Accountability for climate change: a research synthesis through the lenses of the integrated thinking approach

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Abstract

Purpose – The increasing responsibility of organisations towards society and the environment has inverted the relationship between accounting and accountability, leading to accountability-based accounting systems. This study aims to explore the debate on accountability for climate change within the integrating thinking (IT) perspective. Ascertaining the most significant trends in the debate around purposes and performance that characterise climate mitigation engagement and their connections, the study would explore if and to what extent organisations are tackling climate actions.

Design/methodology/approach – A narrative review of the extensive academic literature developed from the Kyoto Protocol to date was performed. After selecting a representative sample, papers were analysed with the support of a new analytical framework that involves three dimensions – answerability, enforcement and outcome – and governance schemes that emerge from the involvement of the private and public sector and civil society. With the support of NVivo software, themes arisen were analysed and coded. Key items were labelled, creating specific nodes and synthesised into the proposed framework.

JEL classification – JEL Code M14, M41, M48

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Findings – A "silo approach" largely characterises the debate on accountability for climate change. The most significant reasons behind the shortcomings of extant climate actions may be retrieved firstly in the weakness of the motivations that guide organisations to operate in a climate-friendly way.

Social implications – This study underlines the need for a 360° integrated approach for strategically tackling climate actions.

Originality/value – This study would represent a further step towards an integrated approach for studying organisations behaviours in the "climate war", embracing the connectivity between purposes and outcomes, capitals and the relationships amongst the various stakeholders.

Keywords Climate change, Accountability, Integrated thinking, Accountability circle, Climate governance, Governance

Paper type Research paper

Introduction

Integrated thinking (IT) belongs to the attitude of encompassing all the interdependencies amongst the factors which influence the ability to create value. As described in the integrated reporting (IR) Framework, it is "the active consideration by an organisation of the relationships between its various operating and functional units and the capitals that the organisations use or affect" (IIRC, 2013, p. 2). In accordance with the World Intellectual Capital Initiative (2013), the IT concept involves two dimensions. On the one hand, it refers to the connections amongst the internal departments of an organisation; on the other, it concerns the connectivity amongst strategy, governance, performance and outcomes. Over the years, many contributions aimed at providing an understanding of how IT should be catalysed into organisations, both theoretically and practically, using different lenses and across organisations (Churet *et al.*, 2014; Vesty *et al.*, 2015; Oliver *et al.*, 2016; Dumay and Dai, 2017). However, IT is still largely considered the most significant driver for the needful change of behaviours in facing recent dares.

Amongst various challenges, climate change represents probably the most pressing one (IIRC, 2019), which musters the interest of numerous fields of research. Using the jargon of Coulson *et al.* (2015), a fair climate is a "store of value" we got from the past. Thus, either preserving its status or fostering its recovery is at the core of the whole society's engagement. IT and its natural extension IR (Al-Htaybat and von Alberti-Alhtaybat, 2017, p. 1436) are powerful tools to move in that direction. IR, indeed, has sharply renewed ways to be accountable by organisations. Although stimulating the interest of several scholars for understanding the state of the art in academia (Dumay *et al.*, 2016; Vitolla *et al.*, 2019) and its magnitude on accountability into a specific context (Silvestri *et al.*, 2017), IR suffered from significant criticism by many scholars (Solomon and Maroun, 2012; Milne and Gray, 2013; Churet *et al.*, 2014; Dillard and Brown, 2014; Lai *et al.*, 2014; Atkins *et al.*, 2015; Barter, 2015; Flower, 2015; Melloni *et al.*, 2016; Mio and Fasan, 2016; Du Toit *et al.*, 2017; McNally *et al.*, 2017; Grassmann *et al.*, 2019). In addition, the overcoming of the traditional accounting centred perspectives (Atkins *et al.*, 2015) leads to a shift from accounting-based accountability to accountability-based accounting (Dillard and Vinnari, 2019), engendering accountability-related issues. This more inclusive concept of critical dialogical accountability (Bebbington *et al.*, 2007) requires practical frameworks, standards and tools to support national and supranational initiatives and to boost engagement of the various actors. Although adopting an IT lens for exploring accountability in the climate change babel is like motherhood and apple pie, there are scant academic studies to date aimed at comprehensively exploring the mostly debated emerging themes of accountability for climate change and the related avenues

for future research studies. As stated by Rached (2016, p. 319), accountability systems can be summarised as "accounts to B for K acts, based on X standards, through Y procedures, at time Z, subject to Q consequences". Referring to climate action, scholars have focussed their attention on the analysis of accountability in terms of governance or processes, without providing a fully integrated overview. Undoubtedly, the numerosity and complexity that characterise existing initiatives in struggling with climate change firstly require an analysis of promoters, governance and aims. In this regard, Widerberg *et al.* (2016) represented the emerging global climate change governance through a pyramid composed of seven triangles, which refer to Public, Private and Civil and Society Organisations (CSO) initiatives autonomously, in pairs or triplet. This debate shows that the transnational climate governance has engendered a shift from the United Nations (UN) multilateral level to a networked and more intricate structure, where transparency, monitoring and reporting are not satisfied yet and the availability and usefulness of sanctions are still poorly understood. Furthermore, despite the formal awareness of organisations' accountability towards climate actions' ultimate impacts, the governance complexity, the related enforcement processes and the number of actors involved may be counterproductive in the definition of transparent accountability relationships. The consequences of these weaknesses are vague sanctions and reward systems, as well as a lack of responsibility at all levels.

Many scholars, therefore, are calling attention to new integrated accountability systems that may be able to face the growing complexity of the modern world and the global challenges that ceaselessly arise. Consistently to IT philosophy, a first step is dismissing the idea of reporting as a mere output to communicate performances, considering IT as a critical milestone for improving decision-making, accountability and communication (IIRC, 2016). Such an approach has been reflected on valuable contributions to IT (Barnabè and Giorgino, 2013; Busco *et al.*, 2013; CGMA, 2014; Mio, 2016; Al-Htaybat and von Alberti-Alhtaybat, 2017) which overcame the "silos approach" that has characterised the traditional corporate reporting paradigm.

In view of the above considerations, this paper represents an attempt to review the academic literature on accountability for climate change developed from 1998 to date, providing a new integrated conceptual framework. IT represented the lens for the analysis, fostering the understanding of how organisations strategically tackle climate-related challenges and the identification of the most significant relationship and trends (Task Force on Climate-related Financial disclosure, 2020).

With the aim to adopt a holistic approach still neglected in studies on accountability processes and outputs (Dumay and Dai, 2017; Busco *et al.*, 2018) and moving further from Widerberg *et al.* (2016), the narrative literature review was performed under three dimensions: answerability (A), enforcement (E) and outcome (O). Each dimension holds the most critical open-ended questions which have shaped the relationships amongst the manifold actors involved in the backdrop of climate change and have characterised the discourse over accountability so far. Of the three dimensions, A and E have been retrieved by previous literature in political science (Schedler *et al.*, 1999; Grant and Keohane, 2005) and environmental economics fields (Deveraux Jennings and Zandbergen, 1995; Macho-Stadler and Perez-Castrillo, 2006) and enlarged to better explore the topic. O, instead, is a more discretional dimension we have chosen for checking to what extent initiatives undertaken have achieved their purposes and how academic scholars have read them through their lenses.

The integration of these three dimensions led to the "AEO" Accountability Circle, revolving around the climate governance triangle developed by Widerberg *et al.* (2016),

which represents the analytical framework to support the analysis of the literature. Indeed, the AEO Accountability Circle represents a way to bind existing governance schemes for climate change to the need to unpack accountability instances according to the integrated framework proposed. To provide a picture of the most significant patterns in the academic debate, each dimension has been exploited individuating sub-research nodes through the use of the NVivo 12 Software Package. Highlighting the debated issues in the literature of accountability for climate change, we aimed at stimulating a reflection on the need for an IT approach around the pluralistic relationships amongst the various actors in the babel of climate change initiatives.

This study would represent a former attempt to narrow and explore the debate on accountability for climate change. Besides, it would be a matter of interest for policymakers interested in boosting and leaning existing initiatives by capturing existing overlapping and elaborate schemes. Finally, by analysing the specific theme of climate change within the ground of the IT philosophy, this study would represent an opportunity to better address climate-related issues in the ongoing developments and revision of the IR framework (IIRC, 2020a, 2020b).

The paper proceeds as follows: Section I provides a snapshot about accountability and its nature from the IT perspective, bridging it with the climate change paradigm; Section II points out the method used to analyse the existing literature through the lenses of the proposed accountability for climate change framework; Section III and its subparagraphs, presents the narrative research synthesis of the academic discourse over climate change accountability; Section IV resumes evidence achieved through the IT lenses and Section V provides concluding remarks and avenues for future research.

The evolution of accountability claims in the landscape of the social and environmental accounting literature

Etymologically, the term accountability refers to the attitude to account. Into the accounting field, it has been adopted for indicating a broad responsibility of an individual or group of individuals (accounts) for the results achieved by an organisation with a particular focus on the public sector. Bellucci and Manetti (2017) claimed that organisations use instruments of external accountability to influence or manipulate stakeholder perceptions. If the content of communications is perceived to be false, misleading or not aligned with expectations, the public as a whole can sanction corporations through media campaigns, divestment and lawsuits. Based on the attitude of organisations in reporting practices, Unerman (2007) proposed a distinction between strategic and holistic accountability concerning. Such a distinction is consistent with the notions of the contractual and communal accountability developed by Laughlin (1996). Strategic accountability reflects a short-term orientation, which implies a classification of stakeholders according to their economic magnitude on the disclosing organisation. Conversely, holistic accountability refers to the attempt of meeting the needs of a broader group of stakeholders.

As stated by Bowen and Wittneben (2011), accounting and accountability are heavily interwoven. The attitude to account should not represent just a way to communicate firm performance, but it is an action to be accountable to the current stakeholders and to future generations (van Liempd and Busch, 2013). Traditional corporate practices have grounded the concept of accountability on that of accounting, limiting the accountability to what is disclosed according to the extant accounting system for years. New social and environmental dares require an overturn of this relation, with accounting systems to support the new accountability systems characterised by numerous and often conflicting, interests (Dillard and Vinnari, 2019). The shift from accounting-based accountability to

accountability-based accounting stems from several types of relationships amongst stakeholders (Biermann and Gupta, 2011) and affect both internal and external levels (Keohane, 2003).

Therefore, the analysis of accountability-related issues have to address five issues: Who is liable or accountable to whom? What are they liable to be called to account for? By what standards are accountable behaviour to be judged? Through what means is accountability ensured? What are the implications if accountability standards are breached? (Hayley and Dryzek, 2014).

Focussing on climate change, so far, the debate on accountability addressed, in particular, the design stage of governance initiatives and the development of accounting practices for being accountable in practice (Newell, 2008; Bowen and Wittneben, 2011; Hoffmann, 2011). However, providing an advanced and integrated framework to enlarge the areas of disclosure does not reflect an improvement of accountability (Dillard and Vinnari, 2019). Besides integrating financial and non-financial information, there is the need for integrated thinking of an accountability system, which points out the "connectivity" (Busco *et al.*, 2013) of various interest groups.

Besides this general consideration, providing a portray of the sub-strand of accountability for climate change, using the IT mindset, seems desirable in light of different and complementary considerations. Firstly, as noted by Pitrakkos and Maroun (2019, p. 556), using the lenses of Suchman's (1995, p. 574) legitimacy theory approach, desirable actions are required "especially [. . .] when adverse events or circumstances draw the public attention to a company's environmental and social performance". In this sense, disentangling the climate accountability babel is of utmost importance for answering how organisations (public, private and civil society, following the partition made by Widerberg *et al.*, 2016) are reacting to global policies implemented (above all the Paris Agreement and United Nations SDGs). Secondly, from a policy-oriented perspective, the nexus thinking, seen as "linkages between multiple distinct entities amongst sectors, scales and regions" (Liu *et al.*, 2018, p. 466) can be used for answering several calls for more research between environmental policy and private sector actors (Dahlmann and Bullock, 2020). Thirdly, it would be a matter of interest seeking how scholars are weighing public pressures on climate actions underway; fourthly, a theoretical framework of studies on accountability for climate changes may represent a foundation for narrowing the debate in the future. Thus, following Adams (2017), rather than focussing specifically on one theory, this paper takes a holistic approach to draw out an extensive reading of this underexplored and wide field of research. Inspired by IT principles, the challenge is to develop an analytical framework for exploring the theme of accountability for climate change looking at the governance, the strategy, the operations and the outcome.

Method

The climate change accountability circle analytical framework

In climate change, as well as in numerous areas of sustainability, a transnational complex regime characterised by the collaboration amongst public, private and/or non-profit organisations has replaced top-down initiatives. This led to a fragmented and decentralised climate change governance, where activities and responsibilities are shared amongst organisations, which operate at different levels and across countries pursuing individual and collective interests (Abbott, 2012). Therefore, public-private partnerships made outmoded traditional approaches for studying accountability. Consequently, there has been the need for frameworks aimed at representing a lens for examining accountability (Hoffmann, 2016), whose first task is understanding climate change governance architecture

(Biermann *et al.*, 2009; Kramarz and Park, 2016). To do that, Widerberg *et al.* (2016) developed a global climate change governance triangle (Figure 1) identifying seven forms of collaboration amongst the various types of actors involved. While the vertexes (1–3) groups the initiatives fostered by a single type of actor (public, private or CSO), the central zone (7) indicates the involvement of all three types of actors. The remaining zones refer to hybrid initiatives: 4 for those promoted by public and private organisations; 5 for actions by public and CSO; 6 for the hybrid engendered by the collaboration between the private sector and CSO.

Following prior literature on accountability (Mashaw, 2006; Unerman, 2007; Hayley and Dryzek, 2014; Silvestri *et al.*, 2017), this study attempted to provide an overview of the most significant patterns emerging in the debate around the governance of climate change and how the multiple actors have engaged their commitment. To do that, we developed an analytical framework grounded on the climate change triangle for comprehensively analysing academic literature. To answer the above-mentioned questions, we identified three main dimensions:

(1) Answerability (A) for exploring most significant academic positions around the motivations that have moved climate actions.

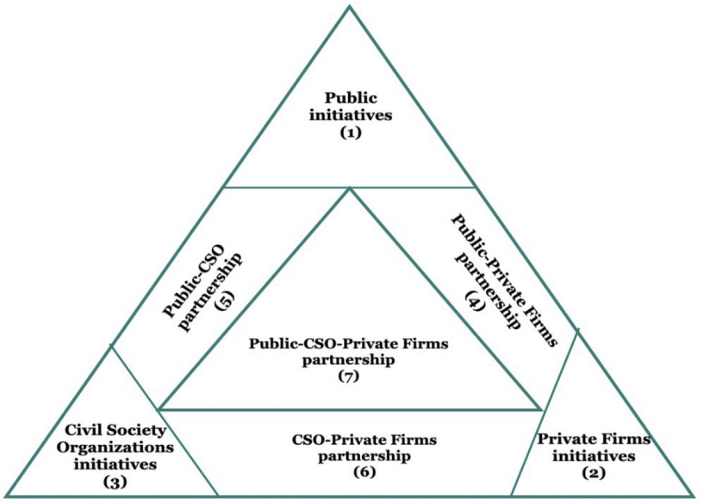
(2) Enforcement (E) for mapping the mechanisms which have been implemented.

(3) Outcome (O) for probing the ultimate implications of climate change commitment, reflecting current performance and future prospects.

Figure 2 illustrates the "Climate Change Accountability Circle" Analytical Framework.

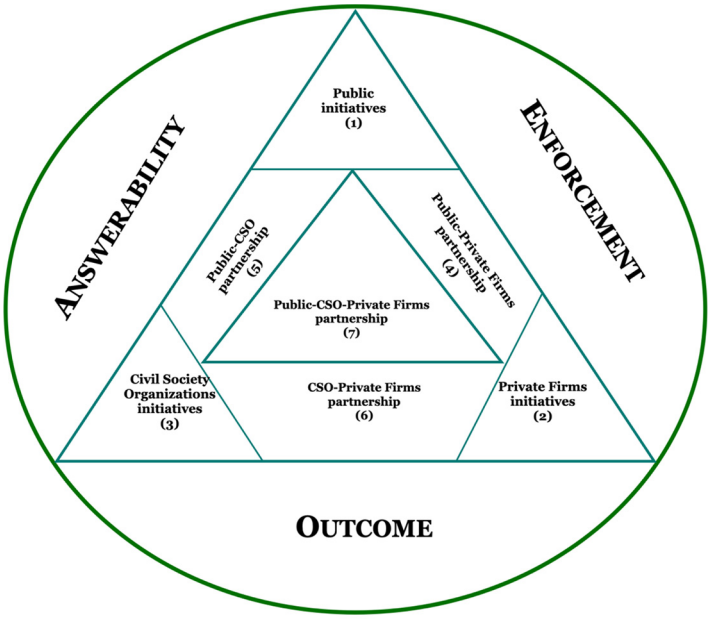
Literature review process

First of all, we performed a search for articles on Business Source Complete and EconLit databases by keywords "accountability"; "accounting"; "reporting"; "transparency", in a combined manner, together with the primary keyword "climate change" into the abstract.



Source: Authors' adaptation from Widerberg *et al.* (2016)

Figure 1.
Climate change governance triangle



Source: Authors' elaboration

Figure 2.
The climate change accountability circle analytical framework

The purpose of this phase was to collect all the studies that address the issue of accountability for climate change. The selection of the studies grounded on the responsiveness to the following questions:

Q1. Why do public institutions, private companies and civil society organisations engage in climate change?

Q2. How is climate mitigation action carried out?

Q3. What are the ultimate effects of climate change commitment?

The terms "governance"; "stakeholder"; "auditor" were, in turn, combined with the main keywords to tackle the issue, to seek studies that address the question, the search was performed by adding the keywords "policy"; "regulation"; "standard"; "process"; "law"; "manag*". Finally, the words "performance", "effect" and "impact" was used for narrowing the analysis on the implications of climate mitigation efforts, in sum, 48 combinations of keywords were used, which lead to an overall result of 2,642 articles. To increase the reliability of the literature review, criteria of language, time and quality were established. Therefore, only studies are written in English and published after 1998 (when the Kyoto Protocol was signed) were included. The adherence to quality standards was assured by involving only peer-reviewed articles and excluding book chapters, reports, conference proceedings, commentaries and editorials. In this way, the sample was shortened to 1,331 studies, as 659 were duplicated. In total, 272 abstracts were selected and underwent a subsequent reading of the entire paper. All papers were entirely read, the quality assessed by two reviewers and, then, two reviewers were appointed at overhauling the entire

selection process for testing the validity of literature review. The selection of papers was based on their relevance to at least one of the "why", "how" and "what" questions mentioned earlier.

In the end, 86 papers composed the final sample on which qualitative content analysis was performed with the support of the NVivo 12 software package. Included studies were classified according to year; journal; scientific field(s) based on SCImago Journal Rankings; governance architecture based on Widerberg *et al.* (2016) classification; accountability dimension(s) addressed [Classification Sheet in Appendix 1].

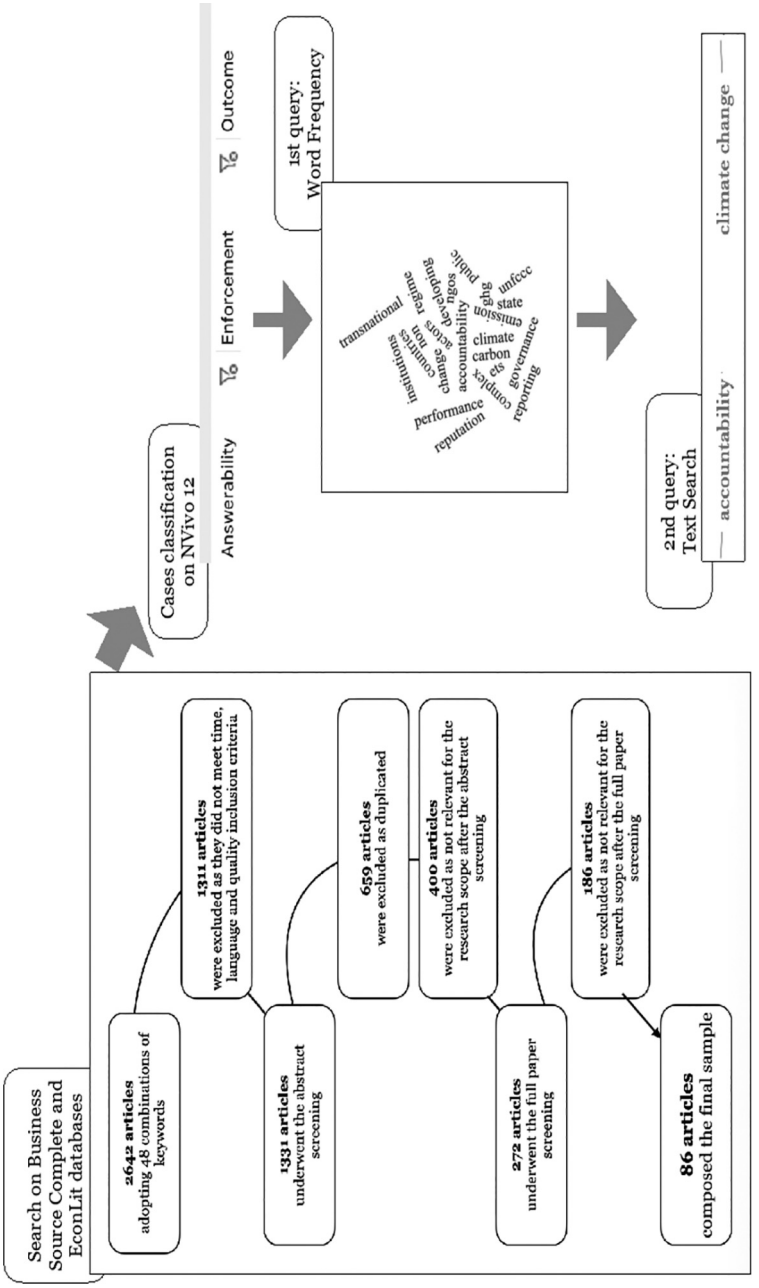
The screening of the papers was conducted through the lens of "The Accounting Circle" analytical framework (Massaro *et al.*, 2016). Adopting deductive coding, the three dimensions (A, E, O) represented the predetermined cases for classifying the studies involved in the sample. Once that each selected paper has been assigned to one or more areas of inquiry, a query for exploring word frequency was performed within each dimension. In this way, we obtained a "word cloud" containing the most used words for each dimension that were selected, focussing on their relevance in representing the most significant trends in accountability for climate change debate. These words represented the keywords for performing a second query on NVivo 12 aimed to search all sources containing them. The output was a "word tree" which allowed us to identify the context in which they were used. The various themes addressed represented the codes used to label and assign units of meaning to the descriptive information (Miles and Huberman, 1994). This approach is consistent with the content analysis "meaning-oriented", aimed at inferring the underlying meanings included in the texts (Smith, 2003). In social science, where meanings and interpretations are critical for exploring phenomena, the content analysis is "potentially one of the most important research techniques" (Krippendorff, 2004, p. 18). However, the role of research in interpreting the text without any influence by the scope of its analysis represents a critical issue to manage when adopting this research methodology (Steenkamp and Northcott, 2008). Figure 3 illustrates the steps which were followed to critically analyse the literature.

Results

Actors involved and their motivations

Climate change has been widely perceived as a highly important issue. Besides tackling risks and uncertainties associated with climate change (i.e. reputation risk, increased insurance costs, cost of compliance with future regulations, reduction in consumer confidence), companies have to face pressures from many groups of stakeholders. While consumers demand climate-friendly products (Eleftheriadis and Anagnostopoulou, 2014), government bodies, institutional investors, media and non-governmental organisations (NGO) ask for an increasing disclosure of information concerning climate mitigation commitment on annual reports, company websites and, to a lesser extent, on a stand-alone social/environmental report (Haque and Azizul Islam, 2015). Because of media have a critical role in promoting an understanding of risk related to climate change, pressures from stakeholders raise if media attention increase. As Haque and Azizul Islam (2015) observed for Australian companies, there is a close association between stakeholder concerns and media attention. Such a relationship fosters companies' participation in initiatives such as the Carbon Disclosure Project (CDP).

Moreover, it stimulated the dissemination of regulatory requirements, which represent another way of coercive pressure (Haque and Azizul Islam, 2015). Comparing sectors subjected to different regulatory regimes, Brouhle and Harrington (2009) recorded a higher level of participation in climate action in heavily regulated industries (e.g. petroleum, electric



Source: Authors' elaboration

Figure 3.
Literature review process

utilities). A lack of regulation and best practice guidelines from the regulatory bodies is considered the primary reason for the non-disclosure attitude to reporting for climate change in Bangladesh (Nurunnabi, 2016). Most firms focus more on regulatory response measures, as they perceived more regulatory risks than physical and market risks. Physical risks are expected to materialise in the more distant future, while the realisation of market risks is considered rather unlikely (Sakhel, 2017). Within this debate, the National Greenhouse and Energy Reporting (NGER) scheme developed in Australia is a compelling case. The key actors involved in NGER are companies and green groups. Australia is one of the highest emitting countries (Haque and Irvine, 2018), presenting the highest per capita level of emissions in the world (Haque and Azizul Islam, 2015). In the view of this consciousness, on the one hand; and supported by the confidence with reporting for accountability, on the other, the NGER policy agenda has been widely accepted by the business community (Lodhia and Martin, 2012).

External pressure represents determinant leverage not only to meet mandatory regulations but also to enhance voluntary disclosure (Liesen *et al.*, 2015) and transparency (Giannarakis *et al.*, 2017). However, significant issues such as the logging of native forests and its impact on climate change have not become an integral part of corporate strategy yet (Brander, 2017). In the insurance sector, for example, the majority of companies do not integrate climate change into their risk management practices (Eleftheriadis and Anagnostopoulou, 2014). Firms with nested logic, in particular, believed the adaptation to short-term climate variability is an effective response to climate change (Thistlethwaite and Wood, 2018). Managers tend to see climate action as a response to a problem rather than an inclusive strategy (Kumarasiri and Gunasekarage, 2017). For example, firms more exposed to excessive risks are more likely to be assured of carbon emissions (Datt *et al.*, 2018). This may depend on the fact that environmental and climate-related issues heavily called upon green groups are still separated from economic interests, which remain the primary concern of company stakeholders (Lodhia and Martin, 2012). Adopting CSR reporting in the oil industry as a proxy of commitment to climate change, Jaworska (2018) observed a propensity of shifting the responsibility for climate change to other stakeholders or to the future in the belief that the market and technology are the only solutions to ecological problems. Organisations require that suppliers and other stakeholder groups take their responsibility to effectively tackle climate change (Ferguson *et al.*, 2016).

Sometimes the leverage for a higher commitment could be represented by the advantage of a more sustainability-oriented competitor, as demonstrated by Kraft (2018) referring to polluting industries. These industries often do not operate in competitive markets. Therefore, results concerning the level of disclosure may be invalidated by competition rules. Although the influence of regulatory pressure, stakeholders do not have much power in a monopolistic market. The author found that increasing the competition, their power increased, leading to a higher level of disclosure. Competition and collaboration amongst firms are even crucial in promoting an understanding of climate change and its aftermaths. Analysing cluster and extra-cluster effects within the wine industry, Galbreath *et al.* (2014) found that firms acquire knowledge around climate issues both from a variety of exchanges with other firms and from other knowledge sources.

Besides the above-explained issues, several studies dealt with the identification of critical factors that shape the willingness to voluntarily disclose for climate change. Overall, firm size is one of the most significant features that positively affects the level of disclosure (Stanny and Ely, 2008; Eleftheriadis and Anagnostopoulou, 2014; Nurunnabi, 2016). However, while larger companies tend to be more accountable to government and society as

a whole, firms facing public, political and social pressure disseminate less information (Giannarakis *et al.*, 2017).

Even from a geographical point of view, different trends may be observed. First of all, the availability of resources influences the propensity at reporting between developing and developed countries (Luo *et al.*, 2013). Moreover, Gallego-Álvarez (2012) discovered that the location of headquarters is directly related to the attitude to disclose and to attain good environmental performance. In particular, the author found that companies, which have their headquarters in countries that have ratified the Kyoto Protocol are more active towards climate change mitigation (Amran *et al.*, 2014; Ascui and Lovell, 2012). A different approach to tackling the climate question has been recognised between Europe and America. While European organisations are more engaged in reporting activities and the debate around governance issues, the American ones are more active in investing in technologies, which may support climate action (Backman *et al.*, 2017). Surprisingly, Nurunnabi (2016) observed little engagement by multinational companies, even though they are not influenced by their country of origin (Grauel and Gotthardt, 2016).

The ownership of the company (Nurunnabi, 2016) and the characteristics of the board (Ben-Amar and McIlkenny, 2015; Liao *et al.*, 2015; Jaggi *et al.*, 2018) matter on the level of transparency. In particular, culture exerts incremental influences beyond economic and regulatory incentives (Liao *et al.*, 2015). Balanced gender diversity and independence of directors within the board increase the tendency to be environmental-oriented. Such an approach, together with attention to certification, may bear climate action also in developing countries (Amran *et al.*, 2014).

The availability of tools aimed to sustain investment decisions, providing information on the firm's position within environmental perspective alongside financial information represents a novelty both for people who are going to invest and for the broader users' group (Andrew and Cortese, 2011). To make these instruments effective, there is a need for strong support from institutional investors (Cotter and Najah, 2012). Effects of domestic institutional efforts, in particular, are positively associated with disclosure attitude (Wegener *et al.*, 2013). Within this context, also internal and external auditors have a critical role, that varies from precise control of compliance to the issue of penalties for misreporting (Trotman and Trotman, 2015).

However, efforts towards climate change mitigation do not involve only the private sector. Several studies addressed the role of public and non-profit sectors in sustaining the cause and promoting accountability and participation of all members of society (Bäckstrand, 2008; Newell, 2008; Kuyper and Bäckstrand, 2016; Kuyper *et al.*, 2017; Widerberg and Pattberg, 2017). The involvement of most of the representative stakeholders may allow overcoming the lack of normative statements. Scobie (2018) provided the example of Caribbean Regions where the cooperation amongst regional organisations, national government departments, agencies, environmental NGOs and the private sector lead to the development of effective internal and external accountability mechanisms. From a social perspective, NGOs are fundamental to increase the inclusiveness of climate initiatives. They are, in particular, appointed at boosting the participation of emerging economies and stakeholders from all levels (Dombrowski, 2010). In some cases, their endeavours have paved the way for the development of standards for calculating and reporting emissions (Green, 2010). Although so far accountancy professions have been the most involved in climate change accountability debate (Ascui and Lovell, 2012), there is an emerging landscape represented by the converge arisen from public norms and private rules (Green, 2013).

Climate change responses by organisations and networks

Over the years, efforts to struggle with climate changes have been aimed at stimulating behaviour changes towards more environmental-oriented practices both amongst the population and amongst companies and at developing measures to translate ecological concerns into accounting information (Bebbington and Larrinaga-Gonzaléz, 2008). Indeed, as the impacts of climate change on organisations are increasing, there is a growing need for decision-relevant information concerning risks, economic implications and adaptive capacity (Linnenluecke *et al.*, 2015). To that end, several types of emission account methods and reporting schemes have been developed for monitoring how companies tackle climate change questions. Traditional corporate inventories and other forms of attributional accounting are not suitable for evaluating mitigation actions. Their usefulness may regard the attribution of responsibility amongst the various emissions sources. Therefore, the most significant references at organisational level are carbon accounting and greenhouse gas (GHG) emissions accounting.

Within carbon accounting, Schaltegger and Csutora (2012) identified two main approaches: accounting for un-sustainability and accounting for sustainability improvements. The former aims to the disclosure of un-sustainability referring to past and current operations and at forecasting future levels of emissions. The latter informs about the decisions – and related measures – that a company is going to implement for improving its environmental performance. At all levels, both two approaches are needed for understanding the entity of the actual magnitude and for developing effective policies. Reviewing the development of carbon accounting, Csutora and Harangozo (2017) identified a large room for improvements. From a methodological perspective, current practices are characterised by top-down and hybrid approaches. Moreover, carbon management remains a separate dimension regarding the overall management. This way, system boundaries are still weakly settled and double counting is frequent. Some methods, such as the emerging market-based approach, may provide misleading information, undermining efforts for mitigating impacts and moving towards renewable energies (Brander *et al.*, 2018). Carbon footprint, instead, may have significant implications on the allocation of responsibilities both between importing nations and exporting nations and between consumers and producers (Harris *et al.*, 2012; Turner, 2014).

Amongst the consequential techniques to evaluate climate-related policies, the project method appears to be better than the Life-Cycle Assessment (LCA) due to its higher easy-to-use and the ability to monitor the impacts over time (Brander, 2017). Moreover, the extant methodologies for the environmental assessment of projects often refer only to the initial phase. To fill this gap, Abdi *et al.* (2018) proposed a model based on the logic used in earned value management, which allows estimating the environmental impact throughout the whole life of a project. However, the new proposed solutions for supporting the evaluation of projects aimed to reduce their magnitude on the environment cannot involve all the issues related to the technology advancement (Hendrickson *et al.*, 2016).

For what concerns NGOs and municipalities, responses to climate action were aimed at increasing the involvement of emerging countries and societal stakeholders from all levels through the development of standards of participation and representation (Zengerling, 2018). Other types of initiatives attempt to guarantee broader inclusiveness within decision-making processes by structured climate action networks (Dombrowski, 2010).

Therefore, current experiences performed at all levels and within the different sectors underlined that climate change commitment is still inadequate. Reports contain several repetitions and the integration between financial and non-financial dimensions is weak (Atkins *et al.*, 2015). Part of the problem stems from the ambition to integrate environmental

issues into international financial standards without compromise their conceptual nature (Lovell, 2014). Furthermore, voluntary reporting schemes (i.e. NGER) were revealed to be focussed on the reporting of GHG emissions and energy consumption. This way, informative insights from stakeholders and the identification of potential problems for businesses are neglected (Lodhia and Martin, 2012).

Although good practices of voluntary disclosure have been implemented, the discretionary in adopting them do not allow the involvement of all organisations. Notwithstanding, the introduction of mandatory requirements such as the Carbon Tax in Australia, may lead organisations to reduce their disclosure due to a higher awareness of negative implications (Liu *et al.*, 2017). One of the consequences of this plight is that most developed accounting frameworks have been generated in a national or regional context, reducing their usefulness on an international scale (Andrew and Cortese, 2011).

Overall, attempts of researchers and practitioners are aimed to encourage the attitude to disclose. Nonetheless, the growth in the quantity was not supported by an improvement in the quality of information disclosed. Analysing data on GHG emissions in the oil and gas industry, Comyns (2016) observed that the average quality of the report was shallow, regardless of firm size. Due to institutional pressures, big companies increase the number of information. Likewise, the commitment of Indonesian companies in GHG emissions disclosure is aimed at legitimating their existence than pursuing an environmental strategy (Faisal *et al.*, 2018). Even responses to CDP demonstrate the apparent success of this initiative. Although the participation is high, comprehensibility of disclosures and actual achievement of desired performance is still questionable (Kolk *et al.*, 2008). In several cases, managers tend to prefer corporate reporting to CDP due to the opportunity of "customising" the disclosure according to the different stakeholder groups (Depoers *et al.*, 2016). For what concerns NGO, efforts in reporting environmental performance are often higher than the environmental performance itself (Haque and Irvine, 2018).

Linguistic strategies jeopardise the reliability of communications related to climate change. The analysis carried out by Ferguson *et al.* (2016) revealed that, over time, companies are moving from asserting that they are pursuing the interest of stakeholders rather than the own ones to shift responsibilities to other stakeholders such as government and suppliers. In Australia, in particular, less carbon-intensive sectors are inclined to adopt a symbolic disclosure strategy according to the intensity of the social debate around climate change, global warming and carbon footprints (Hrasky, 2011). Sometimes, the actual number of emissions may be dodged by the confusion between domestic and imported/exported emissions (Mózner, 2013). Talbot and Boiral (2018) identified four impression management strategies for GHG reporting. The two concealment strategies concern the strategic omission or the manipulation of data. The two neutralisation techniques consist of minimising the importance of non-disclosed emissions or in excuses and promise of future commitment.

As carbon-emission management reckons with several strategic dimensions (Ratnatunga and Balachandran, 2009), limits of existing practices lay on a weak integration of climate action into the overall strategy. Over time strategies pursued by companies have changed: for a while, there was a proactive and creating approach; currently, reactive strategies are prevalent (Bui and de Villiers, 2017). Reasons behind such a situation may be recognised into normative pressures, which bear a misalignment between climate policy and its translation at the organisational level (Cadez and Guilding, 2017). For example, while adopting long-term emission management measures, the majority of companies with more substantial relative emissions do not follow a specific strategy of emission reduction (Weinhofer and Hoffmann, 2010). Otherwise, firms strive for symbolically demonstrating

their attendance to reporting guidelines, without pursuing a strategy for improvement substantively (Haque and Ntim, 2018). In China, for example, companies do not openly mention climate change in their report, as the Chinese government promoted a policy of industry restructuration and energy-savings (Yang and Farley, 2016).

The prevalence of climate management for external disclosure at the expense of an internal strategy is confirmed by the lack of studies fitting into the management control area. Management accounting techniques are seen as tools for defending economic interests and reducing external pressures (Kumarasiri and Gunasekarage, 2017). Leaving aside some limitations related to the nature of management control studies and the difficulty of measuring non-financial dimensions (Hartmann *et al.*, 2013), the absence of such a perspective undermines risk management assessment (Bui and de Villiers, 2017) and a joined carbon management strategy (Burritt *et al.*, 2011). A cost and management accounting perspective, indeed, may provide useful insights around carbon cost structures. The relevance of this information is demonstrated by the study performed by Cadez and Guilding (2017). When the product drives the level of emissions, carbon costs are mainly variable. If the consumption of carbon-related resources is driven by capacity, a company has a harsh cost structure. When the number of emissions depends on both product and capacity, the cost structure is semi-variable.

At least seven reasons may unfurl the scant of interest for the development of effective climate action (Birnik, 2013). However, as Knox-Hayes and Levy (2011) underlined the importance of the participation of all of the stakeholder groups for promoting effective carbon mitigation goals (Haque and Azizul Islam, 2015; Blanco *et al.*, 2017). Alliances between nations can foster intergovernmental forums, as well as forms of private authority, also involving firms and NGOs, which have served both *de facto* and de jure global as rule-makers (Green, 2013). These forms of collaboration are critical within a transnational regime complex (Bäckstrand, 2008; Widerberg and Pattberg, 2017).

Ultimate effects of climate change commitment

The majority of scholars have addressed determinants and approaches to climate commitment reporting. Recently, it has been developing a research strand aimed at exploring outcomes engendered by efforts of the various actors involved. While the output is strictly related to the immediate results of an action (such as disclosure for what concerns climate change engagement), outcome refers to ultimate implications on performance and behaviours for facing the subsequent challenges (Hahn *et al.*, 2015). The intensity of energy employment and regulations tend to influence corporate response to climate change question, but not its aftermaths. Neither the presence of mandatory reporting requirements has been revealed to be a relevant determinant for superior efficiency (Gabe, 2016). Besides the reporting attitude, implications deriving from programme implementation are strongly related even to the ways by which information is disclosed (Matisoff, 2013).

So far, management techniques for reducing emissions have provided little or void benefits (Evangelinos *et al.*, 2015). Doda *et al.* (2016) attempted to justify this result with the absence of a standardised reporting approach and an insufficient impact orientation. Ioannou *et al.* (2016), instead, asserted that a higher target difficulty positively affects the likelihood of target completion from a long-term and non-financial perspective.

Several studies dealt with the overall impact of climate strategy on the performance from financial and non-financial perspectives. Despite the differences in reporting attitude amongst the sectors, Tang and Demeritt (2018) did not find specific patterns in the impact on the performance and on stakeholder relationship. Generally, efforts in sustainability practices do not favour a "halo effect", protecting firm value from negative implications due

to their carbon and gas consumption. Findings disseminated by Cooper *et al.* (2018) underlined a "fallen angel effect", which contributes to reducing firm value. Adverse effects worsen when companies do not disclose their performance, owing to penalties (Matsumura *et al.*, 2014).

Tackling the question of climate change as a threat and adopting a reactive approach are negatively correlated to environmental performance. This strategy contributes to boosting the rigidity of a company, undermining its smartness to react when a risk occurs (Sakhel, 2017). Conversely, a proactive approach leads to more sustainable performance and higher profitability in a five-year horizon. The integration of climate-related issues within the overall strategy allows companies to reduce risks, on the one hand; and to get the opportunities, on the other (Elijido-Ten, 2017). The depth in the integration influences the ability to attain a competitive advantage over other companies (Giannarakis *et al.*, 2017).

Nonetheless, Lee *et al.* (2015) observed a negative – and immediate – effect on the capital market return of proactive climate responses. Investors recognise efforts for mitigating environmental magnitude as an adverse event, which is going to endanger additional costs. To mitigate this adverse effect, firms could increase the frequency of voluntary disclosure. The frequency of communication on media channels, indeed, represents a moderating variable. Still, to evaluate the magnitude of responses to climate change on stock performance, Ziegler *et al.* (2011) analysed portfolios characterised by different environmental performance and considering different sub-sectors and different sub-periods for Europe and the USA separately. The achieved results were that stock performances of companies, which disclose responses to climate change were higher than those of companies, which do not disclose. In terms of time, such a result was particularly evident between 2004 and 2006 in Europe. In terms of sectors, attitude to disclose to climate change rewarded more energy firms in the US. Moreover, the authors found a positive magnitude of institutional climate policy on this relationship. Companies that operate in regions or sectors with more ambitious climate policy regimes reported a slightly higher stock performance.

In the view of CDP responses, Gasbarro *et al.* (2017) observed a different approach between companies and civil society. While companies recognised both risk and opportunities, civil society focusses more on risks. Attempting to boost the confidence of citizens, NGOs are using massive resources to foster inclusiveness and representativeness (Dombrowski, 2010).

The most significant benefits of a climate strategy perceived by organisations are gaining legitimacy (Haque and Azizul Islam, 2015; Nurunnabi, 2016; Faisal *et al.*, 2018; Li *et al.*, 2018); higher awareness and extensive climate change governance (Turner, 2014; Haque and Azizul Islam, 2015; Scobie, 2016; Widerberg and Pattberg, 2017); increasing accountability (Bebbington and Larrinaga-Gonzaléz, 2008; Kolk *et al.*, 2008; Michalisin and Stinchfield, 2010; Schaltegger and Csutora, 2012; Atkins *et al.*, 2015; Haque and Irvine, 2018).

Discussion: many silos, few integrated views

IT promotes integration between decision-making and action for creating value over the short, medium and long term. To do that, it takes the connectivity and interdependencies amongst the related elements within value creation (IIRC, 2013). Critical dialogic accountability, for its part, attentions to plenty of ideological orientations and the asymmetrical – but essential – relationships between accounting and accountability (Dillard and Vinnari, 2019). Understanding dialogic accountability processes firstly require the recognition of relevant stakeholders and the plethora of their needs and interests. Starting from the climate change governance triangle and overcoming the "silo thinking" and incorporating all the connections amongst the various factors that shape the behaviours

of organisations by the IT lens, the extensive journey into the literature on accountability for climate change revealed more shadows than lights. Moreover, IT philosophy suggests, the analysis of the debate involved the strategy, the performance and the prospects, having the governance schemes as ground.

Over time, scholars have been focussed either on the motivations that steered strategies to manage climate change or how organisations perform their climate action or on the implications and expectations related to their engagement. Anyone has integrated all these aspects, providing a 360-degree perspective. This study, hence, represents an attempt to make the state-of-art of the extant debate, underlying emerging trends from each dimension. The scientific interest in the topic has grown since 2015. Contributions came from all around the world, disregarding sectors, ownership and size of organisations.

In the dimension of Answerability, which deals with the reasons behind the development of a climate strategy, have emerged seven main determinants:

(1) Public pressure;
(2) Regulation;
(3) Perceived risk;
(4) Size;
(5) The concentration of markets;
(6) Location; and
(7) Role of institutional investors.

External pressures represent the first and historical reason, which foster behaviours towards climate change mitigation (Haque and Azizul Islam, 2015) and transparency (Giannarakis *et al.*, 2017). Consistently with the legitimacy theory (Suchman, 1995), more pressures lead to an increased level of disclosure (Liesen *et al.*, 2015). This aspect has been reframed also by Lai *et al.* (2014) and Melloni *et al.* (2016) disclosing the attitude of organisations to use integrated reports as tools for legitimizing their strategies; also by using a certain degree of impression management techniques. Amongst the various external pressures, regulation is one of the most significant (Brouhle and Harrington, 2009). Plenty of initiatives, in particular in the private sector, have been encouraged by the introduction of new regulations and the development of mandatory and voluntary reporting frameworks. The power of regulation is recognisable in the risk to incur in sanctions (Sakhel, 2017). The perception of risks that may undermine organisational performance, indeed, represents another factor that impacts the attitude to develop a climate strategy. As happens for other issues, such trends are heavily influenced by the size of the company. Due to the burden of their visibility, large companies tend to disclose more for non-financial aspects than small ones (Stanny and Ely, 2008; Eleftheriadis and Anagnostopoulou, 2014; Nurunnabi, 2016). A lower attitude to disclose over climate change has also been detected in firms, which operate in low-concentrated markets. This may be due to the fact that they expect to be negatively impacted by adverse climate events later in the future (Kraft, 2018). The higher motivations recorded in countries that have signed the Kyoto Protocol may express that even the location matters within the attitude to develop a strategic answer to climate change (Gallego-Álvarez, 2012). As a consequence, the macroeconomic attention to this issue increases the awareness of institutional investors towards the climate strategies developed by companies, which in turn increase their attitude to promote more sustainable practices (Cotter and Najah, 2012).

The trends arising in the Answerability dimension trigger two kinds of reflection. Firstly, managers tend to see climate actions as a response to specific problems or pressures than as a pillar for a strategy oriented to the future. In detecting so, it is worthwhile to note that both the foundations and principles of the IT approach were completely disregarded (Mio and Fasan, 2016; Dumay and Dai, 2017; Busco *et al.*, 2018). Sadly, a "disintegrated approach" is observable following the scheme: silos for climate – silos for natural capital – silos in not connecting capitals – silos in the ultimate disclosure provided (does not matter if formally prepared in accordance or not with the IR framework). Secondly, as the public pressure has a great deal of importance, some actors, especially those operating in high-polluting sectors and industries, used to shift the responsibility on climate changes to other stakeholders, governments and to the future, as the market and future technology developments are seen the only viable solution to the problem (Jaworska, 2018).

The Enforcement dimension that explores how organisations perform their climate action reveals a prevalence of studies fitting into the accounting field. Due to the weak motivations at the ground of organisational climate-related strategies, efforts have been devoted in particular to the translation of good purposes in accounting frameworks (Bebbington and Larrinaga-Gonzaléz, 2008). Most significant outputs are represented by top-down and hybrid approaches guided by popular carbon accounting tools as GHG emissions schemes, Life-Cycle Assessment (LCA), CDP which belong more to accounting for un-sustainability than accounting for sustainability (Schaltegger and Csutora, 2012). Besides reporting practices, unsuccessful results have been achieved in terms of civic participation and representation by NGOs (Zengerling, 2018; Haque and Irvine, 2018). Therefore, many silos are still recognisable even from the Enforcement perspective that point out the weakness of climate-oriented practices and ways to detect the related accountability within integrated reports (Silvestri *et al.*, 2017). Firstly, tools to support climate actions are inadequate, owing in particular to the weak integration between financial and non-financial information (Churet *et al.*, 2014; Atkins *et al.*, 2015). Voluntary reporting schemes have caused mainly such a situation. The high degree of discretion in their implementation and the extensive use of impression management techniques have undermined the comparability and the reliability of information (Comyns, 2016; Ferguson *et al.*, 2016; Melloni *et al.*, 2016). The performance of climate actions, hence, seems to be guided by the conflict amongst the various groups of stakeholders rather than by the substantial awareness to pursue environmental goals.

These trends are also reflected in the Outcome dimension, whose aim is to collect the present and future implications related to climate change engagement by companies and society as a whole. Evidence emerging from the literature suggests we are still far from winning the climate war. Many scholars asserted that the causes might be retrieved in the weakness of management and reporting techniques (Matisoff, 2013; Evangelinos *et al.*, 2015; Doda *et al.*, 2016). In an IT lens, however, to look for the reasons for unsatisfactory results we should go more in-depth, inquiring into the motivations that represent the ground of the climate actions. On the other hand, external pressures, regulation and risks have a positive magnitude to stimulate the commitment of organisations towards climate change mitigation. However, it has not been enough for identifying mandatory and/or voluntary tools to effectively support initiatives (Gabe, 2016) and, consequently, to achieve desired outcomes.

Most of the time, such a situation has occurred because firms have perceived climate change only as a threat, without an inner understanding of the related opportunities both for the companies and for society. This way, all efforts may be wasted. Neither reactive approaches (Sakhel, 2017), nor proactive ones (Lee *et al.*, 2015), indeed, have revealed a

positive relationship between social and environmental commitment and firm performance to date. Nay, sustainable purposes in some cases have resulted in a "fallen angel effect" (Cooper *et al.*, 2018), worsening firm value. On the contrary, positive aftermaths were registered when financial markets have recognised a premium for those companies which importantly enhanced their environmental disclosure or when located in Regions with a higher climate policy commitment, demonstrating the importance of the interplays between private and public sectors and between climate governance and related accountability process, output and outcome (Scobie, 2016, 2018).

Emerging patterns of the literature on accountability for climate change from answerability (A), enforcement (E) and outcome (O) are shown within the Climate Change Accountability Circle (Figure 4). The core of the framework is the "The Climate Governance Triangle" developed by Widerberg *et al.* (2016), while the circles into each dimension represent the key themes arisen [the nodes list is provided in Appendix 2].

Such a lecture, consistently with the IT principles, allows exploring the connection amongst the governance, represented by the "Climate Governance Triangle" at the core of the framework; the strategy, through the Answerability dimension; the performance, within Enforcement perspective; the prospects by the Outcome section. The connectivity amongst these dimensions, on the one hand, revealed the absence of accountable climate action; on the other hand, fosters an understanding of the leverage which needs to be activated to create a climate-friendly value.

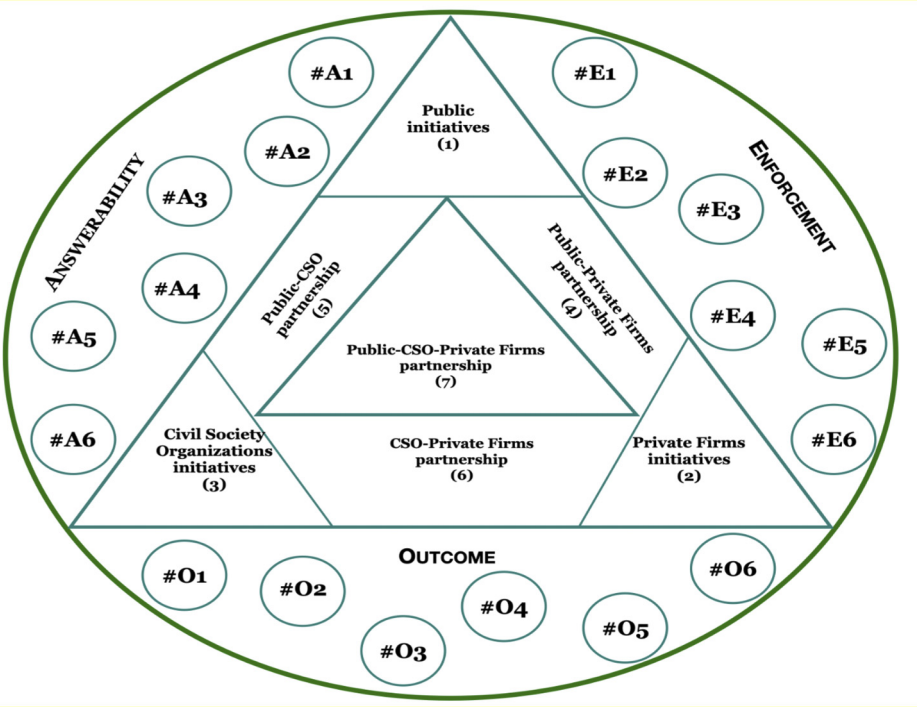


Figure 4.
The climate change accountability circle and related nodes

Source: Authors' elaboration

In more recent years there have been other attempts to provide a new accountability framework grounded on the mutual relationship between existing accountability mechanisms and governance architecture of climate changes, both at the local and supranational level (Lockwood, 2010; Scobie, 2016, 2018). However, an effective transnational regime on climate change seems desirable with the extent to which it is re-arranged under clear and linear accountability strategies and a broad agreement around priorities to pursue.

The proposing integrated framework would represent an answer to the call for new conceptual tools arisen from eminent scholars (Bebbington *et al.*, 2007; Atkins *et al.*, 2015; Bellucci and Manetti, 2017; Dillard and Vinnari, 2019) to face the challenges of the accountability-based accounting era. Furthermore, the urgency of climate change has pointed out the necessity to overcome the different and sometimes divergent individual interests towards a common goal. While new models are underway to estimate the environmental impact on projects and activities (Abdi *et al.*, 2018), mistakes from the past must be avoided break-downing the silos approach that has characterised the enforcement actions undertaken up to date.

Concluding remarks and avenues for future research

Accountability and governance are tangled in their nature and even more when dealing with a global challenge such as climate change. This study attempts to depict an approach for analysing accountability for climate change adopting an IT approach to explore the connectivity amongst the governance, strategy, performance and prospects in climate action. Grounded on "The Climate Governance Triangle", it embraces three – so far separated – accountability dimensions (i.e. Answerability, Enforcement and Outcome). This way, it gets to the development of the Climate Accountability Circle, which stems from the climate governance triangle and expands open issues of accountability at its vertexes.

The IT lens shows a "disintegrated" state of the art with several "non-communicating" themes in the three dimensions used to read the issue from 1998 to date, which is not consistent with the need for expanded and dialogical accountability patterns. The absence of an integrated approach to accountability for climate change resulted in a loss of connectivity amongst internal and external factors, which impact the effectiveness of actions. Neglecting these connections lead to weak motivations, fragmented and confusing performances and unsatisfactory ultimate results achieved. The proposed integrated accountability framework attempts to fill the disintegration, representing a pillar for scholars interested in narrowing their studies on accountability for climate change, bearing in mind an overview of the current landscape. Besides, it would be a matter of interest for policymakers interested in boosting and leaning existing initiatives by capturing existing overlaps and intricate schemes that characterise the transnational complex regime for climate change. Finally, even if focussed on a specific theme as climate change is, on the ground of the IT approach, this study would be helpful for people engaged in the revision of the IR framework, which is underway (IIRC, 2020a, 2020b) and, more in general, in the development of accounting and accountability tools to sustain the complex and pluralistic dialogues throughout the climate war.

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Appendix 1

Table A1.
Reviewed studies classified according to year; journal; scientific field(s), (based on SCImago Journal Rankings); governance architecture (based on Widerberg *et al.* 2016 classification); accountability dimension(s) addressed

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Abdi *et al.*	2018	*International Journal of Project Management*	Business, management and accounting				Private (2)		Yes	
Amran *et al.*	2014	*Sustainable Development*	Energy	Social sciences			Private (2)	Yes		
Andrew and Cortese	2011	*Accounting Forum*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes	Yes	
Atkins *et al.*	2015	*Accounting, Auditing and Accountability Journal*	Business, management and accounting				Private (2)		Yes	Yes
Backman *et al.*	2017	*Business and Society*	Business, management and accounting	Social sciences			Private (2)	Yes		
Bebbington and Larrinaga-Gonzalez	2008	*European Accounting Review*	Business, management and accounting				Private (2)		Yes	Yes
Ben-Amar *et al.*	2015	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)	Yes		
Birnik	2013	*Thunderbird International Business Review*	Business, management and accounting	Social sciences			Private (2)		Yes	
Blanco *et al.*	2017	*Business Horizons*	Business, management and accounting				Private (2)		Yes	Yes
Brander	2017	*Journal of Cleaner Production*	Business, management and accounting	Energy	Engineering	Environmental science	Private (2)	Yes	Yes	
Brander *et al.*	2018	*Energy Policy*	Energy	Environmental science			Private (2)		Yes	
Bui and de Villiers	2017	*British Accounting Review*	Business, management and accounting				Private (2)		Yes	

(*continued*)

Table A1.

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Burritt *et al.*	2011	*Australian Accounting Review*	Business, management and accounting				Private (2)		Yes	
Cadez and Guilding	2017	*Accounting, Auditing and Accountability Journal*	Business, management and accounting	Economics, econometrics and finance			Private (2)		Yes	
Comyns	2016	*Journal of Business Ethics*	Art and humanities	Business, management and accounting	Economics, econometrics and finance		Private (2)		Yes	
Cooper *et al.*	2018	*Journal of Accounting and Public Policy*	Business, management and accounting	Social sciences			Private (2)			Yes
Cotter and Najah	2012	*Australian Journal of Management*	Business, management and accounting				Private (2)	Yes		
Csutora and Harangozo	2017	*Society and Economy*	Business, management and accounting	Economics, econometrics and finance	Social sciences		Private (2)		Yes	
Datt *et al.*	2018	*Journal of International Accounting Research*	Business, management and accounting				Private (2)	Yes		
Depoers *et al.*	2016	*Journal of Business Ethics*	Art and humanities	Business, management and accounting	Economics, econometrics and finance		Private (2)		Yes	
Doda *et al.*	2016	*Corporate Social Responsibility and Environmental Management*	Business, management and accounting	Environmental science	Social sciences		Private (2)			Yes
Dombrowski	2010	*International Environment Agreements*	Economics, econometrics and finance	Social sciences			Civil and society organisations (3)	Yes	Yes	Yes
Eleftheriadis and Anagnostopoulou	2015	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)	Yes		

(*continued*)

Table A1.

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Elijido-Ten	2017	*Journal of Cleaner Production*	Business, management and accounting	Energy	Engineering	Environmental science	Private (2)			Yes
Faisal *et al.*	2018	*Corporate Social Responsibility and Environmental Management*	Business, management and accounting	Environmental science	Social sciences		Private (2)		Yes	Yes
Ferguson *et al.*	2016	*Accounting, Auditing and Accountability Journal*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes	Yes	
Galbreath *et al.*	2014	*Journal of Business Ethics*	Art and humanities	Business, management and accounting	Economics, econometrics and finance		Private (2)	Yes		
Gallego-Alvarez	2012	*Sustainable Development*	Energy	Social sciences			Private (2)	Yes		
Gasbarro *et al.*	2017	*Journal of Cleaner Production*	Business, management and accounting	Energy	Engineering	Environmental science	Private (2)			Yes
Giannarakis *et al.*	2017	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)	Yes		Yes
Green	2010	*Business and Politics*	Business, management and accounting	Social sciences			Private (2)	Yes		
Hahn *et al.*	2015	*Organisation and Environment*	Business, management and accounting	Environmental science			Private (2)			Yes
Haque and Azizul Islam	2015	*Business and Politics*	Business, management and accounting	Social sciences			Private (2)	Yes	Yes	Yes
Haque and Irvine	2016	*Financial Accountability and Management*	Business, management and accounting	Economics, econometrics and finance			Civil and society organisations (3)	Yes	Yes	Yes
Haque and Ntim	2018	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)		Yes	

(*continued*)

Table A1.

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Hartmann *et al.*	2013	*Abacus*	Business, management and accounting				Private (2)		Yes	
Hrasky	2012	*Accounting, Auditing and Accountability Journal*	Business, management and accounting	Economics, econometrics and finance			Private (2)		Yes	
Ioannou *et al.*	2016	*Accounting Review*	Business, management and accounting	Economics, econometrics and finance			Private (2)			Yes
Jaggi *et al.*	2018	*Organisation and Environment*	Business, management and accounting	Environmental science			Private (2)	Yes		
Jaworska	2018	*International Journal of Business Communication*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes		
Know-Hayes and Levy	2011	*Strategic Organisation*	Business, management and accounting	Social sciences			Civil and society organisations and Private (6)		Yes	
Kraft	2018	*Organisation and Environment*	Business, management and accounting	Environmental science			Private (2)	Yes		
Kumarasiri and Gunasekarage	2017	*British Accounting Review*	Business, management and accounting				Private (2)	Yes	Yes	
Kuyper and Backstrand	2016	*Global Environmental Politics*	Energy	Environmental science	Social sciences		Civil and society organisations (3)	Yes		
Kuyper *et al.*	2017	*Review of Policy Research*	Environmental science	Social sciences			Civil and society organisations (3)	Yes		
Lee *et al.*	2015	*Corporate Social Responsibility and Environmental Management*	Business, management and accounting	Environmental science	Social sciences		Private (2)			Yes
Li *et al.*	2018	*Journal of Business Ethics*	Art and humanities	Business, management and accounting	Economics, econometrics and finance	Social sciences	Private (2)			Yes

(*continued*)

Table A1.

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Liao *et al.*	2015	*British Accounting Review*	Business, management and accounting				Private (2)	Yes		
Liesen *et al.*	2015	*Accounting, Auditing and Accountability Journal*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes		
Linnenluecke *et al.*	2015	*Accounting and Finance*	Business, management and accounting	Economics, econometrics and finance			Private (2)		Yes	
Lodhia and Martin	2011	*Accounting, Auditing and Accountability Journal*	Business, management and accounting	Economics, econometrics and finance			Civil and society organisations and Private (6)	Yes	Yes	
Lovell	2014	*Economy and Society*	Art and humanities	Business, management and accounting	Economics, econometrics and finance	Social sciences	Private (2)		Yes	
Matisoff	2013	*Energy Economics Policy*	Energy	Environmental science			Private (2)		Yes	Yes
Matsumura *et al.*	2014	*Accounting Review*	Business, management and accounting	Economics, econometrics and finance			Private (2)			Yes
Michalisin and Stinchfield	2010	*Journal of Business Strategies*	Business, management and accounting				Private (2)			Yes
Nurunnabi	2015	*Environment, Development and Sustainability*	Economics, econometrics and finance	Environmental science	Social sciences		Private (2)	Yes		Yes
Ratnatunga and Balanchandran	2009	*Journal of Accounting, Auditing and Finance*	Business, management and accounting	Economics, econometrics and finance			Private (2)		Yes	
Sakhel	2017	*Journal of Cleaner Production*	Business, management and accounting	Energy	Engineering	Environmental science	Private (2)	Yes		Yes
Schaltegger and Csutora	2012	*Journal of Cleaner Production*	Business, management and accounting	Energy	Engineering	Environmental science	Private (2)		Yes	Yes

(*continued*)

Author(s)	Year	Journal	Discipline	Discipline (2)	Discipline (3)	Discipline (4)	Governance	Answerability	Enforcement	Outcome
Stanny *et al.*	2008	*Corporate Social Responsibility and Environmental Management*	Business, management and accounting	Environmental science	Social sciences		Private (2)	Yes		
Talbot and Boiral	2018	*Journal of Business Ethics*	Art and humanities	Business, management and accounting	Economics, econometrics and finance		Private (2)		Yes	
Tang and Demeritt	2018	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)			Yes
Thistlethwaite and Wood	2018	*British Journal of Management*	Business, management and accounting				Private (2)	Yes		
Trotman and Trotman	2015	*Auditing: A Journal of Practice and Theory*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes		
Wegener *et al.*	2013	*Accounting Perspectives*	Business, management and accounting	Economics, econometrics and finance			Private (2)	Yes		
Weinhofer *et al.*	2010	*Business Strategy and the Environment*	Business, management and accounting	Environmental science	Social sciences		Private (2)		Yes	
Ziegler *et al.*	2011	*Energy Economics*	Economics, econometrics and finance	Energy			Private (2)			Yes

Table A1.

Appendix 2

NODES LIST

Answerability

#A1: private companies, public sector and NGOs,
#A2: external pressure,
#A3: media's magnitude,
#A4: climate mitigation commitment leverage,
#A5: developing countries vs developed countries,
#A6: internal and external auditing.

Enforcement

#E1: climate accounting,
#E2: standards and protocols,
#E3: customisation of disclosure,
#E4: climate change strategy,
#E5: climate-related management control research,
#E6: collaboration amongst stakeholder groups.

Outcome

#O1: halo effect vs fallen angel effect of voluntary sustainability practices,
#O2: financial and non-financial impact,
#O3: environmental performance,
#O4: market performance impact,
#O5: sector-related magnitude,
#O6: reputational benefits.

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