

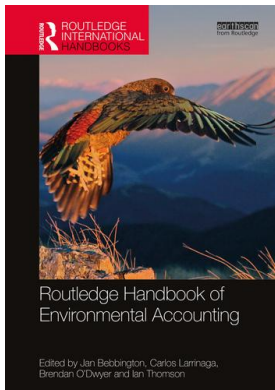
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### **Financial markets and environmental information**

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## FINANCIAL MARKETS AND ENVIRONMENTAL INFORMATION

*Giovanna Michelon*

### Introduction

Human drivers are judged extremely likely to have been the dominant cause of global warming since the mid-20th century. While natural fluctuations may mask it temporarily, the underlying human-induced warming trend of two-tenths of a degree per decade has continued unabated since the 1970s.

Whose words may these be? An earth scientist? A climate change activist? A member of the Green Party? This quote is part of a speech entitled “Breaking the Tragedy of the Horizon – climate change and financial stability” that economist Mark Carney, Governor of the Bank of England (and Chairman of the Financial Stability Board), gave at Lloyd’s of London on 29 September 2015<sup>1</sup>. In this speech, Carney describes climate change as the “Tragedy of the Horizon”, comparing it with the well-known economic problem of the tragedy of the commons<sup>2</sup>. Impacts of climate change are likely to be felt beyond “the traditional horizons of most actors” including that adopted by central banks to set policies for financial stability. “In other words, once climate change becomes a defining issue for financial stability, it may already be too late”. These introductory quotes intuitively reveal that environmental issues, such as carbon emissions and climate change, can have wide impact on the functioning of financial markets.

While the attention of the financial community on environmental matters is relatively recent, accounting academics have since long focused on the role of corporate environmental disclosures in financial markets. An overview of this literature is provided in the next section, which covers both research that employs statistical methods to investigate the relationship between environmental disclosure and market outcomes, and experiments and survey studies that are useful to understand investment decisions and investor preferences.

This chapter further presents recent institutional initiatives on environmental reporting, specifically around climate change issues, which have become important for the financial industry and markets in the aftermath of the Paris Agreement. It concludes by reflecting upon the public interest function of environmental reporting *vis-à-vis* its role for financial market participants, highlighting potential risks and challenges.

## An overview of the academic literature

The role of corporate reporting, broadly defined, in financial markets is twofold (Beyer et al. 2010).<sup>3</sup> Investors need information to evaluate the potential return of investment opportunities. Therefore, corporate reporting is deemed to provide information that is relevant and useful for investment decisions. Furthermore, reporting also serves the purpose of shareholder protection, in that it allows investors to monitor the use of the capital, once it has been committed. While these notions have been developed primarily for accounting information and financial reporting, they apply also to environmental information and reporting, under two assumptions (Berthelot et al. 2003; Christensen et al. 2019). First, corporate environmental activities and their impacts have some relation with the underlying financial performance of companies (i.e. have financial impacts, whether positive or negative) and therefore are relevant for investors to understand business operations, risks and opportunities and assess future cash flows. Second, environmental disclosure should be costly, as inherently it would bear a credible signal that investors can rely upon. Costs of disclosures are not only direct costs sustained to produce the information, such as the gathering of relevant data and implementation of information systems, but also indirect costs such as litigation risk, reputational and proprietary costs (i.e. costs arising when the information provided to the markets can also be used by other parties like competitors, regulators, labour unions, etc.).

Most of the research on the effects of environmental information on financial markets is rooted in two alternative theoretical frames (see Theoretical views) and uses archival data and statistical methods to find associations between environmental reporting (see Characteristics of disclosure) and market outcomes (see Effects on financial markets and investors use of environmental information). Despite the abundance of this type of research, perhaps not surprisingly, the literature provides contrasting and mixed evidence.<sup>4</sup> Further insights on the role of environmental information in financial markets are provided by experiments (which are useful to understand investment decisions) and surveys (that allow to investigate investors' information needs and preferences), discussed in Experimental research and survey studies. Overall, this overview will be useful to understand why research has produced mixed evidence.

### Theoretical views

There are two competing, although not necessarily mutually exclusive, theories that give explanations as to why companies disclose information about environmental activities (Cho et al. 2015; Cho and Patten 2007; Clarkson et al. 2008; Hefflin and Wallace 2017). These theories are key to the understanding of financial market consequences as they relate the reporting strategy of a firm to its underlying performance.

Voluntary disclosure theory, rooted in neo-classical economics, posits that firms with good environmental performance have incentives to use disclosure to signal their type to investors, given that most of corporate environmental strategies and policies are not observable by external stakeholders (Berthelot et al. 2003; Clarkson et al. 2008). If environmental disclosures are a credible sign and inform about the underlying environmental performance of a firm, they reduce *estimation risk*, by decreasing the total risk in owning shares, and/or they reduce *information asymmetries* between firms and investors (Richardson and Welker 2001). Such decrease in risk and information asymmetries is then reflected in share prices. This theoretical approach implicitly recognises that firms' optimal levels of disclosures are based on the trade-off between costs and benefits, and that ultimately the quality of the information provided to the markets

also depends on the underlying reporting incentives, including issues of managerial opportunism (Beyer et al. 2010).

Another stream of literature, rooted in the sociopolitical approach, instead posits the opposite: firms that perform poorly on the environment use disclosure as a tool of legitimacy (Lindblom 2010). Disclosure helps managing the perceptions that relevant publics have about firms' environmental performance, possibly even deflecting attention from issues of concerns or emphasising accomplishments (Cho and Patten 2007; Deegan and Rankin 1996; Neu et al. 1998; Patten 2002). Since environmental disclosure is driven by exposure to legitimacy factors (e.g., operating in an environmentally sensitive business or the visibility of the firm) and not to provide investors with meaningful information to lower information asymmetries or reduce estimation risk, its value relevance for investment decision would be very modest (Cho et al. 2015; Guidry and Patten 2012). However, supporters of this view do recognise that when firms are exposed to regulatory and political pressure, environmental disclosure can mitigate negative financial market reactions in the presence of exogenous environmental accidents (Blacconiere and Patten 1994; Patten 1991, 1992; Patten and Nance 1998). For example, Heflin and Wallace (2017) find that oil and gas firms with more expansive environmental disclosure suffer less negative stock price declines following the BP oil spill in the Gulf of Mexico. Firms with lower pre-spill environmental performance are more likely to increase the environmental disclosure in the aftermath of the accident, as legitimacy theory would predict, and also to improve their environmental performance. Hence, their findings are not completely consistent with the idea that the increase in disclosure post-spill is solely explained by legitimacy purposes and provide support also for the voluntary disclosure theory perspective.

Ultimately, when determining its environmental disclosure strategy, a firm's management is likely to face a tension between responding to the information needs of financial markets and maintaining its legitimacy within other stakeholders, so it is not surprising that the literature has found empirical evidence for both theories. A paper that reconciles the two views is Cormier and Magnan (2015). They find that a firm's environmental disclosure enhances the analysts information context, leading them to provide better forecasts, and, at the same time, also positively affects how stakeholders perceive the firm legitimacy (proxied by favourable news in the media). Legitimacy further reduces the information uncertainty faced by financial analysts.

Regardless of the theoretical approach, a key concern in the literature that estimates the market outcomes of environmental reporting is that whatever causes firms to report on environmental issues also affects firm value (Christensen et al. 2019). For example, the decision to undertake environmental initiatives and report about them could be related to growth opportunities or management reputation, which are not observable or easy to measure. If these unobservable factors are not accounted for in the statistical model, they may induce a bias in the estimation of financial market effects (i.e. one could incorrectly attribute to disclosure the economic effect when instead is driven by the "unobservable" factor). This implies that most studies that find statistical associations between environmental disclosure and financial market outcomes can hardly claim a causal relationship, unless the research design is able to correct for this bias.

### ***Characteristics of disclosure***

Having discussed the theoretical frameworks that explain the motives behind environmental disclosures, we now consider the characteristics of environmental disclosures that have been considered in capital market research. For our purposes, we consider environmental information as any disclosure about firms' environmental activities and impacts, as well as the "financial

implications from a firm's environmental management decision or action" (Berthelot et al. 2003, p. 2).

Environmental disclosures include financial information about the firm's corporate environmental impacts embedded in financial statements. This is the case, for example, for firms operating in natural resource industries, as they are required to account for any future de-commissioning, clean-up and other environmental costs (environmental liabilities). Off-balance sheet environmental liabilities have been shown to affect equity value (Barth and McNichols 1994; Clarkson et al. 2004; Cormier and Magnan 1997) and also bond pricing (Schneider 2011). However, Schneider et al. (2017) are unable to document that the on-balance sheet liabilities are value relevant in the pricing model. Two interpretations of the null finding are possible: either equity investors do not consider environmental liabilities to be relevant in firm valuation, or the reported amounts are not accurate reflections of the underlying liabilities. They call for further research to investigate the relation between firm value and environmental liabilities, as well as on the accounting behind their estimation.

Other industrial firms may also account for, and disclose, capital expenditure for pollution control and abatement. The literature finds that regulatory environmental capital expenditures are negatively associated with future abnormal earnings and share price, in line with the prediction that capital expenditure incurred to comply with environmental regulations represents negative present value projects (Johnston 2005). However, research has also shown that the financial market reacts positively to new voluntary capital expenditure announcements when projects are expected to experience long delays in obtaining environmental regulatory approval, ascribing the positive effect to firm learning and first mover advantages (Wirth et al. 2013).

A large stream of research has focused on narrative disclosures (Beattie 2014). Often firms use both qualitative accounts describing policies and strategies and quantitative indicators that inform about the environmental performance, that is, the outcome of the firm's environmental policies and initiatives (Cho et al. 2010; Michelon et al. 2015; Muslu et al. 2019). Textual characteristics of narrative disclosures are particularly important for research investigating the effects on the financial markets (Lewis and Young 2019). Papers in the literature have adopted a variety of different approaches, making it difficult to understand which disclosures and which characteristics of disclosures matter the most. On one side, studies that take a broad, comprehensive approach to measurement of environmental disclosure typically employ a disclosure framework (i.e. list of information items) covering a variety of topics (e.g. general environmental strategies and policies, energy use, biodiversity preservation, waste production and recycling) (Blacconiere and Patten 1994; Cormier and Magnan 2007; Ingram and Frazier 1980). These indexes assess the extent (presence or absence of the disclosure with respect to the items in the disclosure framework) or quantity (how many pieces of information are reported for each item, e.g., in terms of number of sentences, or words, etc.) of disclosure. Researchers can either collect these data themselves or rely on third-party providers, such as, for example, Bloomberg. Other studies focus on the disclosure of specific environmental issues (among the most common is surely greenhouse gas (GHG) and carbon emissions), but it is hard to disentangle whether the effect on capital market is determined by disclosure *vis-à-vis* the underlying environmental performance that is being reported.

Research has also attempted to measure the "quality" of narrative environmental disclosure by considering the presence of soft or hard information (soft being qualitative statements, whereas hard information is quantitative or financial) (Clarkson et al. 2008; Plumlee et al. 2015), the nature of the news being communicated (positive, negative or neutral) (Deegan and Rankin 1996; Wang et al. 2019), the orientation (forward looking vs. backward looking) (Michelon et al. 2015; Muslu et al. 2019), its tone (optimism) and readability (complexity and certainty of

the language used) (Cho et al. 2010; Melloni et al. 2017; Muslu et al. 2019). Such nuances in analysing disclosure are fundamental because they are able to capture the degree to which environmental information is being manipulated (or not) to manage impressions. For example, firms may provide positive information, and omit to disclose negative news; or may use complex language to obfuscate negative performance. It is important to note that the less sophisticated the variable used to proxy for the “quality” of disclosure, the more likely is that any documented effect on capital markets is related to some other factor that is not being accounted for properly. For example, Dhaliwal et al. (2011) consider a very coarse measure for reporting, that is, the presence or absence of a stand-alone CSR or sustainability report and document that firms adopting the report for the first time experience a reduction in the cost of capital. However, once they split the sample according to the underlying CSR performance, the reduction in the cost of capital holds only for good performers, suggesting that it is not the reporting per se that drives the market effect, but the underlying CSR activities. This result however was not new. Guidry and Patten (2010) had already documented that it is the quality, rather than the adoption, of a sustainability report that drives positive market reactions (in terms of cumulative abnormal accruals in the three days period around the release of the report).

Financial markets participants will broadly rely on information available through a variety of channels for reporting (e.g. the financial statements, the management discussion and analysis in the annual report, corporate websites or sustainability and other stand-alone reports) (Cho et al. 2009; Lodhia 2014; Wanderley et al. 2008). Assuming market efficiency, it should not matter where information is reported. However, a recent paper by Christensen et al. (2017) exploits a regulatory change that requires SEC-registered companies to include information regarding mine-safety performance in the financial reports (Section 1503 of the Dodd-Frank Act). This information was already available to the public, via the US Mine Safety and Health Administration website. Hence, the regulatory change only adds a reporting channel for (rather than content to) this information. Christensen et al. (2017) document a more negative market reaction to the disclosure of safety accidents when these are also reported in the financial report. These results suggest that the reporting channel affects the visibility of information and raise the question for further research about whether the reporting channel matters for investors’ decisions, and why firms choose different channels when they are allowed to do so.

Finally, one last key aspect related to the reporting channel is the distinction between voluntary and mandatory disclosures. However, nowadays there is a blurred line between what is mandatory and what is voluntary (Schneider et al. 2018). Most regulations in this area may mandate the reporting on certain environmental items, but the mandate itself only sets the minimum that should be reported, or provides very broad requirements, leaving managerial discretion with respect to the actual content of environmental disclosures, how to craft it, which specific issues to report about and how to report about them. Hence, especially narrative information, whether mandatory or voluntary, is discretionary and the reporting practice will reflect the underlying reporting incentives of the firm (Christensen et al. 2019; Leuz and Wysocki 2016). Not least, voluntary and mandatory disclosures are likely to affect the market jointly; so as environmental disclosure regulation increases, studies will need to consider the interaction between mandatory and voluntary disclosures. Two papers that tackle how mandatory and voluntary disclosures interact are, for example, Peters and Romi (2013) and Wegener and Labelle (2017). Peters and Romi (2013) studied the compliance to SEC-mandated disclosures of environmental sanctions and found that voluntary disclosure incentives impact compliance with the mandatory requirements (in other words, there is greater compliance for firms that have greater incentives to provide voluntary environmental information). They call for more research to focus on deviation from mandatory disclosure, especially in light of the increase in

investors' interest in environmental performance. Wegener and Label (2017) investigated the value relevance of environmental provisions pre- and post-International Financial Reporting Standards (IFRS) adoption. Their results suggest that environmental provisions act as liabilities for oil and gas firms that also have a sustainability report. For firms in the oil and gas industry that do not have sustainability reports, provisions are interpreted by the market as a costly signal about future growth and this information is associated with higher market values. Both of these studies suggest the need to better understand how mandatory and voluntary disclosures interact and how the market perceives them.

### ***Effects on financial markets and investors use of environmental information***

Having discussed the key characteristics of disclosure that have been considered in financial markets research, we proceed with discussing the financial markets effects of environmental disclosure. As mentioned, most of these findings are obtained through archival studies, which rely on secondary data sets and investigate the existence of statistical associations between environmental disclosure and a certain market outcome (e.g. firm's value). However, academics have also used experiments to investigate investors' preferences and investment decisions, and survey studies that provide direct evidence on the use of environmental information by financial market participants. We will discuss these in Experimental research and survey studies on the following page.

Disclosure literature based in neo-classical economics hypothesizes that better corporate reporting mitigates information asymmetries, improves liquidity and is associated with other capital market effects: reduction of the cost-of-capital, improved value relevance, stock returns effects (Leuz and Wysocki 2016). Theoretically, environmental disclosures would help assessing the financial impact of potential regulatory actions and the risks associated with future compliance requirements (Blacconiere and Patten 1994). Furthermore, as environmental disclosures provide information about firms' environmental policies (Clarkson et al. 2011), in turn it would improve investors' information base and reduce a firm's cost of capital (Lambert et al. 2007). However, the empirical literature has found mixed evidence.

Moneva and Cuellar (2009) provided evidence that *financial* environmental disclosures (investments, costs and contingencies) are value-relevant, but non-financial ones are not. Furthermore, their evidence corroborates the increase of the value relevance of compulsory environmental information. Clarkson et al. (2013) found that voluntary environmental disclosure has more explanatory power than current environmental performance (i.e. the toxic release inventory) for firm market value but not for firm cost of capital. Plumlee et al. (2015) found a positive association between environmental disclosure and firm value after controlling for environmental performance, but no association was found between environmental disclosure and cost of capital. However, when they classified the sample based on whether the information disclosed is soft/hard and positive/neutral/negative, they found that soft/positive environmental disclosures are associated with a lower cost of capital, whereas soft/negative environmental disclosures are associated with a higher cost of capital. Hence, these findings show value relevance of the quality of a firm's voluntary environmental disclosures, with the corresponding effect working through both the cost of equity capital and through the expected future cash flow channels.

A specific stream of literature has focused on disclosure of GHG and carbon emissions. This stream of research is particularly important in light of the climate emergency and the wave of regulatory actions calling for disclosure about how firms contribute to, and are affected by, climate change. Prior literature shows that GHG emissions are value relevant (Baboukardos 2017; Chapple et al. 2013; Clarkson et al. 2015; Griffin et al. 2017; Matsumura et al. 2013) and easily

integrated by investors into valuation models (Eccles et al. 2011). Furthermore, the inclusion of emission information in an environmental report increases the precision of environmental disclosure because it provides quantitative and verifiable information about a firm's environmental performance (Clarkson et al. 2008; Plumlee et al. 2015). Recently, Liesen et al. (2017) showed that GHG emissions disclosures and, to a lesser extent, carbon performance are value relevant: portfolios made of firms with (complete) GHG emissions disclosure and good corporate climate change performance in terms of GHG efficiency are shown to lead to abnormal risk-adjusted returns of up to 13.05% annually. This abnormal return suggests that financial markets are inefficient in pricing publicly available information on carbon disclosure and calls for mandatory and standardised information on carbon performance to increase market efficiency and improve allocation of capital.

Overall, while research points to the relevance of environmental information for financial markets, future research will need to address two major limitations. First, the identification of causal effects is often challenging, as there may be several concurrent events or unobservable factors that bias the estimations. Second, the documented statistical associations are unsuitable to provide any economic cost-benefit analysis to policymakers and regulators because the estimated coefficients may be biased.

### ***Experimental research and survey studies***

Experimental research is useful to understand how environmental information affects investment decisions. Chan and Milne (1999) examined whether disclosure of positive or negative environmental information affects investment decisions for a sample of accountants and investment analysts. While positive information is found to have little impact, the release of negative information reduces investment levels. Milne and Patten (2002) complemented this finding by showing that positive environmental disclosure is able to mitigate the impact of negative environmental performance, attesting to the legitimising role of environmental disclosure. However, these results are not univocal, and in most recent years experiments have provided alternative evidence. In the experiment run by Holm and Rikhardsson (2008), positive environmental performance disclosure positively influences investment choice across both differing investment time horizons and the experience level of the investor. Rikhardsson and Holm (2008) further documented that qualitative environmental information affects short-term allocation decisions, indicating a risk reduction potential of environmental information. Somewhat surprisingly, quantitative environmental information was found to mitigate, rather than extend, the effect of qualitative information. More recently, Martin and Moser (2016) used an experimental setting in which green investments have no impact on the firm's future cash flows by design. They find that investors respond favorably when managers make and disclose a green investment, and document that this response is even more favorable when the disclosure emphasises societal benefits rather than the cost to the company. Rivière-Giordano et al. (2018) instead focused on whether different levels of assurance statements of environmental disclosures affect investment recommendations. While they found that generally environmental disclosure has a positive impact on investment recommendations, recommendations are less favourable when environmental information is provided with low-level assurance than for a company with no assurance statement at all. Their study documented the relevance to increase the level of requested assurance for environmental disclosure.

The main limitation of this approach is that often investors are proxied by students in accounting or business degrees, therefore not having the same level of expertise and abilities (and social context) of real market players (Libby et al. 2002). Furthermore, experiments



typically make use of limited investment amounts and it is not clear whether the magnitude of the underlying investment decision affects the investment strategy itself.

Survey evidence is important in that it allows us to understand directly how investors and other market participants use environmental disclosure. However, such stream of research is relatively scant. Diouf and Boiral (2017) interviewed a range of corporate stakeholders, including fund managers and analysts, to assess their perceptions of firm sustainability reports. Interestingly, their evidence suggest that investors are aware of firms' use of impression management strategies aimed at highlighting positive aspects of their performance and obfuscating negative outcomes. Slack and Tsalavoutas (2018) surveyed sell-side equity analysts and fund managers and provided a similar view of the usefulness of International Integrated Reporting (<IR>) Framework, which includes issues related to the environment. However, investors surveyed by Stubbs and Higgins (2018) would support the adoption of mandatory <IR> because, in their view, other, voluntary forms of sustainability reporting have not led to substantive disclosures or increased the quality of reporting. A recent study by Amel-Zadeh and Serafeim (2018) surveyed mainstream investment firms about their use of and reliance upon environmental, social and governance (ESG) information. The findings suggest that ESG information is relevant to investment performance, but its use is also driven by client demand, product strategy and ethical considerations. Respondents also emphasise the lack of established reporting standards for such disclosures, which makes them hardly comparable.

While in surveys there is always the possibility that participants will not be completely sincere, given the documented scepticism described above, future surveys could be used to understand which specific characteristics, or channels, of disclosure investors would deem most appropriate and useful.

### **Recent institutional developments**

The overview presented above suggests that environmental information does play a role in financial markets, and it is relevant and useful for investors. However, results are not always consistent, partly because various studies have different research designs (e.g. they operationalise differently environmental disclosure), partly because the institutional contexts may be different (e.g. mandatory settings may include different enforcement rules). However, the years ahead will likely generate more research in this area, given the growing number of regulations and guidance documents on environmental (and social) reporting.

One key aspect of this new regulatory wave is the effort to involve more predominantly the financial community (investors, banks and shareholders), as well as the emphasis on the use of environmental (and social) disclosures for the benefits of investors, rather than broader stakeholder groups.

In 2015 the UN 2030 Agenda for Sustainable Development Goals (SDGs) and the Paris Climate Agreement created the conditions for subsequent regulatory actions aimed at aligning financial flows and allocations with the transition to a low-carbon economy and a climate-resilient economic development. The Sustainable Finance Initiative<sup>5</sup> prompted by the EU Commission recognises that the financial sector has a key role to play in reaching the SDGs, as it has the potential to reorient investments towards more sustainable technologies and businesses, finance growth in a sustainable manner over the long term and contribute to the creation of a low-carbon, climate-resilient and circular economy. The Commission set up a technical expert group (TEG) on sustainable finance to support the development of a unified classification system for sustainable economic activities, an EU green bond standard, methodologies for low-carbon indices and metrics for climate-related disclosure (TEG 2019).

A great deal of attention within environmental issues is given to climate-related information. In December 2015, few months after the speech given by Mark Carney on climate change and financial stability, the Financial Stability Board announced the establishment of an industry-led disclosure task force to develop “voluntary, consistent climate-related disclosures of the sort that would be useful to lenders, insurers, investors and other stakeholders in understanding material risks”.<sup>6</sup> In June 2017, the task force released a set of recommendations for climate-related financial disclosures (TCFD 2017). These recommendations are meant to be a foundation to improve investors’ ability to appropriately assess and price climate-related risks and opportunities. The guidance of the TCFD recommends not only to identify risks and opportunities, but also to assess the financial impacts (see Table 12.1). Furthermore, given the uncertainty in the timing and magnitude of the financial impacts of climate change, it recommends utilising scenario analysis for developing strategic plans that can adjust to a range of plausible future scenarios.

Table 12.1 Financial impacts of climate risks and opportunities

<i>Income statement</i>	<i>Balance sheet</i>
<p><b>Revenues.</b> Transition and physical risks may affect demand for products and services. Organisations should consider the potential impact on revenues and identify potential opportunities for enhancing or developing new revenues. In particular, given the emergence and likely growth of carbon pricing as a mechanism to regulate emissions, it is important for affected industries to consider the potential impacts of such pricing on business revenues.</p> <p><b>Expenditures.</b> An organisation’s response to climate-related risks and opportunities may depend, in part, on the organisation’s cost structure. Lower-cost suppliers may be more resilient to changes in cost resulting from climate-related issues and more flexible in their ability to address such issues. By providing an indication of their cost structure and flexibility to adapt, organisations can better inform investors about their investment potential.</p> <p>It is also helpful for investors to understand capital expenditure plans and the level of debt or equity needed to fund these plans. The resilience of such plans should be considered bearing in mind organisations’ flexibility to shift capital and the willingness of capital markets to fund organisations exposed to significant levels of climate-related risks. Transparency of these plans may provide greater access to capital markets or improved financing terms.</p>	<p><b>Assets and liabilities.</b> Supply and demand changes from changes in policies, technology, and market dynamics related to climate change could affect the valuation of organisations’ assets and liabilities. Use of long-lived assets and, where relevant, reserves may be particularly affected by climate-related issues. It is important for organisations to provide an indication of the potential climate-related impact on their assets and liabilities, particularly long-lived assets. This should focus on existing and committed future activities and decisions requiring new investment, restructuring, write-downs or impairment.</p> <p><b>Capital and financing.</b> Climate-related risks and opportunities may change the profile of an organisation’s debt and equity structure, either by increasing debt levels to compensate for reduced operating cash flows or for new capital expenditures or R&amp;D. It may also affect the ability to raise new debt or refinance existing debt, or reduce the tenor of borrowing available to the organisation. There could also be changes to capital and reserves from operating losses, asset write-downs, or the need to raise new equity to meet investment.</p>

Source: TCFD (2017).

The EU Commission also released supplemental guidance on climate-related disclosures (European Commission 2019). An important message contained in the document is the idea that materiality in the context of environmental information is twofold, something that academic research has only limitedly investigated (Canning et al. 2019; Humphrey et al. 2017; Unerman and Zappettini 2014). Climate-related information should be reported if it is necessary to understand the external environmental impacts of corporate activities (environmental materiality). This perspective is of interest mainly for non-financial stakeholders, including regulators and policymakers. However, climate-related information also refers to how climate change may affect the value of the company. Such a perspective is central for investors (financial materiality). While the materiality perspective embedded in the Non-Financial Reporting Directive 2014/95/EU covers both financial materiality and environmental (and social) materiality, the TCFD adopts a financial materiality perspective only. This distinction is also key when comparing other reporting guidance. For example, the GRI framework recommends extensive stakeholder engagement in the definition and identification of social and environmental matters that are to be deemed as material, whereas the Sustainability Accounting Standard Board identifies which items are material by industry in terms of their potential effects on firm's performance (SASB 2016).

While the two approaches can be complementary, it is important to note that there is a trade-off between the two. There is a risk that items that do not necessarily have (short-term) financial implications for capital markets, do have an impact for other stakeholders (i.e. negative externalities) and until these potential negative impacts become a risk for the firm (whether legal, operational or reputational), they may go unaccounted for and their impacts on financial markets unknown and hard to estimate. In other words, an excessive focus on financial materiality of environmental issues bears implicitly the risk that environmental disclosure may be incomplete. A potential solution to this problem is proposed in a recent paper by Unerman et al. (2018). Sustainability reporting often includes issues that “are not captured in, or are external to, the financial dimensions of transactions and events as communicated in financial reporting” (p. 498). These “externalities” arise from the corporate activities, but are borne by others, and therefore do not bear implications for the short-term financial performance (although they may have long-term effects). However, if these externalities are recognised as financial risks or opportunities, firms may voluntarily internalise them. Despite the challenges in quantifying these externalities, the ultimate argument in this paper is that in order to communicate the financial impacts of externalities, the “silos” between domains of financial reporting and sustainability reporting should be broken down.

Overall, recent regulatory developments represent an interesting setting to better understand the role of financial information for financial markets and market-wide effects of regulation, as well as whether and how information released for the benefits of financial markets will be able to drive the change towards a low-carbon economy, as auspicated by policymakers in recent years.

## Conclusion

The chapter has provided an overview of the academic research on the role of environmental information for financial markets. As discussed, empirical evidence is mixed, and research is not always able to provide evidence for causal effects. Furthermore, as the regulatory environment is changing rapidly and the financial community is being urged to take an active role in tackling global issues such as climate change, there will be numerous opportunities for future research that have been highlighted throughout the chapter.

One key aspect that will be important for all of us to understand is whether the involvement of the financial community and the proliferation of environmental reporting guidelines conceived to fulfill investors' information needs will also serve a public interest function, and assist policymakers and civil society to achieve the SDGs. Surely, there seems to be a momentum for environmental information in helping investors assess the risks and opportunities of their investment. It could be that efficient markets incorporate these risks and will drive the allocation of financial resources to those firms that are able to best mitigate their impact on the environment. However, if disclosure remains discretionary, and weakly enforced, there is a possibility that companies will continue to selectively report on those aspects that put them in the best light, providing therefore a biased picture of their environmental commitment. Finally, even in contexts where environmental reporting is mandated and enforced, the risk is that excessive focus on investors needs may create blind spots and lead companies to provide information that is unable to inform public policy and regulatory actions, for example, because limited to short-term financial implications rather than broader environmental impacts that may have long-term effects. A challenge for future research on financial markets will be to address and consider this trade-off in order to properly inform public policy and regulators.

### Notes

- 1 The full speech is available at: [www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability](http://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability). (accessed on 17/01/2020)
- 2 The tragedy of the commons describes an economic problem in which a common-pool (scarce) resource is overconsumed and ultimately depleted by individual users, who act independently and according to their own self-interest, rather than considering the optimal level of consumption for the common good.
- 3 It is important to note that these two roles for reporting assume a very narrow view of accountability that only considers investors as addressees of corporate information.
- 4 We performed a search of academic literature on Scopus with a Boolean approach searching keywords "environmental reporting" OR "environmental disclosure" OR "sustainability reporting" AND one of the following keywords associated with financial market effects: analyst, capital market, cost of capital, financial market, financial performance, firm value, information asymmetry, investment decisions, investor, liquidity, stock market and Tobin Q. This search resulted in 154 papers published since the early 1980s across disciplines. Using my own academic judgement, the discussion provided in this chapter summarises the most relevant insights, as well as highlights venues for future research. I gratefully acknowledge the research assistance of Chaoyuan She.
- 5 [https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance\\_en](https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en). (accessed on 17/01/2020)
- 6 [www.fsb-tcfd.org/wp-content/uploads/2016/01/12-4-2015-Climat-e-change-task-force-press-release.pdf](http://www.fsb-tcfd.org/wp-content/uploads/2016/01/12-4-2015-Climat-e-change-task-force-press-release.pdf). (accessed on 17/01/2020)

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