasingly placing efforts on incentives and advanced forms of data release that can be more valuable than the act of disclosure itself (Bae et al., 2010; Esty, 2004). There are further opportunities for regulators to endorse or reward participation in private schemes in which they have no direct control, to delegate or even to more formally devolve regulatory or enforcement authority (e.g. Bartle and Vass, 2007; Bowen and Panagiotopoulos, 2018a; Upham et al., 2011). Regulators' efforts to increase their involvement in information-based regulation approaches have also been enabled by data analytics, distribution platforms and open government data applications and formats (Pirog, 2014; Sayogo et al., 2014; Thaler and Tucker, 2013; Zuiderwijk and Janssen, 2014).

While these developments are creating a new landscape in environmental regulation, researchers have not yet systematically examined the different types of information-based regulation schemes and the main mechanisms upon which they operate. This could become a significant omission because evidence suggests that the effectiveness of these schemes – if they work at all – depend heavily on the credibility of their components, mechanisms of disclosure and the circumstances under which they are deployed (Taylor et al., 2019, 2015; Weil et al.,

2006). This further becomes evident as the reach of information-based regulation schemes has been expanding to many different contexts and emerging economies like the Philippines, Indonesia and China (Jorge et al., 2007; Lee et al., 2013; Zeng et al., 2010).

Given the ideological shift towards smarter, better and alternative regulation (Gouldson et al., 2009; Lange et al., 2010) and particular rise in interest for information-based regulation (see Taylor et al 2015; Taylor et al 2019), we aim to contribute to our conceptual and practical understanding by developing a classification based on whether the scheme is mandatory or voluntary, and whether the performance standard disclosed is based on compliance or beyond compliance behaviours. Based on these main components, four different types are distinguished and presented using illustrative examples to show how they work in practice. This analytical framework offers an original conceptual organisation of information-based regulation schemes along the dimensions of compliance and voluntariness, emphasising how change mechanisms vary between scheme types and how this affects their stability and effectiveness.

The classification highlights new frontiers in information-based regulation, where regulators use voluntary disclosed information or information indicating beyond compliance behaviours to regulate firms. It further shows the importance of transitions and design choices between the four types and mechanisms so that stakeholders can sufficiently interpret their impacts through gradual adaptation. The paper concludes by highlighting new theoretical questions and implications on the nature of voluntariness and compliance.

## 2. A CLASSIFICATION OF INFORMATION-BASED REGULATION

Traditionally, information-based regulation schemes have been mandatory and compliance-based but innovative developments and trends in regulatory practice point to a potentially wider range in scheme design. A primary distinction is whether disclosure is mandatory or voluntary.

In mandatory schemes, information disclosure is required by statutory instruments, formal regulations or is automatically disclosed by the regulator. For example, in New Zealand and Australia, all genetically modified food and ingredients must be labelled as such (Fortin and Renton, 2003; Gruère et al., 2009), and in the USA, the Environmental Protection Agency (EPA) requires mandatory disclosure of toxic chemical releases by industrial and federal facilities (Hamilton, 2005). In contrast, voluntary schemes offer optional disclosure of information in the scheme. For example, businesses may voluntarily disclose non-compliance incidents at their facilities in a compliance audit within the US EPA's Audit Policy (Short and Toffel, 2008; Stafford, 2007) or voluntarily disclose that their environmental management system has been certified by third-party agencies such as the ISO.

A second and less explored distinction relates to variations about the target performance standard expected of participating firms. Compliance in any given governance context is relative to norms and compliance performance standards are negotiated as acceptable to the regulator and, indirectly, to other stakeholders (Edelman and Suchman, 1997). Although regulatory agencies have traditionally concerned themselves with the non-compliance / compliance performance border, they are increasingly recognising that compliance is relative, and appreciating that certain firms can be performing at a level beyond that required by regulation or law (Paddock and Wentz, 2014). For example, firms may display environmental permits or chemical hazards labels to demonstrate that they are in compliance with the relevant regulation. Other information schemes such as the EU's Energy Efficiency Labels for domestic appliances or Building Research Establishment Environmental Assessment Method (BREEAM) ratings for sustainable buildings may indicate that a firm's performance is higher than the basic legal

compliance bar and current regulatory enforcement norms (Greenwood et al., 2017; Waide et al., 1997).

Figure 1 shows the new classification based on these two main distinctions. The columns represent the initial distinction of whether information disclosure is required – 'mandatory' or 'voluntary' – and the rows represent the performance quality standard that the firm is disclosing about. The 'compliance' category indicates whether the information is about firm performance at a basic legal compliance standard, above which no further compliance enforcement activity is possible or required. The 'beyond compliance' category indicates that firm performance can be at an exemplary level that is higher, or sooner, than expected by basic regulatory compliance (Bowen and Panagiotopoulos, 2018a; Taylor et al., 2015). To illustrate the classification and elaborate on each type, we draw on current literature of relevant cases as summarised in Table 1 and discussed in the following sections.

## 2.1. TRADITIONAL SCHEMES

Traditional schemes (lower left quadrant in Figure 1) require organizations to disclose a specific set of information in a standardised format. Participating firms have little flexibility with what information they disclose and how, and as such do not have opportunities to go beyond compliance. For example, under the UK's Renewable Transport Fuel Obligation (RTFO) carbon and sustainability reporting system certain fuel suppliers must submit (independently verified) monthly reports on their net GHG savings and the sustainability of their biofuels in accordance with the Department for Transport's guidelines (Chalmers and Archer, 2011; Upham et al., 2011). Similarly, the National Greenhouse and Energy Reporting System (NGERS) in Australia requires companies that exceeded a pre-determined corporate group threshold to audit and report

their annual GHG emissions, energy consumption and production. Failure to comply with either scheme may result in financial penalties. In the case of RTFO, a civil penalty may be issued to a supplier if they do not apply for an RTFO account or they fail to redeem enough Renewable Transport Fuel Certificates or buy-out their obligation (Department for Transport, 2017b). Under the NGER Act failure to meet registration requirements, reporting requirements, record-keeping requirements or auditing requirements led to a civil penalty.

Evaluation studies show that in response to the RTFO, fuel suppliers improved disclosure consistency and quality, as well as availability of reliable data (Chalmers and Archer, 2011). Mandatory reporting and the regular publication of fuel suppliers' performance compared to targets generated enough internal industry pressure for obligated firms to improve reporting and performance. The reputational risks associated with failing to meet compliance standards could affect a fuel supplier's licence to operate, which in turn will affect their financial performance. By reporting correctly and in line with what is legally expected, firms can mitigate any potential reputational risks.

Likewise, revealing toxic chemical releases through online inventories provides confidence internally and externally that a firm is meeting its regulatory obligations (Hamilton, 2005). In addition to improving the reporting standards of regulated companies, traditional schemes are a useful tool for helping reporting firms to understand their business better. For instance, NGERS led to some firms developing a new understanding about where energy is being used in their operations due to the systematic auditing process they had to perform in order to meet compliance (Martinov-Bennie and Hoffman, 2012). In this sense, firms 'learn through doing', whereby having to disclose information leads firms to reassess their practice and identify previously unforeseen or unknown risks and opportunities. Yet, paradoxically, analysis of

NGERS also indicated that, while firms may know their operations better, the additional costs and responsibility of reporting, particularly the cost of producing and assuring the data to meet the regulatory requirements, prevented action (Martinov-Bennie and Hoffman, 2012) and represented a compliance risk to small and medium-size firms that may only have limited resources (Lodhia and Martin, 2012).

Despite potentially improving reporting standards and internal awareness of environmental issues, traditional schemes do not appear to transform organisational behaviour and practice. Due to the narrow focus and relative rigidity of such schemes, the ability to affect change over time may diminish when participating entities lack opportunities or incentives to innovate beyond the required level. In the case of the RTFO, the UK Department for Transport's (2017a) impact analysis indicated that after an initial high rate of GHG emission reductions caused by incentivising participating firms to switch from crop-based to waste-based feedstocks (which have a higher net GHG savings), the rate of reduction plateaued. In addition, critics of the RTFO highlighted potential unintended social and environmental consequences due to limitations in the scheme's remit. Depending on which biofuels participating firms used, GHG emission reductions, energy security improvements, and benefits to local economies may be negated. Increases in the manufacturing of biofuels also affect biodiversity due to land-use change, as well as increase demand for feedstocks could inflate the cost of staple foods (e.g., corn, wheat) (Boucher, 2012; Palmer, 2010; Patterson et al., 2011).

To address such shortcomings, it has been suggested that stakeholders other than the regulator should be engaged to encourage continued change. For example, mandatory GM labelling in Australia/New Zealand provided a reason for processors and retailers to avoid using GM ingredients (Gruère et al., 2009) and for consumers to avoid buying GM products (Fortin

and Renton, 2003). The lack of flexibility of traditional schemes also provides incentives for firms to engage in regulatory capture by attempting to shape the regulation in their favour (Levine and Forrence, 1990).

For these reasons, traditional schemes reinforce behavioural norms as firms seek to improve their performance to match industry standards or seek cost efficiencies, maintain both their legal and social licence to operate, as well as legitimise industry norms. The downside of such an organisational response is that traditional schemes are susceptible to greenwashing or superficial behaviour amongst firms as they seek to differentiate themselves from their competitors or, even more disconcerting, firms may also generate more favourable figures for reporting to avoid negative consequences. For instance, "negative stock market reactions to Toxic Release Inventory information lead to a reduction in the release of toxics onsite but increased the waste shipped offsite" (Marchi and Hamilton, 2006, p. 58).

## 2.2. ASSURANCE SCHEMES

In assurance schemes (lower right quadrant in Figure 1) firms voluntarily disclose whether they are meeting basic legal standards in their operations, often through a label or other industry-led stamp of approval. While the underlying behaviour of meeting a basic legal compliance level is mandatory, communicating about it through disclosure is an additional voluntary step that some firms decide to undertake to provide additional stakeholder assurance.

In many cases, assurance schemes emerge in the wake of high-profile corporate failures. For example, the Red Tractor in the UK is a food assurance scheme that aims to improve trust in UK food production in response to food scares. The scheme relies on credible third-party involvement to endorse products against a number of good agricultural practices and animal

welfare standards (Assured Food Standards, 2018; Northen, 2001; Richards et al., 2011). After initially being developed by the industry, the UK Department for the Environment Food and Rural Affairs (Defra) amplified Red Tractor's uptake by using it as a signal of compliance with basic farming practice that can provide regulatory relief, insofar that Red Tractor farms are less likely to receive compliance inspections (Assured Food Standards, 2018). A similar example is the Institute of Nuclear Power Operations (INPO) self-regulatory assurance scheme created by industry and endorsed by the US Nuclear Regulatory Commission to address previous performance and safety failings (Rees, 1994; Rust and Rothwell, 1995; Taylor and Wolak, 2011). Member utilities voluntarily disseminate information on nuclear plant performance and management practices, as well as undergo regular on-site plant evaluations to demonstrate safety and reliability in operations.

In addition to potential regulatory relief, assurance schemes can facilitate opportunities for internal learning. Toffel and Short (2011) find that firms improved both their regulatory compliance and environmental performance when they voluntarily disclosed regulatory violations under the EPA's Audit Policy. This was based on an analysis of 19,986 facilities within the period of 1991-2003 where 688 facilities voluntarily disclosed violations with only 30% of them doing so more than once in subsequent years. The key change mechanism was internal learning by participating firms rather than an external driver from customers or other stakeholders. Likewise, research shows that firms participating in Red Tractor improved their understanding and management of food assurance issues in their field operations (Garcia, 2007; Richards et al., 2011), whilst INPO member utilities benefitted from each other's operational experience that was facilitated by the sharing and acting on the lessons learned (INPO, 2007).

Despite these seemingly special characteristics of assurance schemes, compliance with standards may come with little market differentiation. Whilst early adopters of Red Tractor were rewarded with market differentiation since they were amongst the first to voluntarily engage in additional assurance disclosure, this competitive advantage faded over time with Red Tractor becoming a standard practice. By 2017, 78,000 farmers across the UK had been awarded the Red Tractor standard (Assured Food Standards 2018). Red Tractor endorsement no longer represents a competitive advantage that allows for a premium price to producers for quality produce (Kirk-Wilson, 2002), instead Red Tractor ensures market access to major food retail chains (Garcia, 2007; Richards et al., 2011) by guaranteeing that "food is British and legal, but little else" (Hickman, 2012). There is also some apprehension about significant costs of participating, with farmers indicating the increased administration work associated with the scheme, and the annual inspection costs and preparatory activities involved (Garcia, 2007).

Assurance schemes may also lead to an audit culture amongst participating firms that end up focusing on mitigating risk and the downsides of not participating, rather than taking opportunities offered by schemes to learn and improve. Under such intentions participation in assurance schemes like Red Tractor, for example, become strategic for food producers, insofar voluntary compliance (participation) can instil confidence in customers about the quality of food without much investigation. Richards et al. (2011, p. 34) call this phenomenon "trust manufacturing", when trust is "identified, commoditized and sold alongside other product characteristics".

The degree of internal learning facilitated by assurance schemes, particularly the sharing of knowledge, is likely to be affected by industry characteristics such as the competitive nature of an industry. One of reasons behind the apparent success of INPO in improving knowledge

exchange across the nuclear industry was the lack of competition between facilities (INPO, 2007). In the Audit Policy assurance scheme, studies have noted the tendency by firms to disclose minor infractions only when faced with higher probability of inspection (Stafford, 2007) or only after regulators had already committed resources to inspect and prosecute them (Short and Toffel, 2008). Thus, Short and Toffel (2008) conclude that the policy appears to be most effective when it operates 'in the shadow of the regulator'. Indeed, Gunningham and Sinclair (2017) note that the INPO turned to the government regulator, the Nuclear Regulatory Commission, after initial frustrations in its inability to work effectively in isolation. Internal learning may be a more powerful mechanism in 'sin industries' (e.g., nuclear power, mining, tobacco) that are more sensitive to the perception of external stakeholders in maintaining a social licence to operate, and are thus often more conscious about their outlook as they are collectively as strong as the weakest performer (King et al., 2011).

## 2.3. PERFORMANCE SCHEMES

In performance schemes (upper left quadrant of Figure 1) firms are required to participate yet the form of disclosure can indicate firm behaviours beyond that required by legal compliance. Typically, performance disclosure schemes reveal an ordinal score or performance on an interval scale, rather than the dichotomous disclosure of assurance schemes. For example, Energy Performance Certificates (EPC) in the EU provide information about buildings' energy performance – rating energy efficiency and environmental ($CO_2$) impact on a scale from A to G. All buildings at construction, sale or rent are required to have an EPC to inform potential buyers or occupiers and hence aim to indirectly influence consumer choice and suppliers' production outputs. The intention is that "increased transparency will cause a structural shift towards higher

demand for energy-efficient buildings which in turn effects prices, supply and GHG emission reductions" (Fuerst and McAllister, 2011, p. 6608).

China's GreenWatch program is another example of an information scoring system that grades a company's environmental performance against state-defined benchmarks and then makes results publicly available. The public disclosure of performance scores aims to stimulate change in polluters behaviour by removing information asymmetries between polluters and groups such as consumers and citizens (Wang et al., 2004; Liu et al., 2010a; 2010b; Liu et al., 2012). In performance schemes, behaviour change is driven through the social and consumer pressure of making current performance highly visible and thus influencing consumer awareness and choice. This might provide a strong incentive for firms to respond by striving for a high score (Bowen and Panagiotopoulos, 2018a). For example, GreenWatch encouraged firms to improve or deter poor environmental performance in response to increased pressures imposed by different stakeholders (Liu et al., 2010a; 2010b; Liu et al., 2012). Similarly, the EU Energy Labelling Scheme for appliances led to improvements in performance standards in appliances of German firms as they sought to address market share decline (Waide et al., 1997). The benefits contribute to Germany's (and other European Union member country's) portfolio of energy-efficient policies to reduce electricity demand (Wiel and McMahon, 2005). As Heinzle et al. (2012) note, energy efficiency labels help manufacturers to gain competitive advantages by signalling the relative environmental friendliness of their products.

However, evidence on the operation of performance schemes is not strong. In a 2010 survey of 347 house owners in Southampton (UK), EPCs were seen as useful, but not influential on the decision making process, and had a negligible impact on sale price and price negotiation (Watts et al., 2011). Other shortcomings in the implementation of the scheme include low participation

rates and providing certificates after the marketing stage or upon sale/rental agreement. Whether intentional or not, Fuerst and McAllister (2011, p. 6609) note "this may be indicative of the importance that tenants place on this information rather than any attempt to obfuscate by owners". Ultimately, the ability of performance schemes to affect change relies on an engaged audience of information users.

Studies of other performance schemes have highlighted the importance of the specifics of information disclosure. In the case of nutrition labels, consumers often report difficulty in interpreting quantitative information contained in labels, and misleading serving sizes and health claims (Campos et al., 2011), the impacts of which made it difficult for consumers to compare products. Therefore, unless the guidelines for reporting are clearly established and communicated to the target audience, a scheme's potential to change behaviour is limited. This critical factor might be more prevalent when the evaluation of performance relies on a well-trained group of inspectors that have to assess firms consistently.

Furthermore, as experienced in the case of the EU's Energy Labelling Scheme, performance schemes can reach a point of inertia in stimulating change amongst participating firms. As Heinzle et al. (2011, p.61) note "while the original idea was to only have the best products marked with an A rating, this highest energy efficiency class has become a de facto standard in many product categories, to an extent where up to 90% of products such as refrigerators, dishwashers and washing machines on the European market are now A- labelled (European Commission, 2010)". The problem of limited influence required the scheme's criteria to evolve over time by extending its rating class to A*** by 2010 (Heinze and Wüstenhagen, 2012). In a study of cold appliances in Denmark, the change to the schemes interval scale ranking "increased sales of high-efficiency appliances by 55%, at the announcement, and by a further 42% when

implemented" (Bjerregaard and Møller, 2019, p.891).Yet, "the effectiveness of a well-established energy labelling scheme can actually be diminished by the introduction of new rating categories" (Heinzle et al. (2011, p.61). Despite appliances becoming more energy efficient, the shift towards an 'A' grade, unintentionally distorted the scheme's interval scale ranking. Appliance makers began to increasingly object to grade awards of 'C' because it had become synonymous with a failing grade and consumers thought they were buying A* class appliances, which however represented only average energy efficiency (Industry Europe, 2019); eventually the labelling scale will revert back to A to G and existing labels will be rescaled to reset the scheme's impact.

## 2.4. PROACTIVE SCHEMES

Proactive schemes (upper right quadrant of Figure 1) have a voluntary disclosure requirement and target performance at a level beyond basic compliance. This type of scheme is less established, with several countries implementing experimental pilots (Glachant et al., 2002). Proactive schemes operate like standards, insofar they establish formal rules designed to play a coordinating function (Botzem and Dobusch, 2012) through the specification of voluntary 'best practice' rules that rely on third-party pressure (Brunsson et al., 2012).

For example, in 2012-13, the Environment Agency in the UK piloted the Environmental Permitting Regulations' Assurance Scheme (EPR EMS+) which aimed to lighten the burden of regulatory compliance on industrial facilities by taking account of environmental management systems already in place (Environment Agency, 2014). By linking regulatory compliance with certified environmental management systems such as the ISO 14001, firms and regulators could benefit from fewer inspections, lower compliance fees, less pressure on staff resources and

generally less bureaucracy. Industrial facilities that complied were allowed to submit a light-touch Annual Compliance Statement signed by the CEO (or equivalent) confirming the environmental performance and compliance is led at the highest level (Bowen and Panagiotopoulos, 2018b).

Forestry Stewardship Council (FSC) Certificate is another example where third-party assurance is accepted instead of the normal procedure to meet compliance (i.e., attain UK Woodland Assurance Statement) with the UK's Timber Procurement Policy (Brack, 2014; Defra, 2013). Similarly, BREEAM owned by a non-state organisation and indirectly supported by the UK government, assesses, rates, and certifies the sustainability of a building's construction (Kajikawa et al., 2011; Schweber, 2013). Certification provides a framework that construction firms can follow to indicate their voluntary beyond compliance performance in sustainable construction.

The lack of longitudinal evaluations of proactive schemes limits the strength of conclusions about how they work in practice. The EPR EMS+ trial did not result in overall lower average site compliance compared to the preceding two years or an increase in substantiated complaints (Environment Agency, 2014). There was also an overall net reduction in the time that inspectors spent on audit and advice under the EPR EMS+ by approximately 2-3 hours per site. However, despite reducing the burden for regulators, firms participating in the EPR EMS+ were unable to clearly identify a reduction of administrative burden although it was widely stated that familiarity under a full scheme could improve this. Firms that took part tended to have a good prior compliance levels, suggesting that this scheme is less appropriate for poorly performing firms, which are unlikely to voluntarily participate and go beyond the required or acceptable level of performance (Bowen and Panagiotopoulos, 2018b).

In the case of BREEAM, it has been suggested "that the system successfully alerts building owners and professionals to the importance of environmental issues in construction" (Crawley and Aho, 1999 cited in Kajikawa et al., 2011, p.237), and allows comparison and benchmarking of different buildings. However, commentators have highlighted that the specific and complex certification criteria requires expertise that can cause "the cost of compliance to be high" (Kajikawa et al., 2011, p.237). Tensions exist between financial and sustainability requirements of construction projects, as well as between professionals' own understanding of sustainability and BREEAM's criteria, the result of which undermines respect for the scheme (Schweber, 2013).

Nevertheless, BREEAM is increasingly becoming a condition for planning permission for publicly funded non-residential building (Schweber, 2013). Thus, although not a mandatory scheme for large segments of the construction industry, firms involved in publicly funded buildings and with sustainability-oriented clients have had to accept the overlay of a BREEAM assessment process. As more and more institutions and authorities make the attainment of a voluntary environmental label a required performance standard, proactive schemes such as BREEAM are becoming quasi-compulsory as the distinction between voluntary and mandatory becomes blurred (Cole and Jose Valdebenito, 2013; Fuerst and McAllister, 2011; Schweber, 2013).

Finally, there are potential issues around consistency in the skills and experience of third party auditors and certification bodies and the frequency of inspection, which could affect appropriateness of proactive schemes. In the case of the FSC (Auld and Bull, 2003), a global cross-sectoral forest management certification system that includes some state involvement, concerns have been raised about the legitimacy and credibility of the scheme, particularly

regarding the operation of certifiers and the accreditation and auditing practices (Auld and Gulbrandsen, 2014; Moog et al., 2015). The result of this has seen prominent NGOs resign support for the FSC, with some forming a web-based watchdog (FSC-watch) to document instances of malpractice and misuse (Moog et al., 2015). This highlights an important dimension about the instability of proactive schemes and need for continuous evolution.

## 3. DISCUSSION AND IMPLICATIONS

So far, we have identified four distinctive types of information-based regulation schemes and compared them based on their underlying mechanisms, opportunities and challenges as summarised in Figure 2. Here we elaborate on the theoretical, practice and policy implications of the classification, focusing on the underlying change mechanisms in information-based regulation schemes and on the nature of voluntariness and compliance.

### 3.1. CHANGE MECHANISMS IN INFORMATION-BASED REGULATION

Altogether, information-based regulation schemes are theorised in the governance literature to operate through three mechanisms: performance comparison, internal learning and earned recognition. While research recognises the potential of each of these mechanisms, the classification demonstrates that each mechanism is likely to be more influential in different types of information-based regulation. Fung et al. (2007) recognise that information-based regulation can improve performance quality standards through naming and shaming, and can also reduce risks to the public through transparency and internal learning. Similarly, Lee (2010) highlights the difference between a direct effect of internal learning and an indirect effect of stakeholders

(such as capital markets and NGOs) using public information disclosure. The examples presented in the article suggest that performance comparison, internal learning, and the least explored mechanism - earned recognition - are each more likely to occur in different types of information-based regulation.

The performance comparison driver is more powerful in mandatory and beyond compliance schemes. A key feature of beyond compliance schemes is that the performance level is graded in some way, and presented in a standardised format to facilitate comparison. This taps into a naming and shaming dynamic, and encourages performance improvements by firms so as not to be evaluated by stakeholders, including regulators, as the worst performers. However, the mandatory nature of performance schemes can also increase the level of attention paid by firms to scoring well in less productive ways, such as gaming emissions so that facilities perform at their best at the time of the test. Although performance schemes that operate through social comparison are the most empirically studied type of information-based regulation, future research can continue to explore when and why performance comparison actually changes the behaviour of regulated firms.

In contrast, assurance schemes aim to establish public confidence through voluntary disclosure that firms are meeting a compliance standard. These schemes rely on self-improvement through internal learning within the firms. Voluntary, industry-led assurance schemes often begin when there is uncertainty about the social or environmental issues firms face and how to deal with them (Bowen, 2017). Assurance schemes require internal audits and self-policing on whether the firm's facilities are meeting a compliance level, hence encouraging internal focus. At their best, assurance schemes facilitate the transfer of good practice, and increase communication and information sharing between members through direct contact (King

and Lenox, 2000). They can also lead to the development of a community of auditors and consultants who help spread credible information from one firm to another (Jahn et al., 2005). In the US EPA's Audit Scheme, the most engaged stakeholders can be the legal community seeking to understand the implications of voluntarily disclosing (non)compliance performance, rather than the end consumers or the public. Thus future research might explore the extent to which learning in assurance schemes is directed at the scheme's rules rather than the underlying environmental issues at hand.

Proactive disclosure schemes attempt to leverage earned recognition, which is the most ambitious but also most difficult and possibly controversial mechanism to implement. These schemes are the purest form of taking elements from industry self-regulation – voluntary and beyond compliance disclosure schemes – and using them for regulatory purposes. In a form of risk-based regulation in proactive disclosure schemes (Gouldson et al., 2009; Hood et al., 2001), regulators evaluate the environmental performance of a firm based past or current environmental disclosures. Firms with evidenced beyond compliance performance such as an environmental management system, earn recognition and receive regulatory relief. While earned recognition in proactive disclosure schemes is the most innovative frontier in information-based regulation, it is also the mechanism that is the least explored in the literature.

## 3.2. NATURE OF VOLUNTARINESS AND COMPLIANCE IN INFORMATION-BASED REGULATION

Our analysis highlights questions on the theoretical nature of voluntariness and compliance. We distinguished whether a scheme is voluntary or not from the perspective of the regulator, and considered disclosures that were used by the regulator but are not necessarily legally mandated.

However, the illustrative cases suggest that voluntariness may be less clear-cut than is usually supposed, and that voluntariness may differ in the eyes of different stakeholders, which has implications for regulatory efficacy (Hsueh, 2013). An information-based regulation scheme may not be required by law but can be effectively required by stakeholders such as consumers, supply chain partners, industry associations, media or NGOs to maintain a firm's 'licence to operate'. Once a private logo, code of conduct or reporting practice becomes institutionalised, it effectively becomes mandatory in practice even if it's technically voluntary from the perspective of the regulator. In the case of Red Tractor, for example, since most large UK supermarkets will only purchase Red Tractor assured farm products, the scheme is effectively a pre-requisite for market access.

Indeed, using voluntary, industry-led schemes as a proxy for regulatory assurance has been criticised in the broader regulation literature. Bartley (2007), for example, shows how the US apparel industry succeeded in replacing a discourse of legal compliance with one based on compliance to voluntary industry codes in response to rising stakeholder concerns about sweatshop labour. This enabled firms to maintain control over compliance through participating in the Fair Labor Association (FLA) to certify labour standards. Heinzle and Wüstenhagen (2012) argue that industry involvement in the evolution of the mandatory EU Energy Efficiency Labels scheme reduced the scheme's effectiveness.

We also find that some 'quasi-mandatory' schemes have both voluntary and mandatory elements. For example, the Building Research Establishment's (BRE) Code for Sustainable Homes is mandatory for new build social housing in the UK, but a voluntary option for local authorities and private developers setting standards for private market housing (Greenwood et al., 2017). Other schemes shift between being mandatory and voluntary over time, as for

example BREEAM in Wales, which was initially voluntary, then required and then withdrawn as a mandatory element of planning applications in 2014 as part of a simplification exercise.

Compliance performance standards in some cases appear to be specific to space and time. Previous research has recognised that compliance is relative to norms in any given context (Edelman and Suchman, 1997). Thus, information-based regulation schemes can be evaluated relative to compliance differently in different geographical areas. For example, Red Tractor is effectively used as a compliance-level logo in the UK, but is perceived as a beyond compliance differentiator in international markets (Richards et al., 2011). The US EPA Audit Policy scheme is a national public CSR disclosure scheme, but the performance level required to meet a compliance bar varies by state as negotiated by regulated firms, their lawyers and state-level regulators (Short and Toffel, 2008). Similarly, compliance performance may vary over time when: 1) schemes that were once differentiators can become a business-as-usual norm or 2) when expectations about compliance increase over time and what is still labelled as 'voluntary' is in fact anticipated from firms. For example, the UK's second-largest supermarket chain, Sainsbury's announced in 2012 that although it would continue to use Assured Food Standards schemes to manage supply chain integrity with its UK suppliers, it would be dropping the Red Tractor logo from packaging. As Sainsbury's CEO explained: "Red Tractor doesn't differentiate us… why would we lend credibility to a label that anyone can use?" (McEwan, 2014). This same dynamic was observed in the EU Energy Efficiency label for domestic appliances, which extended its rating class to A*** because 90% of appliances were labelled as 'A' by 2010 (Heinze and Wüstenhagen, 2012).

Conceptualised together, the fluidity of voluntariness and compliance pose serious questions for future research and practice of information-based regulation. Proactive schemes that use

beyond compliance, voluntary disclosures for regulatory purposes seemed particularly unstable. Regulatory involvement in proactive schemes made them either more mandatory or more compliance-oriented over time. While regulators are experimenting with this new frontier of regulation, it is not yet clear whether this type of scheme will be sufficiently robust to deliver on the promise they hold for enthusiasts of smarter, better and more flexible regulation.

## 3.3. POLICY IMPLICATIONS

Overall, the analysis highlights the significant role of the institutional, spatial and historical environment in which firms are operating in determining the effectiveness of information-based regulation schemes. With variations in a firm's stakeholders, performance expectations and challenges at hand, motivations for engaging with a particular issue via an information-based regulation scheme might vary significantly. Information-based regulation schemes are less likely to be prioritised the higher they are perceived on the scales of voluntariness and beyond compliance. Schemes might have better potential to become institutionalised via a process of evolution – from traditional to assurance or performance and then to proactive – to allow stakeholders and the institutional environment to develop the necessary understanding. Once a scheme becomes sufficiently interpreted within the industry, regulators can consider moving within the design options and change mechanisms that information-based regulation schemes can offer. This process can take place in line with assessments about cost-effectiveness, regulatory burden and the salience of the issue to push firms towards more socially and ethically responsible environmental behaviour. Therefore, for policy makers and regulators, a gradual implementation plan for information-based regulation schemes can be considered as the most suitable way to manage risk transitions and place such schemes within the range of acceptable

instruments (Gouldson et al., 2009; Taylor et al., 2019) instead being perceived as suitable alternatives only in low to medium risk policy contexts (Uchida, 2007).

Further to the challenges of implementation planning, there are attention limitations that information-based regulation schemes entail when they are perceived as a legitimate low barrier option within an increasingly connected information environment (Taylor et al., 2019). While multiple regulatory obligations on firms continuously result in new rankings, reviews and scores, attention by firms and information users still remains limited. For information-based regulation schemes to gain sufficient importance, regulators might have to reconsider the boundaries of their own functions beyond setting the framework and releasing data. Following the necessary design choices in non-traditional schemes, regulatory involvement is likely to require capacity to perform complementary functions such as delegating, endorsing or assuring information by others, and smart data management to stimulate further value creation from information-based regulation -related data (e.g. visualisation tools, application programming interfaces for wider distribution, better insight using analytics) (Bae et al., 2010; Bowen and Panagiotopoulos, 2018a; Esty, 2004). These activities exemplify the call for regulators to become smarter in their public use of data and information disclosure as an alternative instrument in environmental policy (Gunningham et al., 1998).



## 4. CONCLUSION

The paper presented a classification of information-based regulation based on whether the scheme is mandatory or voluntary, and whether the disclosures reveal compliance or beyond compliance performance behaviours. This conceptual organisation of information-based schemes on the basis of voluntariness and compliance provides a new point of reference to the existing literature instead of comparing schemes individually. The classification demonstrates how

different schemes work in practice with their associated risks, benefits and mechanisms, which ultimately impact on the operation of the scheme. Furthermore, our analytic review emphasises how change mechanisms vary between scheme types and how this affects their stability and effectiveness, which is often not a clear distinction when information-based schemes are presented in the environmental regulation literature.

A limitation to these conclusions is reliance on secondary sources to assess information disclosure and behaviour change, and the current strength of evidence available in the literature on the cases. Caution is warranted in generalising these insights because of the relatively recent implementation of many of these schemes and thus lack rich and detailed empirical evaluation. As such, the classification requires further examination with more schemes in action helping to establish whether and to what extent our initial findings are generalisable. In particular, it would be important to systematically and empirically test the assumption that dichotomous, voluntary assurance schemes are driven by internal learning, whereas scaled performance schemes are driven by external social pressure. Furthermore, the robustness of each of the types of schemes could evaluated separately with particular questions remaining about the sustainability of proactive schemes.

As a final point of departure for future research, while the classification is useful to map the range and operation of schemes in a particular jurisdiction at a specific point in time, the slippery nature of voluntariness and compliance should be explored further. For example, future research could examine interactions between voluntary and mandatory disclosure requirements in contemporary regulation, and the extent to which these complement or substitute each other over time (e.g. Locke et al., 2013). Similarly, there are unanswered questions about interpretations of

compliance in performance and proactive schemes, and the conditions under which achieving certain levels of compliance is actually seen as beneficial by the regulated entities.

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## FIGURES

*Figure 1: A classification of information-based regulation schemes based on the disclosure requirement and expected performance quality standard of a participating firm*

*Figure 2: Change mechanisms, opportunities and challenges of information-based regulation schemes*

## TABLES

*Table 1: Illustrative information-based schemes used by regulators*

| | Information-based scheme used by regulator (and country) | Description | Role(s) of regulator | Disclosure requirement | Performance level | Illustrative references |
|---|---|---|---|---|---|---|
| **Traditional** | Renewable Transport Fuels Obligation (UK) | Requirement on transport fuel suppliers to disclose what percentage of all road vehicle fuel supplied is from sustainable renewable sources. | Design; Monitor; Enforce | Mandatory | Compliance | Department for Transport (2017b, 2017a, 2008) Chalmers and Archer (2011) Upham et al. (2011) |
| | National Greenhouse and Energy Reporting System (Australia) | A single national framework for disclosing information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation. | Design; Monitor; Enforce | Mandatory | Compliance | Lodhia and Martin (2012) Martinov-Bennie and Hoffman (2012) |
| | Genetically Modified labels (Australia and New Zealand) | Requires labelling of all genetically modified food and ingredients, apart from that prepared for immediate consumption (such as restaurant and takeaway food) and highly refined foods where the novel DNA or novel protein has been removed | Design; Monitor; Enforce | Mandatory | Compliance | Gruère et al. (2008) Gruère et al. (2009) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Toxic Release Inventory Program (USA) | Disclosure of toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. | Design; Information provision | Mandatory | Compliance | Marchi and Hamilton (2006) Freedman and Stagliano (2008) Hamilton (2005) |
| **Assurance** | Red Tractor (UK) | A product and supply chain certification programme that discloses information about food safety and animal welfare issues in farming. | Endorse | Voluntary | Compliance | Richards et al. (2011) Hickman (2012) Assured Food Standards (2018) |
| | Institute of Nuclear Power Operations (USA) | Requires the disclosure of information about nuclear power plant operations. | Endorse | Voluntary | Compliance | Graham et al. (2001) Rees (1994) |
| | Environmental Protection Agency Audit Policy (USA) | Firms voluntarily disclose non-compliance incidents to the EPA in return for regulatory relief and learning. | Design | Voluntary | Non-compliance | Stafford (2007) Short and Toffel (2008) Toffel and Short (2011) |
| | Energy Star Product Label (USA) | Symbol for energy efficiency. | Endorse | Voluntary | Compliance | Webber and Brown (2000) McWhinney et al. (2005) Boyd et al. (2008) |
| **Performance** | Energy Performance Certificate (UK) | An information certificate that provides details on the energy performance of the property and what can be improved. | Design; Information provision | Mandatory | Beyond compliance | Watts et al. (2011) |
| | Energy Efficiency Labels for appliances (UK/EU) | Information about a product's energy efficiency. | Design | Mandatory | Beyond compliance | Waide et al. (1997) Heinzle and Wüstenhagen (2012) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | GreenWatch program (China) | Rates environmental performance of firms from best to worst using five colours—green, blue, yellow, red, and black—which represent excellent, good, fair, bad, and very bad, respectively. | Design, Information provision | Quasi-mandatory | Beyond compliance | Wang et al. (2004) Liu et al. (2010a) Liu et al. (2010b) |
| | Nutrition labels (Various) | Display of nutritional information on pre-packaged foods. | Design, Information provision | Mandatory | Beyond compliance | Campos et al. (2011) |
| **Proactive** | System Based Supervision of Compliance Assurance (Netherlands; Germany; UK) | Environmental regulators accept disclosure of beyond compliance certified environmental management systems such as ISO 14001 as evidence of compliance assurance; e.g. EPR EMS+ trial by the Environment Agency in the UK | Endorse; Accept third-party rating | Voluntary | Beyond compliance | Environment Agency (2014) Glachant et al. (2002) |
| | Building Research Established Environmental Assessment Method (UK) | Using disclosure of BRE's assessments and ratings of the sustainability of buildings in planning and public procurement processes. | Endorse; Accept third-party rating | Voluntary | Beyond compliance | Fuerst and McAllister (2011) Kajikawa et al. (2011) Schweber (2013) Cole and Valdebenito (2013) Greenwood et al. (2017) |
| | Integrated Environmental Policy Instruments Scheme (Portugal) | Regulatory use of sustainable production labels that indicate better environmental management practices. | Endorse; Information provision | Voluntary | Beyond compliance | Santos et al. (2006) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Forest Stewardship Council Certificate (UK) | FSC certificate can be used in place of UK Woodland Assurance Statement to meet the Timber Procurement Policy. | Endorse ; Accept third-party assurance | Voluntary | Beyond Compliance | Defra (2013) Brack (2014) Auld and Bull (2003) Auld and Gulbrandsen (2014) Moog et al. (2015) |

## Highlights

- Information-based regulation is the use of public disclosure practices like ratings, rankings and labels
- Classification of schemes based on mandatory/voluntary and compliance/beyond compliance
- Presents case studies and illustrative examples of how the classification works in practice
- Discusses implications of voluntariness and compliance as schemes evolve
- Provides recommendations for designing and implementing information-based schemes

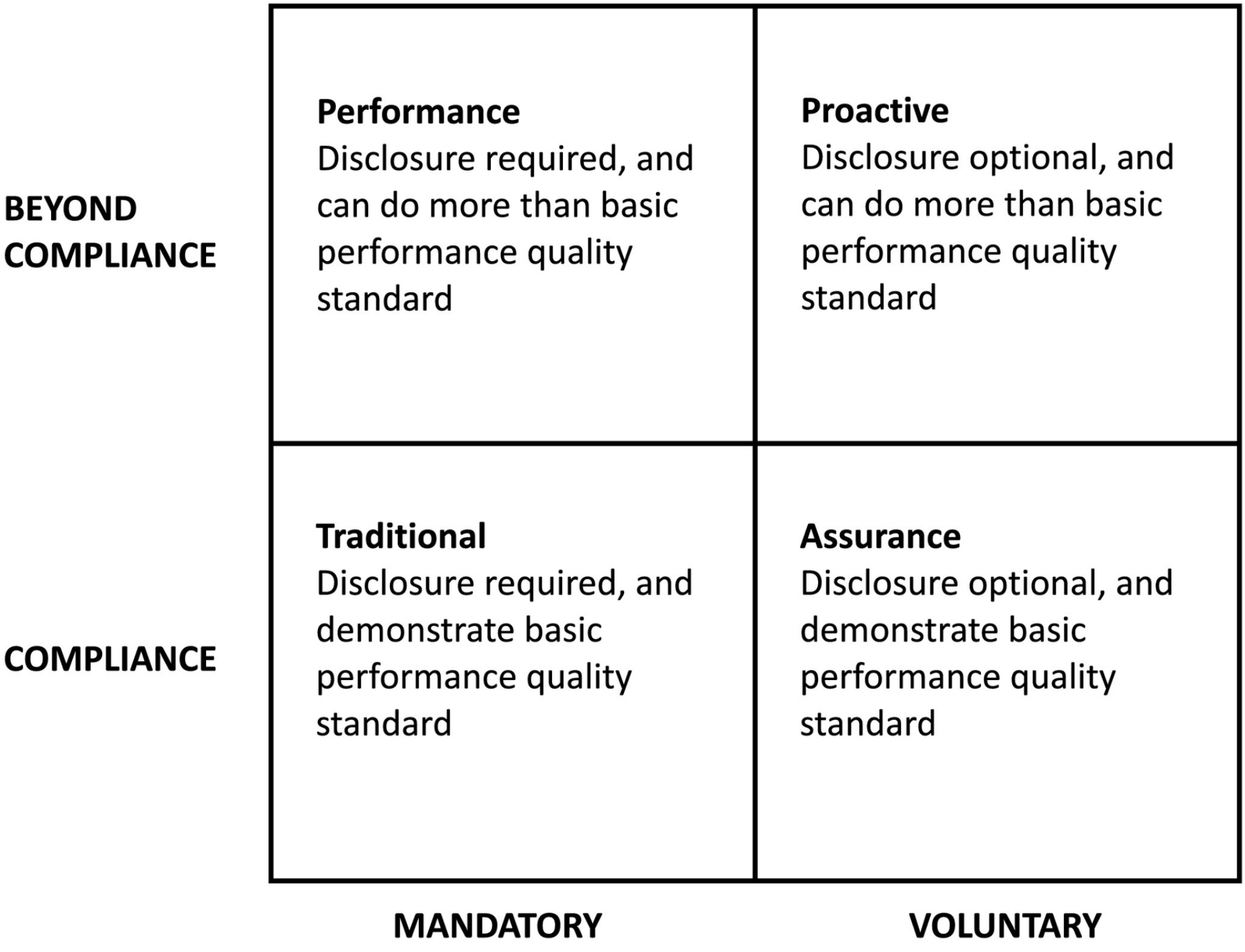
BEYOND COMPLIANCE
COMPLIANCE
Performance
Disclosure required, and can do more than basic performance quality standard
Proactive
Disclosure optional, and can do more than basic performance quality standard
Traditional
Disclosure required, and demonstrate basic performance quality standard
Assurance
Disclosure optional, and demonstrate basic performance quality standard
MANDATORY
VOLUNTARY

Figure 1

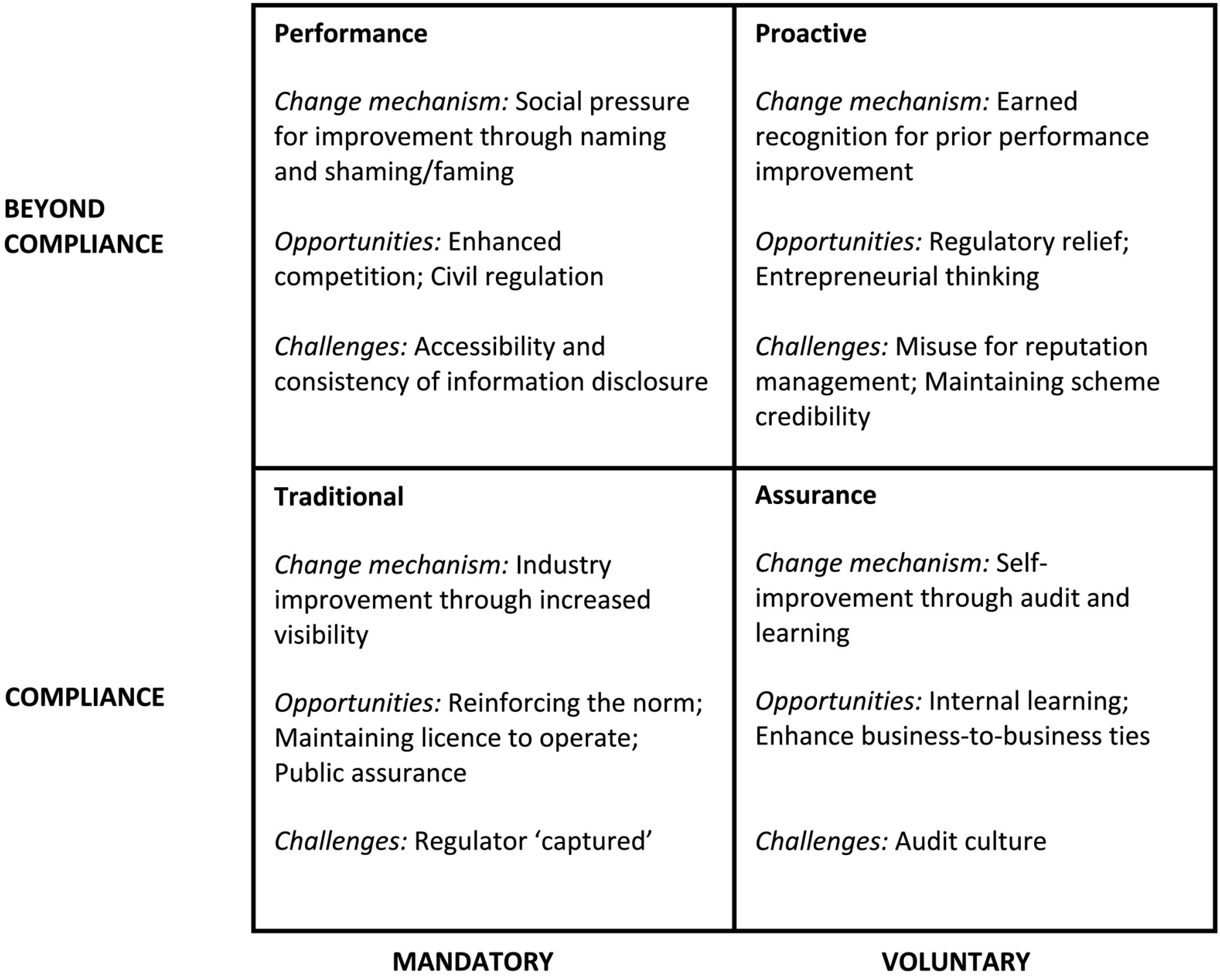
Performance
Change mechanism: Social pressure for improvement through naming and shaming/faming
Opportunities: Enhanced competition; Civil regulation
Challenges: Accessibility and consistency of information disclosure
Proactive
Change mechanism: Earned recognition for prior performance improvement
Opportunities: Regulatory relief; Entrepreneurial thinking
Challenges: Misuse for reputation management; Maintaining scheme credibility
Traditional
Change mechanism: Industry improvement through increased visibility
Opportunities: Reinforcing the norm; Maintaining licence to operate; Public assurance
Challenges: Regulator 'captured'
Assurance
Change mechanism: Self-improvement through audit and learning
Opportunities: Internal learning; Enhance business-to-business ties
Challenges: Audit culture
BEYOND COMPLIANCE
COMPLIANCE
MANDATORY
VOLUNTARY

Figure 2