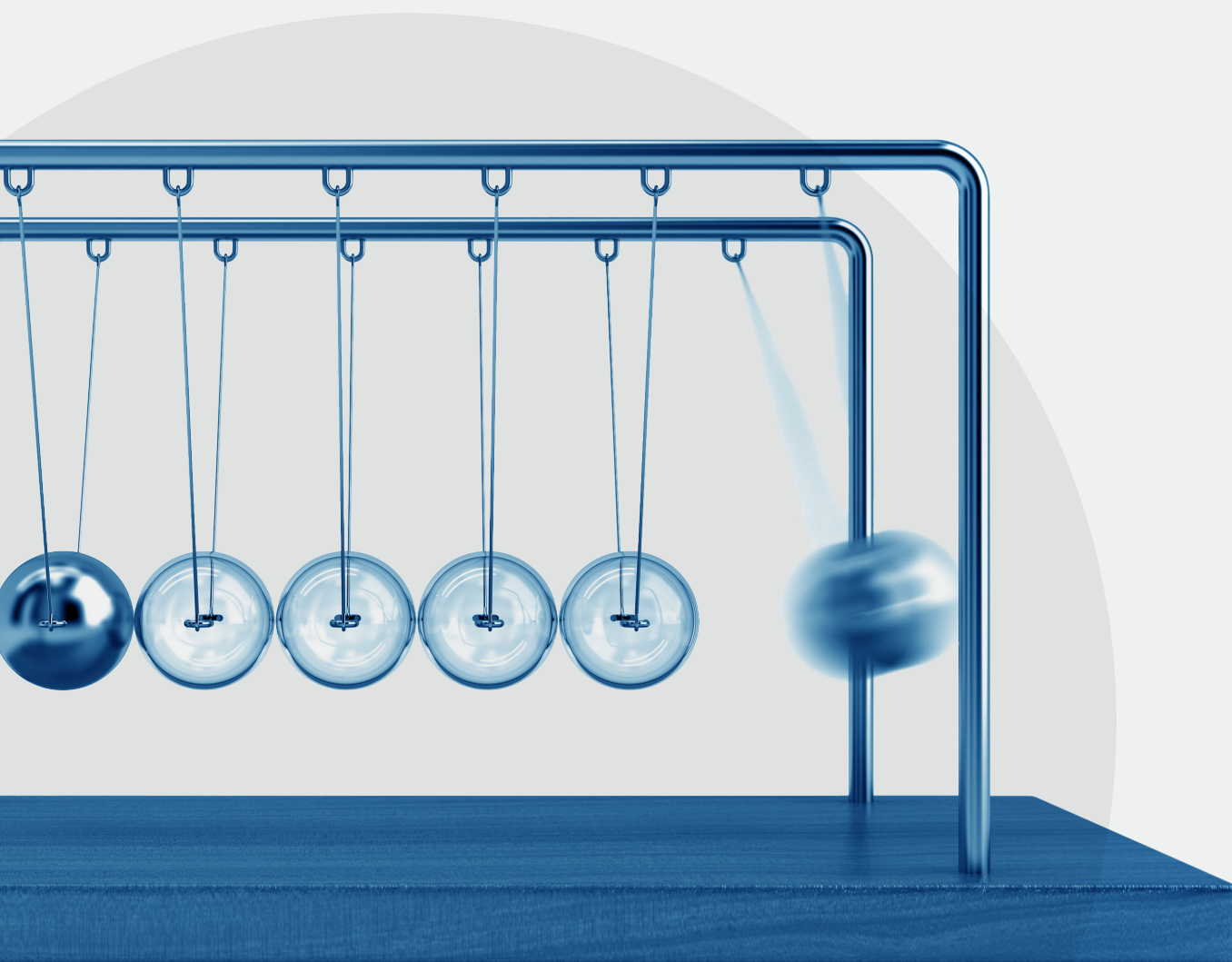


# **Black Box Accounting:** Discounting and disclosure practices of decommissioning liabilities

Giovanna Michelon  
Mari Paananen  
Thomas Schneider





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# FOREWORD

*“Since society is ultimately liable for the cost of decommissioning assets that operators cannot pay for, decommissioning liabilities (DLs) and companies’ related accounting choices are issues of public interest. Therefore, we recommend that standard setters require disclosing such information to allow those who use financial statements to see inside the ‘black box’ of accounting for DLs.”*

A strong and pertinent key conclusion from this new ICAS-funded research project.

Increasingly, investors are no longer solely interested in the financial outcomes of their investments. Increasingly, they care about the impact of their investments and the role they play in the promotion of global sustainability issues.

Increasingly, the ‘trust score’ of companies or their products is enhanced when they behave in an environmentally and socially responsible manner.

This report by Giovanna Michelon from the University of Bristol, Mari Paananen from the University of Gothenburg and Thomas Schneider from Ryerson University sets itself against this wider background by considering whether accounting according to IAS 37: *Provisions, Contingent Liabilities and Contingent Assets* is designed and applied not only in the best interests of investors and creditors but, as importantly, in those of the general public. The research team sought to shine a light very specifically on accounting for the costs of decommissioning and clean-up operations in polluting industries.

When a company acquires certain types of long-term assets, such as an oil rig or a nuclear power plant, it incurs an inherent obligation to remove the assets, and clean-up and restore the site once the asset has reached the end of its useful life. Furthermore, a critical issue crystallises where such a company becomes insolvent – the clean-up liability remains attached to the asset, which may therefore become less attractive to a potential buyer, and so, if eventually the asset remains unsold, the taxpayer ends up picking up the decommissioning tab. This scenario is likely to be more frequent in a post-Covid world.

IAS 37 mandates that the future cost of clean-up be estimated and accounted for using an appropriate discount rate to calculate the present value of these costs. However, the standard does not mandate for businesses to disclose the rate they have used, nor makes clear whether the basis for calculating the discount rate should be an accounting choice, by design or in practice.

When boiled down to its core, this research report recommends that:

Standard setters require disclosing the discount rates applied to facilitate comparability and allow for users of financial statements and other key stakeholders to see inside the ‘black box’ of accounting for decommissioning liabilities;

Preparers include and auditors demand enhanced disclosures, to include not only the discount rate but also undiscounted future estimated cash flows and timing of decommissioning activities, augmented by a comprehensive narrative on the major uncertainties surrounding these three items.

To go beyond those recommendations in the report, I would argue that boards and their audit committees should take a robust approach to improving disclosures relating to decommissioning provisions, when to do so would be consistent with the over-riding principle of a true and fair view as well as the public interest.

**Guy Jubb**

***Chair of the Research Panel***

**October 2020**

## Executive summary

### *Study objectives and background*

This project focuses on discount rates used in accounting for decommissioning costs, clean-up costs, and other related environmental liabilities, as per IAS 37 - Provisions, Contingent Liabilities and Contingent Assets (IAS 37), with the purpose of:

1. determining the level of diversity in practice related to the choice of discount rate and investigating country- and firm-level factors that might explain this diversity;
2. identifying corporate disclosure and transparency practices that help stakeholders understand the ‘black box’ of decommissioning and other environmental liabilities;
3. clarifying the nature of decommissioning and other environmental liabilities and pointing out the major implications of our findings for standard-setters, policy-makers, preparers and auditors.

Decommissioning commitments are among the largest liabilities for firms in pollution-prone industries, and when these firms fail, the public often bears the cost of the environmental implications of their actions. Decommissioning commitments require estimating the future cash outflows associated with decommissioning an asset and choosing a discount rate for calculating the present value of these future cash outflows. These commitments also entail cleaning up and restoring the site on which the asset is located. These decommissioning liabilities (DLs) do not disappear if the polluting firm goes into insolvency but remain associated with the asset and impair any future cash flows of creditors or future owners. Large DLs may leave creditors or potential buyers with no desire to hold the firm’s residual assets as, unlike financial liabilities, DLs are physical liabilities and any monetary amount attached to them is only a proxy of these physical liabilities (i.e. provisions). No matter how big or small the firm, DLs are implicitly owned by society, which will ultimately sustain the decommissioning costs or, worse, suffer the potential negative environmental impacts.<sup>1</sup> Further, we argue that DLs constitute a dilemma from a conceptual framework (CF) point of view. The CF prescribes that firms disclose information (e.g. discount rates) to help investment and lending/credit decisions, yet investors and lenders/creditors are not claimants and are unlikely to bear the ultimate burden of DLs that have not been addressed. Further, the CF defines materiality as the threshold at which the disclosure influences these stakeholders’ decisions, yet those who are more likely to bear the cost of unaddressed DLs neither will, nor can, make the kind of decisions to which the CF refers. Accounting choices and policies on DLs, as well as disclosure practices, are surely important to investors and analysts who are interested in assessing the value or solvency of a firm. However, given the important societal implications inherent to the valuation and reporting of DLs, how to account for them in the best interests of the *public*, rather than those of corporations or shareholders, is an issue that standard-setters and regulators should tackle sooner rather than later.

The current study uses a large international sample to determine whether global diversity exists in the choice of discount rate and the disclosure of the rate used, as well as other disclosures around DLs. Going beyond the strict technical debates under IAS 37 on whether a firm’s “own credit risk” (i.e. the spread between a risk-free rate and the market rate of debt based on the firm’s credit worthiness) should be included in the discount rate (see Schneider et al., 2017), the project contributes to an informed discussion about which choice is appropriate theoretically.

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<sup>1</sup>Despite the fundamental difference between DLs and financial liabilities, we do note that there are some implicit public guarantees for financial liabilities in the “too big to fail” cases.

## Research questions

The previous discussion serves as the basis for three research questions:

- RQ1 Is there significant diversity in the choice of discount rate in accounting for DLs and environmental liabilities and, if so, what are the firm- and country-level factors that might explain it?
- RQ2 What are the disclosure practices in accounting for DLs?
- RQ3 Given the social impact of DLs, what are the theoretical bases and objectives in the application of discount rates?

## Summary of research approach

This study employs a multi-method approach, combining archival data and statistical analyses with semi-structured interviews. Archival data on discount rates and related DLs were manually collected from a global sample of firms from 2005 to 2016 in IFRS-reporting countries across three pollution-prone industries: Oil & Gas (O&G), mining, and utilities. We retrieved 10,621 annual reports and, using computerized textual analysis, used the text of the financial statements' note(s) on environmental liabilities to analyse disclosure practices about the discount rate, particularly whether the company used a risk-free or adjusted discount rate. This process identified 4,339 annual reports that included environmental liabilities, of which 2,103 also disclosed the discount rate used. After retrieving other financial information from Thomson Reuters, we performed a multivariate analysis. Because of missing variables, the final sample composition was 1,398 observations in the O&G industry (corresponding to 336 unique firms), 1,389 observations in the mining industry (364 unique firms) and 496 observations in the utilities industry (93 unique firms). We sought to capture descriptively the determinants, at the firm and country level, of (1) the choice to disclose the discount rate; (2) the choice not to use a risk-free rate and (3) the discount rate used. The multi-variate analysis was run separately for each industry.

This archival analysis of disclosure practices was complemented by twenty-seven semi-structured interviews from a unique cross-section of stakeholders, including six preparers, seven auditors, five regulators and standard-setters, three users, four experts and two representatives of civil society (NGOs). Geographically, the interviewees were from Canada, France, Italy, Spain, Sweden, the UK and the USA. The interviews were intended to pinpoint the information needs of various groups with respect to how decommissioning costs are accounted for, illustrating how disclosures can open the 'black box' of environmental liabilities in the eyes of various stakeholders. The interviews of different groups allow us to address the public interest and practical/policy issues related to disclosure and discounting of DLs. The researchers also held a roundtable with a similar cross-section of stakeholders, which allowed for face-to-face discourse among the participants. The interview guide was structured around questions related to accounting for DLs as well as reporting and disclosures. For external stakeholders, questions regarding information needs and use were included. The analysis of the interviews focused on applied and theoretical aspects of the discount rate and disclosure as they pertain to DLs.

## Findings

Evidence from the quantitative and qualitative analysis suggests significant diversity in practice in discount rate choices and DL disclosure in terms of reported discount rates across both industry sectors and countries.

Regarding the first research question, the analysis shows substantial variation in the choice to disclose the discount rate and in the discount rate used across countries, and reveals that the adjustment to the discount rate is also industry and country specific. For example, whilst the mean discount rates are relatively homogeneous across industries, the range of discount rates used is wide, with minimums of 0% in all industries, and maximums of 17.8% (O&G), 33.1% (mining), 13.88% (utilities). Geographically, the United Kingdom (UK) firms tend to make a considerable adjustment to the risk-free rate in all of the industries studied, whereas Canadian firms tend to adjust more often in the mining and O&G sectors than they do in the utilities sector. Diversity in the choice of the discount rate is also related to significant variation to the discount rates assigned to each liability. Companies are not fully transparent regarding how they determine the discount rate, so what causes such significant variation is not transparent either, although one can infer from the business's general context that the choice is likely related to where the assets are located; that is, the discount rate is chosen based on where the operations are.

The result of diversity in practice is reflected in many of the interviewees' comments. For example, one of the auditor interviewees stated, *"I guess it would be fair to say that there is a range in practice, even if you compare across the mega major oil companies."*

The interviews also revealed that, in practice, whether to include the firm's own credit risk is now considered an accounting choice. Notably, the interpretation of IAS 37 with respect to discount rates as a policy choice contradicts the IC conclusion in 2011 related to discount rates for DLs.

The multi-variate analysis suggests that the determinants of the choice to disclose discount rates vary across industry sectors. In the O&G industry, country-level determinants of the choice of disclosing the discount rate are the enforcement of regulation, gross domestic product (GDP), environmental protection rankings, and the level of the risk-free rate. However, the level of enforcement is not significant for the mining sector and none of the country-level determinants are significant in the utilities sector. A firm-specific driver of the choice to disclose discount rates is Big 4 auditors (except in the utilities sector), and firm size also has a positive impact on the willingness to disclose discount rates, but only in the mining and utility sectors. Similarly, when we investigate the choice to adjust the discount rate and the factors influencing the value of the discount rate, we find that the determinants vary across industries (see Table 7 in the report for detailed results).

Although there is significant diversity in practice across all countries, Canadian firms dominate the sample in terms of disclosure. For example, among the countries most represented in the O&G sector, about 70 percent of Canadian companies disclose the discount rate, whereas the incidence of disclosing companies in the UK, Australia and Norway is relatively low (9.2%, 2.9% and 1.8%, respectively). This finding indicates that Canada is a special case, the reason for which emerged in the interviews: previous Canadian GAAP dictated disclosure of the discount rate. Such disclosure is also the expectation of securities regulators, as indicated in a comment from a Canadian regulator interviewee: *"I think people have carried that forward. From my perspective, I think that falls under IAS 1. ... I don't think anyone even questioned that because it was already disclosed, so companies are not trying to hide it."*



As for the second research question, comprehensive disclosure practices are those that provide the discount rate(s) used and the underlying assumptions (including the undiscounted liability), as well as the horizon and timing of future cash flows. The most comprehensive disclosures provide additional information, such as detailed descriptions of what the cash flows reflect, a discussion of any uncertainties surrounding environmental provisions, reconciliation of provision changes between beginning and ending balances with comparatives for the previous year, and sensitivity analyses. The interviews further revealed that users and civil society need more disclosure to be able to assess the true nature of the liability: the discount rates used and methodology, information about undiscounted amounts, what is included in estimated cash flows, and how and when resources will be used.

With regard to the third research question, there is consensus among the interviewees that these types of liabilities differ significantly from financial liabilities, but there is less agreement as to which discount rate is appropriate. However, many interviewees, in line with the ecological economics literature (discussed in the main report), agree that a low discount rate is the most appropriate. For example, as one of the experts interviewed put it: *“It’s a moral issue about how far you discount the costs and liabilities for future generations; if anything, I want a negative discount rate.”* A negative discount rate implies that the value of the liability today is higher than the sum of the future cash flows at nominal values. From a practical point of view, if firms provide comprehensive disclosures, the actual rate used becomes a second-order issue: users given the discount rate, undiscounted liability, timing, and so on, would not only get a more transparent view into the ‘black box’ but could also make their own assumptions about the present value of DLs. However, comprehensive disclosure is not the international norm under IAS 37.

## Implications of findings and recommendations

This study has several salient recommendations for standard-setters, policy-makers, preparers and auditors, specifically in relation to a call for guidance on the discount rate but also to a call for guidance on enhanced disclosure. The key question for **standard-setters** that arises from the findings is whether IAS 37 was written with the intention to say that the basis for calculating the discount rate is an accounting choice or that it is acceptable that doing so has simply turned out to be the case in practice.

If it is acceptable that doing so has turned out to be the case in practice, **standard-setters** need to clarify an appropriate basis for the discount rate. If it is acceptable that the basis for calculating the discount rate is an accounting choice, there is still the issue of ensuring transparent disclosure to inform users’ decisions, ensure comparability across firms, and inform public policy. From evidence gathered in both archival and interview data, it appears that guidance (in IAS 37 and, generally speaking, within IFRS) is insufficient regarding what should be disclosed in relation to DLs. Since society is ultimately liable for the cost of decommissioning assets that operators cannot pay for, DLs and companies’ related accounting choices are issues of public interest. Therefore, we recommend that standard setters require disclosing such information to allow those who use financial statements to see inside the ‘black box’ of accounting for DLs.

For **preparers and auditors**, the findings in this study suggest a demand for enhanced disclosures related to DLs. Descriptive statistics on discount rates used, examples of complete disclosures, and the comments of interviewees (presented in the main report) give preparers and auditors benchmarking information that would enable stakeholders to make informed decisions. In particular, this study documents that disclosures of the discount rate, (undiscounted) future estimated cash outflows, and timing of decommissioning activities are the three pieces of information that stakeholders need. However, the discussion of major uncertainties surrounding these three items warrants a comprehensive and complete reporting practice, as well as enhanced understanding from a user perspective. Therefore, we recommend that preparers and auditors disclose such information, which allows users of financial information to open the ‘black box’ of accounting for DLs.

# 1. Introduction

Research suggests that assumptions related to discount rates have material consequences for companies across many industries with respect to the valuation of balance sheet items like decommissioning commitments, pension obligations, and stock options (Blankley and Swanson, 1995; Schneider et al., 2017). The present project focuses on discount rates used in accounting for decommissioning costs, clean-up costs, and other related environmental liabilities, as per IAS 37: Provisions, Contingent Liabilities and Contingent Assets (IAS 37), with the purpose of:

1. determining the level of diversity in practice related to the choice of discount rate and investigating country- and firm-level factors that might explain this diversity;
2. identifying corporate disclosure and transparency practices that help stakeholders understand the ‘black box’ of decommissioning liabilities and other environmental liabilities;
3. clarifying the nature of accounting for decommissioning liabilities and other environmental liabilities and pointing out the major implications of our findings for standard-setters and policy-makers.

Future decommissioning, clean-up, and other environmental costs are called asset-retirement obligations (AROs) under US and pre-IFRS Canadian GAAP, and the term is in common usage in practice in Canada, including in many official company reports. Under IFRS, AROs are called environmental and “decommissioning provisions,” but we use the term “decommissioning liabilities” (DLs). DLs are among the largest liabilities for firms in pollution-prone industries, and when these firms fail, the public typically bears the cost of the environmental implications of firms’ actions.

DLs (and environmental liabilities in general) refer to physical degradation of the environment, and the financial liability reported in the financial statement is a proxy for what it may take to remedy it. When a firm goes bankrupt with DLs left unaddressed, the ultimate payer is the public, which has to live with the polluted environment or pay for the clean-up. Thus, unlike financial liabilities, environmental liabilities are implicitly guaranteed by society, which will ultimately sustain the decommissioning costs or suffer the potential negative environmental impacts.<sup>2</sup> Therefore, DLs constitute a dilemma from a conceptual framework (CF) point of view for two reasons. First, the CF prescribes that firms disclose information (e.g. discount rates) to aid decisions related to investment and lending/credit, yet investors and lenders/creditors are not claimants and are unlikely to bear the burden of DLs that have not been addressed.<sup>3</sup> Second, the CF defines materiality as the threshold at which the disclosure influences these specific stakeholders’ decisions, yet those who are more likely to bear the cost of unaddressed DLs neither will nor can make the kind of decisions to which the CF refers.<sup>4</sup> Further, given that these costs are often sizeable, firms may be incentivized to understate the amount of the DLs. The magnitude of future DLs is determined by management’s estimated costs (an area of potential concern on its own), the discount rate, and other assumptions, such as timing of decommissioning activities.

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<sup>2</sup>Despite the fundamental difference between DLs and financial liabilities, there are some implicit public guarantees for financial liabilities in cases of firms that are “too big to fail.”

<sup>3</sup>IFRS Conceptual framework 2018 paragraph 1.2

<sup>4</sup>IFRS Conceptual framework 2018 paragraph 2.11

This project builds on prior evidence from the Canadian O&G and mining industries, where diversity in practice in the choice of discount rate has been documented on firms' transition to IFRS, suggesting that these firms may have chosen the discount rate opportunistically to manage reported future DLs (Schneider et al., 2017). Before Canada's move to IFRS in 2011, Canadian GAAP was similar to US GAAP in dictating inclusion of the firm's own credit risk in discounting DLs, an upward revision from the risk-free rate that is based on the firm's credit-worthiness (i.e. the less credit-worthy the firm, the higher the discount rate and the lower the reported DL). In 2010, the Canadian Accounting Standards Board asked the IFRS Interpretations Committee (IC) if IAS 37 allowed the inclusion of a firm's own credit risk. The ensuing debate is covered in detail in Schneider et al. (2017), but in the end, the IC chose not to address the issue, stating that it expected no diversity in practice under the assumption that predominant practice was to use the risk-free rate. With no specific direction from the IC, the key firm-specific decision when Canadian firms with large DLs transitioned to IFRS was whether to include their own credit risk or to discount the DL based on a risk-free rate. Schneider et al. (2017) document that most firms used a risk-free discount rate, but large companies with considerable future DLs opted to include their own credit risk and to use a higher discount rate so they could report lower DLs and, perhaps, remain comparable to their US counterparts, where the firm's own credit risk is the norm for discounting DLs.<sup>5</sup>

Therefore, the first aim of this project is to extend Schneider et al.'s (2017) findings in space (e.g. industry and country) and time (over an extended period of time) and to investigate whether there is global diversity in the choice of discount rate under IAS 37. Such a systematic cross-country overview of corporate practices around the discount rate for DLs can help us address concerns about how firms globally interpret and apply IAS 37. Clearly, understanding the dynamics and factors that are related to corporate practices are important for standard-setters and policy-makers.

The second aim of this project is to identify best practices in disclosure of DLs. For example, evidence gathered in a study of European pollution prone companies suggests that many firms do report information about uncertainty, discount rates used, details about the timeline and costs and sites. However, these firms rarely provide all the pieces of information needed (Paananen et al., 2020). Such additional discretionary disclosure reported in mandatory financial statements is vital to the ability to assess how DLs relate to the firm's viability and to understanding the potential societal costs associated with these corporate activities. Just as there is ambiguity regarding the discount rate under IAS 37, there is ambiguity regarding the extent of disclosure required, so developing best-practice guidance about what to disclose is necessary if users are to understand the black box that is the reported DL. The development of guidance regarding best practices will benefit from insights into stakeholders', investors', experts', and regulators' needs for information.

To report information about uncertainty, discount rates they use, details about the timeline, and costs and sites. However, these firms rarely provide **ALL** the pieces of information needed.

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<sup>5</sup>Other theoretical aspects of the appropriate discount rate could also be considered in the discount rate debate regarding IAS 37, but the debate presented in this paragraph was (and is) the main debate. The final section of this report touches on other aspects of the debate. Note that a move to a risk-free rate can easily cause the balance sheet amount of the DL to double (Schneider 2011).

Finally, the project goes beyond the strict technical debate about whether a firm's own credit risk should be included in the discount rate under IAS 37, and contributes to an informed discussion—that is, one based on large-scale evidence and interview data—about whether inclusion of the firm's own credit risk is appropriate theoretically. Specifically, the tension inherent in the choice of discount rate for estimating the costs of DLs is related to the nature of these liabilities. As highlighted in Schneider et al. (2017, p. 397), “environmental liabilities do not just go away in the event that the firm cannot make good on its commitments.” Hence, how to account for them in the best interests of the *public*—rather than those of corporations or shareholders—is an issue that standard-setters and regulators should address sooner than later.

The research questions (RQs) used to pursue these three aims are formalized as follows:

- RQ1 Is there significant diversity in the choice of discount rate in accounting for DLs and environmental liabilities and, if so, what are the firm- and country-level factors that might explain it?
- RQ2 What are the disclosure practices in accounting for DLs?
- RQ3 Given the social impact of DLs, what are the theoretical bases and objectives in the application of discounting?

To address these research questions, archival data were collected on firms' reporting from 2005 to 2016 in IFRS reporting countries across three pollution-prone industries: oil and gas (O&G), mining, and utilities. These data were used to analyse current accounting recognition and reporting under IAS 37. To provide context to the archival results, twenty-seven interviews and a four-hour roundtable on IAS 37 with key stakeholders were conducted and systematically analysed. The evidence suggests that diversity in the choice of discount rate is the norm under IAS 37. Disclosure practices are equally diverse, as the evidence (archival and interview) suggests firm- and country-based effects. Some of the best disclosure practices allow the user to look into the 'black box', but there is no obligation under the current standard for firms to provide information that allows investors or the general public to understand systematically the timing or amount of DLs. Transparency is left to firms, securities regulators, and activist investors' demands.

The next section reviews the academic literature on discount rates and environmental liabilities. Section 3 presents the research design and methodology, followed by the results in Section 4. The report concludes with a summary and a discussion of the findings' implications for accounting standard-setters, regulators, preparers and auditors.

## 2. Background and the extant literature

Accounting practices vary widely across industries and countries (Nobes, 2013; Stadler and Nobes, 2014). This study focuses on one area: the use of discount rates in accounting for DLs, which affect the present value of cash outflows. IAS 37 guides the accounting for DLs but has been much criticized by both practitioners and academics for not being sufficiently clear (Gray et al., 2019; IFRS Foundation, 2019). Not surprisingly, the issue of discount rates has been on the IASB's project list since 2014.

The use of discount rates is inconsistent across firms, industries, and countries (Gray et al., 2019). Comment letters from both the 2011 and 2015 IASB Agenda Consultation indicate that the issue is important, and empirical research suggests that the lack of guidance may have resulted in opportunistic behaviour among some firms (Blankley and Swanson, 1995; Birt et al., 2016; Schneider et al., 2017; Paananen et al., 2020). The IASB has considered this feedback and is now gathering information to help it decide whether to amend parts of IAS 37, particularly regarding the inputs to use in measuring provisions, such as whether to include the firm's credit risk in its discount rates (IFRS Foundation, 2019).

Prior studies on DLs can be divided into three strands of research: (1) the use of discount rates in accounting practice, (2) disclosure practices related to these kinds of obligations, and (3) the theoretical discussion on which discount rates to apply to environmental liabilities that are characterized by long horizons and high levels of uncertainty in both the measurement and timing of future cash outflows.

### ***The importance of discount rates in accounting practice***

Accounting research on discount rates suggests that firms in certain circumstances use discount rates opportunistically. The most commonly examined areas in which discount rates are used are in accounting for goodwill and in pension provisions. Carlin and Finch (2010) examine a sample of Australian firms' use of discount rates for the purpose of impairment tests of goodwill and find that most of the sample firms underestimated the discount rates they used (i.e. they overestimated the carrying value of goodwill). Turning to provisions on the liability side, research documents opportunistic behaviour related to the discount rates used to measure pension liabilities. Blankley and Swanson (1995) find in a U.S. sample that the discount rates used to estimate pension provisions lagged behind declines in market rates, which led to underestimating the provisions. On the other hand, Comprix and Muller (2011) document systematic use of lower discount rates to overestimate pension provisions prior to freezing pension plans, that is, exaggerating the magnitude of provisions to justify pension plan closures to stakeholders. A debate is also ongoing on what discount rates to use when accounting for pensions among governmental organisations, as these organisations tend to use the expected return on assets held in pension trusts (Hallman and Khurana, 2015; Himick et al., 2016). The use of expected return rates might have a negative impact on future retirees because, if the expected return on assets is higher than the market rate, the provision for future pensions will be underestimated and because using the expected return may encourage risk-taking in pension investments. Research shows that the revision of IAS 19 *Employee Benefits* (IAS 19) tempered such behaviour by ensuring that firms use the same discount rate for the plan's assets and the provision (Anantharaman and Chuk, 2018).

### ***Diversity in disclosure practices related to environmental obligations***

Looking specifically at research on incentives for disclosure related to environmental provisions, Lee and Hutchison (2005) identify three closely linked factors—societal, firm-and/or industry-specific, and individual-specific—that drive the decision concerning the information about environmental commitments firms choose to disclose, and when. The societal category refers to norms in the form of rules, regulations, legitimacy incentives, and public pressure. Research in this area suggests that ambiguity in regulations is a major problem, particularly in the O&G industry (Wright, 1982, 1998), so regulations can be difficult to enforce, and it is management incentives that drive the choice of what and when to disclose. Research also shows that firms' concerns about their environmental reputation and public pressure affect disclosure choices, particularly around major environmental events (Patten, 1995; Walden and Schwartz, 1997; Patten and Trompeter, 2003). Turning to firm-specific characteristics, research finds that factors like size, risk, and industry influence disclosure choices (Patten, 1991; Cormier and Magnan, 2003), while factors related to cost/benefit analysis of the disclosure decision are corporate sponsoring of philanthropic organisations, potential tax benefits, and information costs among firms with dispersed ownership structure (Li and McConomy, 1999; Tilt and Symes, 1999; Cormier and Magnan, 2003). Finally, individual-specific factors that drive disclosure decisions are long-term focus and leadership style (Trotman and Bradley, 1981).

Research on disclosure practices specifically related to DLs is comparatively scant, and most studies that do address them focus on the extractive industries (Wilson and Zabriskie, 2010; Abdo et al., 2018; Gray et al., 2019). Gray et al. (2019) broadly identify two challenges related to accounting in the extractive industries: lack of rigorous accounting standards and the high level of uncertainty around estimation of both assets and liabilities. Abdo et al.'s (2018) study of the compliance level among UK O&G companies' reporting of DLs is an example of the problematic lack of rigorous accounting standards. The authors find a high level of compliance, although the information provided is a bare minimum. Specifically, they find that firms provide the information required under IAS 37 but only as a single number and without details to help users understand the geographic location or timing of future cash outflows. However, research also finds that certain circumstances may mitigate the effects of less rigorous standards and improve firms' willingness to provide disclosures and DLs valuation (Fornaro and Huang, 2012; Paananen et al., 2020). Fornaro and Huang (2012) study the reporting of conditional AROs and find that abusive behaviour is more likely when accounting standards lack clarity, but this abuse is mitigated by monitoring through corporate governance systems. For their part, Paananen et al. (2020) examine a European sample of companies and find significant diversity in disclosure practices and levels of forthcoming but that these issues are mitigated by media exposure.

Schneider et al. (2017) study a sample of Canadian mining O&G firms and find significant diversity in the choice of discount rates, as Canadian firms reporting under IFRS that have large DLs and significant exposure to the U.S. equity market are more likely than other firms to add firm-risk to the risk-free discount rate. Canada transitioned to IFRS in 2011 but, previously, Canadian GAAP was aligned with US GAAP on reporting DLs, so many firms chose to report their DLs to remain comparable to their U.S. peers, which also avoided a significant increase in reported DLs. This recent study was possible since it is common practice in Canada for firms to disclose the discount rate, which is not the case in other IFRS-reporting jurisdictions. For example, Paananen et al. (2020) find that on average, 40% of a sample of 164 firms listed in Europe do not report discount rates at all, as doing so is not explicitly required under IAS 37.

### *Theoretical basis for applying discount rates for environmental purposes*

Considering the current study's focus on discount rates in an environmental context, research on discount rates reported in the field of economics was also reviewed. Environmental economics focuses on future societal environmental costs in general, and firms' DLs, on which this study focuses, are part of these future costs. As also identified in the field of accounting, economists report that one major problem related to the use of discount rates in estimating the present value of economic obligations is that these obligations often materialise in a very distant future (Stern and Persson, 2008). Stern and Persson (2008) illustrate this problem using an example in which the present value of an obligation of \$1 million over a period of 300 years (which is reasonable considering nuclear waste, for example) is \$50,000 using a discount rate of 1 percent and less than \$0.50 using a discount rate of 3 percent.

The environmental economics literature takes two approaches to discounting: *discounted utilitarianism* and *classical utilitarianism* (Davidson, 2014). The former suggests that there is no need to protect future generations from the consequences of environmental damages, while the latter suggests the opposite and that the value of future provisions should reflect that obligation (Weitzman 1994; Weitzman 1998; Dobes et al., 2007; Gollier and Weitzman 2010; Goulder and Williams, 2012; Davidson, 2014). From a classical utilitarian perspective, in some situations, discount rates should be based on ethical values as opposed to economic analysis of current market rates. The literature identifies the issue of discount rates applied to very long-term future environmental liabilities because of uncertainty related to these future costs and their timing (Dobes et al., 2007). Although the concept *very long-term* is not defined, it implies costs that will occur decades or centuries into the future (Dobes et al., 2007). An ethical approach raises such fundamental questions as how much weight should be put on the welfare of future generations (Stern and Persson, 2008).

In sum, the logic of compounding discount rates creates a conception that events that would be seen as monumental today do not matter because they occur in a distant future, and minor changes to discount rates make an enormous difference in the present value of future cash outflows (Weitzman, 1994; Weitzman, 1998; Stern and Persson, 2008; Gollier and Weitzman, 2010). Further, there is no evidence of systematic trends in rates of return, and extrapolating the rate of return of capital into the future cannot consider largely unpredictable factors like technological changes (Gollier and Weitzman, 2010). Moreover, in addition to the ethical dilemma of discounting environmental costs across future generations, the inherent uncertainty related to these costs directly affects current climate-change policies (Gollier and Weitzman, 2010). Therefore, current research in environmental economics suggests that future environmental costs should be discounted at a rate that declines as the time horizon lengthens, thus approaching its asymptotically lowest possible value (Gollier and Weitzman, 2010).

Moreover, research based on future welfare expectations shows that survey respondents prefer a lower discount rate in cases of uncertainty related to very long-term sustainability (Moxnes, 2014; Bartolini and Sarracino, 2018). Researchers also debate whether the discount rate should change over time or not. Dobes (2007), Goulder and Williams (2012), and Johansson-Stenman and Stern (2015) assume a constant very long-term discount rate, while Freeman et al. (2015) and Freeman and Groom (2016) find that the very long-term rate declines over time. Specifically, Freeman and Groom (2016) identify sharp upper and lower boundaries, but the distance between these boundaries is too wide for use as practical guidance. The studies that suggest a specific very long-term discount rate anchor between 1.5 percent and 3.2 percent.

In sum, it appears that the ethical perspective that recommends discount rates be based on ethical considerations and survey respondents' preferences coincide. That is, both appear to favour using a low discount rate and that the longer the horizon, the lower the rate.



### 3. Research approach

To investigate the research questions outlined in section 1, this research employs a multi-method approach that combines an archival collection of disclosure practices for DLs and a set of interviews with stakeholders. The multi-method approach allows a far-reaching overview and assessment of the problem and is the foundation on which normative guidance on the issue at hand is based.

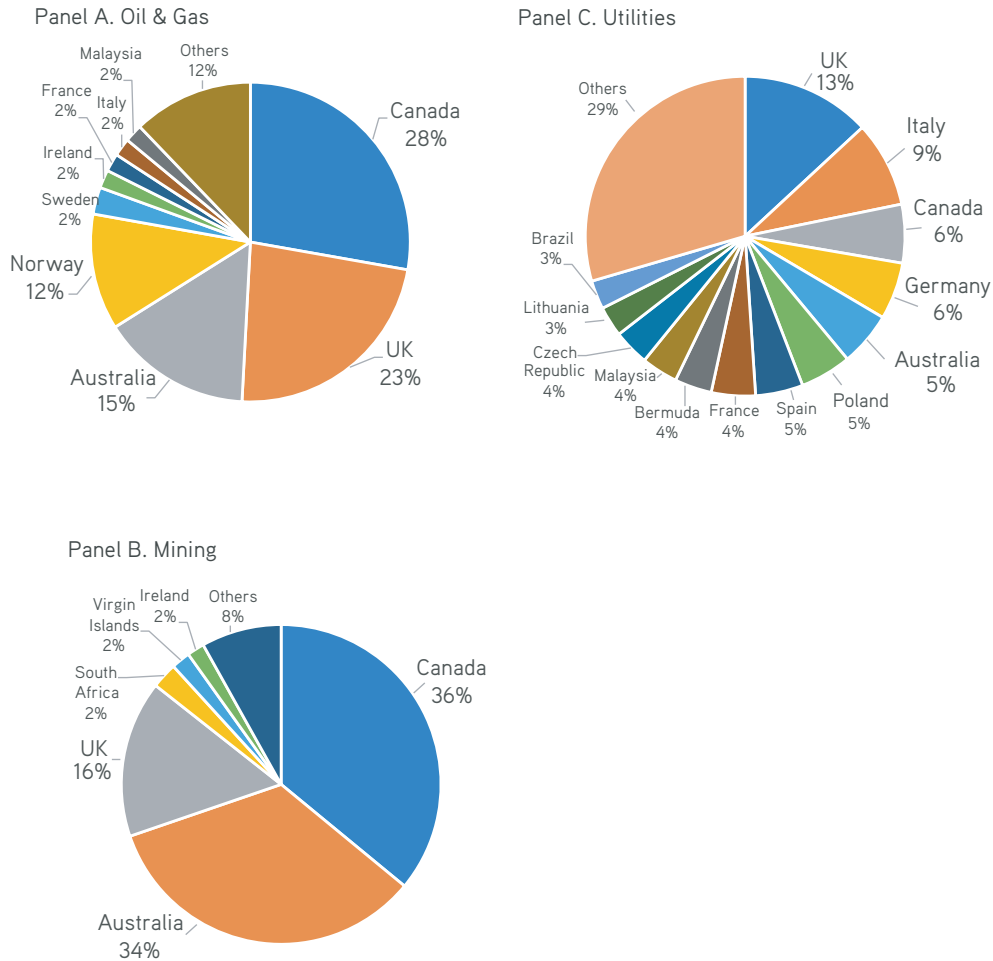
The archival study is based on a comprehensive international sample of publicly traded companies in pollution-prone industries (O&G, mining, and utilities) that reported under IFRS from 2005 to 2016. Since publicly available databases have no itemised disclosures on discount rates and/or related DLs, these data were manually collected and coded from the notes to the financial statements with the support of textual analysis. Annual reports were downloaded from PI Navigator, a database that provides access to corporate filings. Table 1 reports the number of reports searched and analysed.

**TABLE 1: *Sample selection (Reports analysed)***

Year	Oil and Gas	Mining	Utilities
2005	95	18	124
2006	121	35	126
2007	165	72	136
2008	169	79	139
2009	159	76	142
2010	162	79	143
2011	487	545	275
2012	458	689	274
2013	545	701	290
2014	533	692	287
2015	497	686	249
2016	464	668	241
Total	3,855	4,340	2,426

Figure 1 shows the breakdown of reports by country for each industry for the overall sample. The O&G and mining industries are heavily concentrated in three countries—Canada, the UK and Australia—whereas the utilities sector is more geographically diverse, as shown in Panel C.

**Figure 1. Country breakdown**



Two research assistants manually gathered information about the amount of DLs and, when available, the discount rate (or range of discount rates) used in the computation of the DLs. The texts of the notes were also collected and later used to analyse the disclosure practices about the discount rate, particularly whether the company was using a risk-free or adjusted discount rate. This information was collected using computerized textual analysis (Appendix I).

A multivariate analysis was performed using the data collected and other financial information from Thomson Reuters Eikon with the aim of descriptively capturing, at the firm and country level, the determinants of (1) the choice to disclose the discount rate (DR disclosed); (2) the choice not to use a risk-free rate (adjusted DR) and (3) the discount rate used (DR). We use a logistic regression model to investigate (1) and (2) and an ordinary least squares model to explore (3). The multivariate analysis was run separately for each industry, given that the descriptive analysis revealed diversity in practice.

The determinant variables at the firm and country level considered follow the literature discussed in Chapter 2. *DL materiality* is the ratio of a reported DL to total liabilities. *Size* is measured as the natural logarithm of total sales. *Leverage* is the ratio between total liabilities and total equity. *Profitability* is measured as EBIT over total assets. *Big4* is a dummy that equals 1 if the report was audited by one of the Big4 auditing firms (PwC, Deloitte, EY and KPMG), and 0 otherwise. *Enforcement* is the country's level of enforcement, measured following Brown et al. (2014). *GDP* is the country's gross domestic product per capita. *EPI* is the country-specific environmental performance index (<https://epi.envirocenter.yale.edu/2018-epi-report/introduction>). Finally, *Country risk-free rate* is the ten-year interest rate on the country's treasury bonds. The regressions include year fixed effects and robust standard errors clustered at the firm level.<sup>6</sup>

As one of the study's objectives is to get inside the 'black box' of DLs, the archival analysis of disclosure practices was complemented with twenty-seven semi-structured interviews. For this purpose, the research team reached out to a sample of the European companies that were analysed in the first phase of the study. Other potential interviewees were identified and contacted through personal, professional, and institutional networks and by referral, following a snowball approach. These additional interviewees included external auditors who specialise in the audit and valuation of O&G, mining, or utilities companies; independent consultants; investors and financial analysts who follow the relevant industries; industry and accounting regulators in the UK and Canada; academic experts; and standard-setters. All interviewees were approached using emails or LinkedIn. The twenty-seven interviewees represented a unique cross-section of stakeholders, as they included six preparers, seven auditors, five regulators and standard-setters, three users, four experts, and two representatives of civil society. Obtaining interviews with firms, analysts, investors, and industry regulators was particularly challenging. Geographically, the interviewees were from Canada, France, Italy, Spain, Sweden, the UK and the USA. Eight of the interviews were conducted face-to-face, with the remaining done via Skype or telephone.

The interviews were intended to pinpoint the information needs of various groups with respect to how decommissioning costs are accounted for to illustrate how disclosures can open the 'black box' of DLs to the eyes of stakeholders. Interviewing a variety of groups allows the public interest and practical/policy issues related to disclosure and discounting of DLs to be addressed. The researchers also held a roundtable with a similar cross-section of stakeholders (two preparers, one auditor, two standard-setters/regulators, two experts, and one user), which facilitated face-to-face discourse among the participants. Table 2 presents the list of interviewees and roundtable participants.

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<sup>6</sup>As the regression model does not address endogeneity, the documented relationships should be interpreted as descriptive, rather than causal.

**TABLE 2: *List of interviewees and roundtable participants***

Stakeholder	Background	Code	Country	Date of interview
Interviewees				
Preparers and assurance <sup>(1)</sup>	Independent Consultant	Preparer 1	USA	15 Jan 2019
	Auditor	Auditor 2	Sweden	21 Dec 2019
	Auditor	Auditor 3	Italy	1 Feb 2019
	Auditor	Auditor 4a	UK	7 Feb 2019
	Auditor	Auditor 4b	UK	7 Feb 2019
	Valuation consultant	Preparer 5a	UK	7 Feb 2019
	Valuation consultant	Preparer 5b	UK	7 Feb 2019
	Auditor	Auditor 6	Canada	8 Feb 2019
	Preparer (utilities)	Preparer 7	Sweden	21 Feb 2019
	Auditor	Auditor 8	Canada	20 Feb 2019
	Preparer (utilities)	Preparer 9	UK	7 Mar 2019
	Independent consultant	Preparer 10	Canada	4 Apr 2019
	Auditor	Auditor 11	Canada	11 Apr 2019
Experts	Academic – Accounting	Expert 1	France	7 Jan 2019
	Academic – Accounting	Expert 2	UK	22 Feb 2019
	Academic – Accounting	Expert 3	Canada	22 Feb 2019
	Practice – Estimator	Expert 4	Canada	15 May 2019
Regulators and standard setters	Accounting regulator	Regulator 1	Canada	21 Jan 2019
	Accounting regulator	Regulator 2	Canada	21 Jan 2019
	Securities regulator	Regulator 3	Canada	13 May 2019
	Standard setter	Standard setter 1	UK	30 Jan 2019
	Standard setter	Standard setter 2	Belgium	18 Jan 2019
Users	Financial consultant	User 1	Sweden	7 Jan 2019
	Credit analysts	User 2	Spain	7 Jan 2019
	Financial consultant	User 3	UK	22 Apr 2019
Civil society	Environmental NGO	NGO 1	Canada	11 Jan 2019
	Environmental NGO	NGO 2	UK	1 Feb 2019
Roundtable				
Users	Credit analyst	Roundtable User 1	Spain	27 Feb 2019
Regulators and std setters	Standard setter	Roundtable Std setter 1	UK	
	Accounting regulator	Roundtable Regulator 1	UK	
Expert	Academic - economics	Roundtable Expert 1	Sweden	
	Practice - accounting	Roundtable Expert 2	UK	
Preparers and auditors	Auditor	Roundtable Auditor 1	UK	
	Preparer (utilities)	Roundtable Preparer 2	Sweden	
	Valuation consultant	Roundtable Preparer 3	UK	

<sup>(1)</sup> We consider preparers and auditors as one stakeholder group as they are accounting practitioners involved the process of providing financial information to external users.

All interviews and the roundtable event were audio-recorded and then professionally transcribed. The research protocol is such that all interviewees and participants who participated in the roundtable were guaranteed anonymity in this research report. They were also given the right to withdraw their participation after the fact, up until the research report becomes public. The interview guide was structured around questions related to accounting for DLs, as well as reporting and disclosures, and for the external stakeholders, questions regarding information needs and use were included. An example of the interview guide is in Appendix II. The objective of the interviews and roundtable was to elicit responses that inform the research questions, but the semi-structured setting allowed for discussion of many issues that pertain to DLs.

The interviews lasted an average of forty-five minutes and were conducted between December 2018 and May 2019. The roundtable took place in February of 2019 in London (UK), and lasted approximately four hours, including breaks. The resulting transcriptions, which provide a rich set of data, were uploaded for analysis to the qualitative software program NVivo, which is the dominant software platform used for qualitative research (e.g. Schneider and Andreaus, 2018; Bebbington et al., 2019).<sup>7</sup> NVivo allows excerpts from the transcribed interviews to be coded based on specific themes in the data; as a researcher works through the documents, passages can be highlighted and coded to “nodes” based on specific themes, and sub-nodes can be created as sub-sets of a parent node. Given the three research questions, the coding focused on the discount rate, DLs’ characteristics, and disclosure of DLs. Each of these topics were used as a parent node, and sub-nodes were created for passages that addressed the research question from an applied or theoretical perspective. For example, if an interviewee talked about the theoretically correct discount rate under IAS 37, the comment was coded to “discount rate – theoretical,” and if an interviewee discussed how he or she establishes the benchmark from which to determine a discount rate, it was coded to “discount rate – applied.” Once this coding was completed, passages within these nodes and sub-nodes could be systematically reviewed as stand-alone passages, or the researchers could move from passage to passage in the original documents (i.e. the full interview transcriptions). It is from these data that the qualitative analysis of the interviews and roundtable presented in the next section was developed.

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<sup>7</sup>For more information on NVivo, see <https://www.qsrinternational.com/nvivo/what-is-nvivo>.

## 4. Research findings

### *Disclosure practices*

As reported in Table 3 Panel A, not all reports included non-null DLs in the financial statements. Some instances contained non-null DLs but no specific note on DL or any relevant information about the DLs. Other instances contained a specific note about the DLs, but no DLs: 104 instances in the O&G sector, 52 instances in utilities, and 71 instances in mining. Following are two examples of such disclosures:

*There is no legal or constructive liability in the current country of operation that would require the company to recognize a decommissioning liability.*

*The enforcement of environmental regulation in the Russian Federation is evolving and the enforcement posture of government authorities is continually being reconsidered. The Group periodically evaluates its obligations under environmental regulations. As obligations are determined, they are recognized immediately. Potential liabilities, which might arise as a result of changes in existing regulations, civil litigation or legislation, cannot be estimated but could be material. In the current enforcement climate under existing legislation, management believes that there are no significant liabilities related to environmental matters.*

**TABLE 3: *Disclosure rates***

**Panel A. Observations with non-null decommissioning liabilities**

	Oil & Gas	Mining	Utilities
<i>N. of reports with non-null decommissioning liabilities</i>	<i>1,808</i>	<i>1,990</i>	<i>541</i>
Incidence with respect to reports analysed	46.90%	45.85%	22.30%
N. of reports without note on DL	116	25	68

**Panel B. Discount rate disclosures**

	Oil & Gas	Mining	Utilities
N. of reports declaring to use a risk-free rate	795	614	43
<i>of which using an “adjusted” risk-free rate</i>	<i>312</i>	<i>249</i>	<i>13</i>
N. of reports declaring to use a discount rate	340	820	163
<i>of which using an “adjusted” discount rate</i>	<i>157</i>	<i>372</i>	<i>30</i>
<b>N. of reports actually stating the discount rate used</b>	<b>960</b>	<b>980</b>	<b>163</b>
<b>Incidence with respect to reports with non-null DL</b>	<b>53.10%</b>	<b>49.25%</b>	<b>30.13%</b>

Table 3 Panel B provides an overview of disclosure practices regarding the discount rate. In the O&G sample, we find that only 53.10 percent of the reports disclosed the value of the discount rate used, and this rate is lower in the mining (49.25%) and utilities (30.13%) industries. Untabulated data reveals that the choice to disclose the discount rate is related to the firm’s country of incorporation. For example, among the countries most often represented in the O&G sector (Figure 1), about 70.2 percent of Canadian companies disclosed the discount rate, whereas only 9.2 percent, 2.9 percent, and 1.8 percent of the

companies in the UK, Australia, and Norway, respectively, disclosed the discount rate. Similarly, in the mining industry, about 67.8 percent of Canadian companies disclosed the discount rate, compared to 6.6 percent in Australia, 12.9 percent in the UK, and 31 percent in South Africa. As for utilities, almost all disclosing companies operate in the nuclear business, and cross-country differences are reduced: in the UK, about 26.4 percent of firms disclosed the discount rate, compared to 10 percent in Italy, 52.1 percent in Canada, and 75 percent in Germany.

In terms of disclosure practices, some firms may still not disclose the discount rate but do provide generic information about how the rate is determined. This analysis of the disclosures reveals diversity in how firms choose a method by which to determine the discount rate and in the level of transparency. For example, most of the O&G and mining firms declared the risk-free rate as the baseline, which may or may not be “adjusted” to consider various types of risks (e.g. the firm’s own credit risk, risks that are specific to the obligation, such as future regulation), whereas most firms in the utilities sector referred to generic “discount rates” that may or may not be adjusted.

Box 1 shows some examples of disclosures related to DLs<sup>8</sup> that illustrate the diversity in practice. The disclosure in the notes to DLs can be as succinct as providing only the overall timeline for the DLs (e.g. Pennon Group in 2009, Severn Trent in 2006) or as comprehensive as indicating specifically which assets (e.g. fields) will be decommissioned and in which years (e.g. Aker Exploration in 2012). The Aker Exploration note provided the discount rate used and revealed that each field was assigned a specific discount rate that considered inflation, rather than putting inflation in the estimation of future cash flows. The PGE 2014 disclosure offered a sensitivity analysis to illustrate the impact of a change in the discount rate on the value of the DLs. The last disclosure, MOL 2015, is an example of a comprehensive disclosure. Besides the discount rate(s) used (i.e. the risk-free rate) and the horizon and timing of future cash flows, it discussed uncertainties, reconciled provision changes between beginning and ending balances with comparatives for the previous year and explained future cash outflows.

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<sup>8</sup>IAS 37 requires disclosure of a reconciliation for each class of provision [para. 84] and a brief description of the nature of the obligation, timing, uncertainties, assumptions, reimbursement, if any, for each class of provision [para. 85]. It does not require disclosure of the discount rate. The present study’s analysis does not systematically collect information about compliance with the standard, as doing so would be outside the scope of the project. However, the study qualitatively illustrates variations in firm disclosures with several examples.

## Box 1 – Examples of disclosures

### Basic disclosures

Environmental and landfill restoration provisions are expected to be substantially utilised over the period from 2010 to beyond 2050. (*PENNON GROUP, 2009, UK, Gas, Water & Multiutilities*)

[E]nvironmental and landfill restoration provisions reflect costs to be incurred over the operational life of individual landfill sites and in the case of aftercare costs, for up to 30 years thereafter. Discounting is applied. (*SEVERN TRENT, 2006, UK, Gas, Water & Multiutilities*)

Provision is made for reliably estimated decommissioning costs at the end of the useful economic life of the Group's power stations and generating assets, if and when a legal or constructive obligation arises, on a discounted basis. The amount provided represents the present value of the expected costs. (*INTERNATIONAL POWER, UK, 2009, Gas, Water & Multiutilities*)

### Extended disclosures

The company's removal and decommissioning liabilities relate to the fields Varg, Enoch, Glitne, Atla, Jette and Jotun. Time of removal is expected to come in 2014 for Glitne, and in 2018 for Jotun, Enoch, Jette, Varg and Atla. The liability is based on an implementation concept in accordance with the Petroleum Activities Act and international regulations and guidelines. The calculations assume an inflation rate of 2.5 percent before tax and a nominal discount rate of 5.03 percent for Enoch, Jotun, Varg, Atla and Jette, and 4.93 percent for Glitne before tax in 2012. The corresponding rate for 2011 was 6.24 percent for Jotun and Enoch, and 5.92 percent for Varg and Glitne. (*AKER EXPLORATION, 2012, Norway, Oil & Gas*)

The discount rate had the most significant impact on value of the rehabilitation provision. The PGE Group estimates that: - should the discount rate be lower by 1 percentage point (p.p.) the relevant provision would increase by PLN 1,124 million (whereof the amount of PLN 331 million will be presented in profit or loss) - should the discount rate be higher by 1 percentage point (p.p.) the relevant provision would decrease by PLN 799 million (whereof the amount of PLN 236 million will be presented in profit or loss). (*PGE, 2014, Poland, Electricity*)

### Comprehensive disclosures

Quantification and timing of environmental and field abandonment liabilities.

Management estimates the future cash outflow associated with environmental and decommissioning liabilities using comparative prices, analogies to previous similar work and other assumptions. Furthermore, the timing of these cash flows reflects managements' current assessment of priorities, technical capabilities and urgency of such obligations. Both the amounts and the timing of these future expenditures are reviewed annually, together with expectations on the rates used to discount these cash flows. Long-term nominal discount rates are expected to be between 3.5% and 4.5% (2014: 3.5%). Consequently, the carrying amount of these obligations (see Note 20 and in "Scope of environmental and field abandonment provision" paragraph above) is exposed to uncertainty.

### Environmental provision

As of 31 December 2015, provision of HUF 79,218 million has been made for the estimated cost of remediation of past environmental damages, primarily soil and groundwater contamination and disposal of hazardous wastes, such as acid tar, in Hungary, Croatia, Slovakia and Italy. The provision is made on the basis of assessments prepared by MOL's internal environmental audit team. The amount of the provision has been determined on the basis of existing technology at current prices by calculating risk-weighted cash flows discounted using estimated risk-free real interest rates. The amount reported as at 31 December 2015 also includes a contingent liability of HUF 22,631 million recognized upon acquiring INA Group, representing its present environmental obligations and a further HUF 15,818 million environmental contingent liability regarding the acquisition of IES.

### Provision for Field Abandonment liabilities

Liabilities: As of 31 December 2015 provision of HUF 278,727 million has been made for estimated total costs of plugging and abandoning wells upon termination of production. Approximately 5% of these costs are expected to be incurred between 2016 and 2020 and the remaining 95% between 2021 and 2065. The amount of the provision has been determined on the basis of management's understanding of the respective legislation, calculated at current prices and discounted using estimated risk-free real interest rates. Activities related to field suspension, such as plugging and abandoning wells upon termination of production and remediation of the area are planned to be performed by hiring external resources. Based on the judgement of the management, there will be sufficient capacity available for these activities in the area. As required by IAS 16 – Property, Plant and Equipment, the qualifying portion of the provision has been capitalized as a component of the underlying fields. (*MOL, 2015, Hungary, Oil and Gas*)

## Descriptive statistics on discount rates

To explore this diversity in disclosures of discount rates, the subsample of reports that provided the value of the DR were analysed. While most companies provided a single estimate, some disclosed the range of discount rates used, mainly because the corresponding assets were based in various locations. Table 4 reports some basic descriptive statistics on the discount rate. All discount rates disclosed as point estimates are reported as "lower bound." Table 4 reports separately the value disclosed as "upper bounds" and also provides an average discount rate.



**TABLE 4: Discount rate (DR)**

**Panel A. Oil & Gas**

Discount rate	Obs.	Mean	Std. Dev.	Min	P25	P50	P75	Max
Lower bound	960	3.71%	0.030	0.01%	2.00%	2.50%	4.00%	17.00%
Upper bound	206	3.80%	0.025	0.49%	2.34%	2.87%	4.15%	17.80%
Average	960	3.89%	0.029	0.01%	2.16%	2.55%	4.50%	17.00%

**Panel B. Mining**

Discount rate	Obs.	Mean	Std. Dev.	Min	P25	P50	P75	Max
Lower bound	980	4.76%	0.036	0.00%	2.00%	3.77%	7.50%	30.00%
Upper bound	287	6.51%	0.051	0.34%	2.64%	5.90%	8.75%	33.10%
Average	980	5.35%	0.035	0.00%	2.25%	4.60%	7.97%	20.00%

**Panel C. Utilities**

Discount rate	Obs.	Mean	Std. Dev.	Min	P25	P50	P75	Max
Lower bound	163	4.03%	0.024	0.00%	2.37%	4.10%	5.00%	13.88%
Upper bound	31	4.46%	0.010	1.75%	4.00%	4.55%	4.80%	6.50%
Average	163	4.13%	0.024	0.003%	2.60%	4.25%	5.00%	13.88%

In the O&G sample, the average discount rate is 3.89 percent, with a standard deviation of almost 3 percent. The distributions of lower and upper bounds are generally similar, and the ranges are relatively narrow. The lowest discount rate disclosed is 0.01 per cent, and the highest is 17.8 percent. Untabulated analysis suggests that most of the firms that use a discount rate higher than the value of the 75<sup>th</sup> percentile are located in Australia, Canada, Cyprus, Ireland, Russia and the UK. Discount rates are generally higher in the mining sector than they are in the O&G sector, where the average discount rate is 5.35 percent, and are also more dispersed (standard deviation of 3.5%), with some companies using discount rates as high as 33.1 percent. High discount rates are usually associated with adopting a discount rate that follows the location of operations. For example, Yamana Gold (mining) and Madalena Energy (oil) both have operations in Argentina, where the risk-free rates in the years covered by the sample were generally in double digits<sup>9</sup>. The range between the lower and upper bounds is wider than it is in the O&G sector. Untabulated evidence suggests that firms that use a discount rate higher than the value of the 75<sup>th</sup> percentile are located in, Australia, Canada, South Africa and the UK. Finally, in the utilities sector, the mean of the discount rates is 4.13 percent, and the greatest value is 13.88 percent. Firms that use a discount rate higher than the value of the 75<sup>th</sup> percentile are located in France, Germany, and Russia.

Table 5 provides descriptive statistics for the average discount rate in the countries with the highest number of firms that provided the discount rates they used. The table also reports the average risk-free rate by country, given the country-year distribution of the firms in the sample. Overall, this analysis shows substantial variation in the discount rate used across countries and that the adjustment to the discount rate is also country- and industry-specific. For example, most UK firms in all industries include a considerable adjustment to the risk-free rate, whereas Canadian firms in the mining and O&G sectors tend to adjust more than do firms in the utilities sector.

<sup>9</sup>For example, in its 2014 report Yamana Gold states: “The Decommissioning, Restoration and Similar Liabilities are calculated as the net present value of estimated undiscounted future cash flows, which total \$310.9 million (December 31, 2013 - \$240.8 million) using discount *rates specific to the liabilities of 2.6% to 33.1%* (December 31, 2013 - 3.6% to 24.6%)” [emphasis added] (Yamana Gold, 2014, p. 43).

**TABLE 5: Average DR in countries with greatest disclosure frequencies****Panel A. Oil & Gas**

Average DR	Obs.	Mean	Std. Dev.	Min	Max	Risk-free rate
Canada	752	3.27%	0.024	0.48%	15.35%	1.95%
UK	82	6.27%	0.030	0.94%	14.20%	0.94%
Ireland	23	7.83%	0.030	2.00%	10.00%	4.31%
Australia	17	3.93%	0.021	2.12%	10.37%	3.29%

**Panel B. Mining**

Average DR	Obs.	Mean	Std. Dev.	Min	Max	Risk-free rate
Canada	664	4.61%	0.034	0.00%	20.00%	1.91%
UK	89	6.73%	0.036	0.02%	16.00%	0.81%
Australia	96	6.04%	0.038	0.00%	16.47%	3.26%
South Africa	35	7.54%	0.022	3.65%	13.60%	8.21%

**Panel C. Utilities**

Average DR	Obs.	Mean	Std. Dev.	Min	Max	Risk-free rate
Germany	31	4.83%	0.010	1.28%	5.50%	2.29%
France	25	4.85%	0.003	4.08%	5.00%	2.73%
Canada	24	1.36%	0.007	0.34%	3.14%	1.97%
UK	23	3.24%	0.012	2.00%	5.80%	0.98%

Table 6 reports descriptive statistics for the firm-level variables used in the multivariate analysis. The sample size is reduced because of missing financial data in Thomson Reuters Eikon. In the O&G industry, more than half of the reports provided their discount rates, which average 3.78 percent, and almost a quarter of the reports declare an adjustment to the risk-free rate. Disclosure rates are slightly lower in the mining sector, where only 48 percent of reports provide the discount rate, than in the O&G sector. In addition, the adjustment practice is slightly more common (28% of reports in the O&G sector declare an adjustment), and the mean of the discount rate is higher (4.72%). In the utilities sector, fewer reports provide the value of the discount rate than in the O&G and mining sectors, and the practice of adjusting the risk-free rate is less common, probably because 156 of the 163 disclosing firms operate in the nuclear business and so are highly regulated.<sup>10</sup> The mean of the discount rate in the utilities sector is 4.08 percent, with little variation across firms (standard deviation of 2.58%). DLs are more material in the O&G and mining sectors than in the utilities industry. Utilities firms are generally larger, more profitable, and more levered than O&G and mining firms.

<sup>10</sup>Some European States, such as France, impose conditions that require the rate to be: a) below a cap calculated to be in line with variable market conditions; b) lower than the expected rate of return on the assets that cover the liability (dedicated assets); and c) consistent in time (European Commission, 2017).

**TABLE 6: Descriptive statistics for multivariate analyses****Panel A. Oil & Gas (n=1,398)**

	Mean	S.D.	Min	P 25	P 50	P 75	Max
DR disclosed	0.552	0.497	0	0	1	1	1
adjusted DR	0.235	0.424	0	0	0	0	1
DR	3.78%	3.02%	-0.01%	2.15%	2.50%	4.24%	17.00%
DL materiality	0.196	0.213	0.000	0.035	0.115	0.289	0.891
Size	17.018	3.552	7.958	14.877	17.042	18.934	25.364
Leverage	0.534	0.944	0.005	0.224	0.413	0.579	8.996
Profitability	-0.072	0.387	-3.394	-0.071	-0.009	0.052	0.292
Big4	0.473	0.499	0	0	0	1	1

**Panel B. Mining (n=1,389)**

	Mean	S.D.	Min	P 25	P 50	P 75	Max
DR disclosed	0.480	0.500	0	0	0	1	1
adjusted DR	0.282	0.451	0	0	0	1	1
DR	4.72%	3.59%	0.02%	1.98%	3.88%	7.25%	30.00%
DL materiality	0.149	0.212	0.000	0.034	0.082	0.181	0.994
Size	17.381	3.111	7.117	16.207	18.097	19.302	22.582
Leverage	0.388	0.279	0.001	0.209	0.335	0.502	1.719
Profitability	-0.001	0.181	-1.359	-0.059	0.013	0.086	0.350
Big4	0.582	0.493	0	0	1	1	1

**Panel C. Utilities (n=495)**

	Mean	S.D.	Min	P 25	P 50	P 75	Max
DR disclosed	0.269	0.444	0	0	0	1	1
adjusted DR	0.085	0.279	0	0	0	0	1
DR	4.08%	2.58%	0.00%	2.50%	4.15%	5.00%	13.88%
DL materiality	0.048	0.073	0.000	0.004	0.014	0.055	0.373
Size	21.473	2.051	10.581	20.339	21.645	22.814	24.829
Leverage	0.647	0.173	0.232	0.530	0.681	0.776	1.119
Profitability	0.056	0.051	-0.727	0.040	0.053	0.073	0.222
Big4	0.574	0.495	0	0	1	1	1

**Variable definitions**

DR=discount rate value; DR (upper)=discount rate upper bound if disclosed; DR disclosed=dummy equal to 1 if company reports the discount rate used, 0 otherwise; Adjusted DR=dummy equal to 1 if company reports to adjust the discount rate used, 0 otherwise; DL materiality=decommissioning liability/total liabilities; Size=natural logarithm of total sales; Leverage=total liabilities/total equity; Profitability= ebit/total assets; Big4 = dummy equal to 1 if report is audited by a Big4 (i.e. PwC, Deloitte, EY and KPMG), 0 otherwise. All financial variables are measured at year end.

### **Multivariate analysis**

*Choice to disclose the discount rate:* Table 7 Panel A reports the logit regressions that investigate the choice to disclose the discount rate for each of the industries analysed. Findings suggest that the determinants of this choice vary across industries.

In the **O&G industry**, firms with high leverage and profitability are more likely to disclose the discount rate used, as are those that are audited by the Big 4. The coefficients for firm size and the materiality of the DLs are not statistically significant. As for country-level determinants, firms in countries with strong enforcement are more likely to report the discount rate they used, but firms in rich countries and in countries with high environmental protection are less likely to disclose the discount rate. Finally, the higher the country risk (as measured by the country's risk-free rate), the less likely O&G firms are to disclose the discount rate. Given the incidence of Canadian companies in the O&G sample, we run the regression excluding them and adding an indicator variable among the regressors (untabulated). In line with the descriptive evidence reported above, Canadian companies are more likely to disclose the discount rate.

In the **mining industry**, country determinants play a similar role (with the exception of the level of enforcement, which is not statistically significant). At the firm level, determinants of the choice to disclose the discount rate used are size, as large firms are more likely to disclose than small firms are, and Big 4 auditing. Untabulated tests suggest Canadian companies are more likely to disclose the discount rate.

In the **utilities sector**, country determinants do not have a statistically significant effect on the decision to disclose the discount rate, whereas the materiality of the DLs and firm size are associated with the likelihood of reporting the rate. In other words, the practice of disclosing the discount rate is relatively common across countries in this industry, but firm-specific factors affect this choice.

**TABLE 7: Multivariate analyses**

Panel A. Logit regression (Disclosure of DR/adjusted DR)

	Oil & Gas		Mining		Utilities	
	(1)	(2)	(3)	(4)	(5)	(6)
	DR disclosed	adjusted DR	DR disclosed	adjusted DR	DR disclosed	adjusted DR
DL materiality	0.870	-0.011	0.304	-0.641	<b>8.958***</b>	-3.491
	[1.535]	[-0.018]	[0.483]	[-1.170]	<b>[2.786]</b>	[-0.739]
Size	0.035	0.057	<b>0.151***</b>	0.045	<b>0.248*</b>	<b>-0.546**</b>
	[0.517]	[1.265]	<b>[3.073]</b>	[0.914]	<b>[1.686]</b>	<b>[-2.143]</b>
Leverage	<b>0.444***</b>	-0.016	0.094	-0.142	-0.162	-1.093
	<b>[3.358]</b>	[-0.113]	[0.231]	[-0.394]	[-0.087]	[-0.464]
Profitability	<b>0.875**</b>	-0.196	-0.045	-0.318	-9.853	<b>14.479*</b>
	<b>[2.218]</b>	[-0.544]	[-0.082]	[-0.524]	[-0.995]	<b>[1.746]</b>
Big 4	<b>0.711***</b>	<b>0.723***</b>	<b>0.462**</b>	<b>0.485*</b>	-0.401	0.485
	<b>[2.819]</b>	<b>[2.630]</b>	<b>[2.070]</b>	<b>[1.942]</b>	[-1.007]	[0.830]
Enforcement	<b>0.088*</b>	0.065	-0.012	0.014	-0.005	0.242
	<b>[1.772]</b>	[1.371]	[-0.394]	[0.567]	[-0.186]	[1.561]
GDP	<b>-0.001*</b>	-0.000	<b>-0.001***</b>	-0.000	0.000	-0.000
	<b>[-1.660]</b>	[-1.324]	<b>[-3.192]</b>	[-1.581]	[0.831]	[-0.105]
EPI	<b>-0.384***</b>	<b>-0.066*</b>	<b>-0.237***</b>	<b>-0.080***</b>	-0.065	<b>-0.174*</b>
	<b>[-4.277]</b>	<b>[-1.818]</b>	<b>[-7.106]</b>	<b>[-2.986]</b>	[-1.514]	<b>[-1.751]</b>
Country risk-free rate	<b>-1.316**</b>	-0.073	<b>-1.099***</b>	<b>-0.437***</b>	-0.113	<b>-0.933**</b>
	<b>[-2.395]</b>	[-0.554]	<b>[-6.382]</b>	<b>[-3.068]</b>	[-0.827]	<b>[-1.981]</b>
Constant	23.384***	0.701	15.609***	5.910**	-1.906	10.500
	[2.881]	[0.148]	[4.167]	[2.009]	[-0.471]	[1.498]
Year fixed effects	YES	YES	YES	YES	YES	YES

Robust z-statistics in brackets

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Columns (1), (3), (5) show results for the following logit regression:  $P(\text{discount rate is disclosed}) = f(\text{DL materiality, Size, Leverage, Profitability, Big 4, Enforcement, GDP, EPI, country risk-free rate})$ . Columns (2), (4), (5) show results for the following logit regression:  $P(\text{discount rate is adjusted}) = f(\text{DL materiality, Size, Leverage, Profitability, Big 4, Enforcement, GDP, EPI, country risk-free rate})$ . All models are run with year fixed effects and robust standard errors clustered at the firm level.

Variable definitions: *Enforcement* is measured following Brown et al. (2014), *GDP* is the country Gross Domestic Product (per capita), *EPI* is the country specific environmental performance index (<https://epi.envirocenter.yale.edu/2018-epi-report/introduction>), and *Country risk-free rate* is the 10 years interest rate on the country treasury bonds. All other variables are defined in the note to Table 6.

Panel B. OLS regression (DR values)

	Oil & Gas	Mining	Utilities
DL materiality	<b>-0.029***</b>	0.014	-0.038
	<b>[-4.709]</b>	[0.632]	[-1.281]
Size	-0.000	<b>-0.002**</b>	-0.002
	[-0.443]	<b>[-2.073]</b>	[-1.660]
Leverage	0.000	<b>0.020*</b>	0.005
	[0.171]	<b>[1.774]</b>	[0.618]
Profitability	-0.009	<b>0.029*</b>	-0.034
	[-0.684]	<b>[1.800]</b>	[-0.538]
Big 4	-0.002	0.003	<b>-0.010**</b>
	[-0.548]	[0.642]	<b>[-2.277]</b>
Enforcement	<b>-0.002***</b>	<b>-0.001*</b>	<b>-0.002***</b>
	<b>[-4.559]</b>	<b>[-1.847]</b>	<b>[-5.021]</b>
GDP	0.000	<b>0.000*</b>	<b>0.000***</b>
	[0.809]	<b>[1.743]</b>	<b>[4.583]</b>
EPI	0.001	<b>0.001*</b>	-0.001
	[0.758]	<b>[1.913]</b>	[-1.476]
Country risk-free rate	-0.004	<b>0.007**</b>	<b>0.003**</b>
	[-1.126]	<b>[2.533]</b>	<b>[2.217]</b>
Constant	0.096	0.043	0.192***
	[1.245]	[0.757]	[3.087]
Year fixed-effects	YES	YES	YES
R-squared	0.253	0.114	0.718

Robust t-statistics in brackets

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The table shows results for the following regression model, with robust standard errors clustered at the firm level:

**Discount rate value** = *aDL materiality* + *bSize* + *cLeverage* + *dProfitability* + *eBig 4* + *fEnforcement* + *gGDP* + *hEPI* + *iCountry risk-free rate* +  $\varepsilon$

Variable definitions: All variables are defined in the note to Table 6.

*Factors that explain why firms adjust the discount rate:* Table 7 shows the determinants of the choice to adjust the risk-free rate. In the **O&G industry**, firms that are audited by the Big 4 and firms in countries where environmental protection is weak are more likely to consider adjustments to the risk-free rate. The same holds true for firms in the **mining sector**, but mining firms are also less likely to adjust the risk-free rate when they are in countries with high risk-free rates. Untabulated analysis shows that Canadian O&G and mining companies are more likely to adjust the discount rate. In the **utilities sector**, large firms are less likely to adjust the risk-free rate, while profitable firms are more likely to do so. The country determinants are the same as in the mining sector.

*Determinants of the DR:* Table 7 Panel B shows the determinants of the value of the discount rate. Again, several differences across industries are noted. The materiality of DLs is negatively associated with the value of the discount rate used in the **O&G sector**. Untabulated analysis suggests that this result is heavily influenced by Canadian companies in the sample, which tend to use a lower discount rate than companies in other countries. This finding is aligned with findings in Schneider et al. (2017), which shows that O&G junior companies—that is, smaller players in the industry—are more likely to use the risk-free rate, as they operate in the exploration phase and so have smaller DLs. The materiality of DLs is not a determinant in the **mining and utilities industries**, whereas the level of the enforcement in the country where the firm is located is a determinant in all three industries, such that the stronger the enforcement, the lower the discount rate used. In the **mining sector**, the discount rate is negatively related to firm size and positively related to leverage and profitability. In this sector, country determinants that drive the value of the discount rate are the GDP, the level of environmental protection, and the risk-free rate. In the utilities sector, firms that are audited by the Big 4 tend to use a lower discount rate, but similar to mining companies, they use higher discount rates when enforcement is low and the country's GDP and risk-free rate are high.

## Analysis of interviews

### *Research Question 1 – Choice of the discount rate*

As noted in the research design section, coding of the interview transcriptions focused on applied and theoretical aspects of the discount rate, disclosure, and the characteristics of DLs. Research question 1 focuses on the discount rate, and the discount rate coding forms the main node of interest in this context. One hundred and ninety-eight passages were coded to the discount rate node across the interviews and the roundtable, with 123 addressing how the discount rate is applied in practice and 75 addressing the discount rate from a theoretical perspective.

The wide range of discount rates seen in the archival analysis (in the preceding section) are reflected in the comments of a number of the practitioners:

*I guess it would be fair to say that there is ranging practice, even if you compare across the mega major oil companies.* (Auditor 4a)

Another preparer's comment reflected an even wider range, which is representative of the archival data previously presented:

*What we ended up seeing with AROs and regulatory-driven liability estimates is that the discount rate you attach to these things becomes an important discussion point. Are you going to use your risk-free adjusted rates? Are you going to use a zero rate? Are you going to use some socially viable rate, 2 percent or 3 percent? Or are you going to use your cost of capital—10 percent to 20 percent or 30 percent, depending on the entity?* (Preparer 10)

What comes across clearly in the interviews, regardless of any theoretical aspects of the discount rate, is that auditors, regulators, and standard-setters consider that, under IAS 37, firms have the choice to use either a risk-free rate or a credit-adjusted rate when they discount DLs. Therefore, the discount rate used under IAS 37 is effectively an accounting policy choice, which was reflected by one of the interviewees:

*So we view it as essentially an accounting policy choice, so most—I shouldn't say all, but most—of our really big clients factor their own credit risk into their provisions.* (Auditor 8)

None of the interviewees in any of the countries suggested that their firm's own credit risk could not be used under IAS 37. With regard to research question 1, then, we conclude from the interviews that diversity in practice is the norm, not the exception, when it comes to the choice of discount rate. As documented in Schneider et al. (2017), this conclusion is inconsistent with those of the IFRS Interpretations Committee when it chose not to address this issue in 2011, despite the request of the Canadian Accounting Standards Board. In some cases, even if an auditor believed the theoretically correct discount rate under IAS 37 was a risk-free rate, the choice of discount rate was at the firm's discretion:

*Certainly, I think the most technically correct answer is it's a risk-free discount rate. I'm sure you know this question went back to the IFRS Interpretations Committee for guidance, and I would say the resulting rejection notice didn't actually help the situation at all, so rather than getting clarity, it just reinforced that there might be an element of judgement there.* (Auditor 6)

The interviewees also reflected diversity in practice regarding the inclusion of factors like country risk, inflation, and duration in the discount rate. Having said that, interviews with preparers made clear that considerable discussion and thought goes into the discount rate under IAS 37:

*We spend a lot of time on it and it's something we normally would involve our own internal experts in to get their views—trying to figure out what the rate is, what the risk factor is to adjust ....* (Auditor 11)

As a final note on the discount rate, a key comment emerged regarding firm-level factors that confirms the results of Schneider et al. (2017). The comment suggested that, with the adoption of IFRS in Canada, large firms with exposure to the US market were more likely to use a credit adjusted rate:

*....that's because the (old) Canadian GAAP under part five of the handbook mirrors US GAAP and their accounting for ARO. It was the exact same standard, which was a credit-adjusted risk-free rate, and a lot of the big guys just said, "Okay, well, if there's a policy choice that got us to keep the same as before, we don't want to go to market with completely different financial statements on transition to IFRS, so we're going to keep with the credit-adjusted rates."* (Regulator 3)

Regulator 3's comment also shows how the discount rate is now the firm's policy choice that allows for very different balance sheet amounts to be recognized under IAS 37 for similar liabilities, which is clearly an issue for one of the users interviewed:

*Company X<sup>11</sup> uses basically the forty-year government bond, which could be all right, but others use the AA corporate index. There is a variety of measures that have been used, so which is the correct measure?* (User 2)

In the next sub-section, we discuss disclosure, which might allow comparability despite differences in the balance sheet amounts.

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<sup>11</sup>[Company X is a real company but is not named to ensure the interviewees' anonymity.]



## ***Research Question 2 – disclosure aspects from the interviewees***

Across the twenty-seven interviews and the roundtable were 171 instances where passages were coded to the disclosure node. Ninety of these were coded as applied aspects of disclosure, and eighty-one were coded as theoretical aspects of disclosure. The disclosure requirements in IAS 37 are presented in paragraphs 84 and 85. The standard does not state that the discount rate or the undiscounted amount of the provision must be disclosed. The predominant view of the interviewees and roundtable participants was that, without these two disclosures, the reported liability is a completely opaque number. With these two numbers, although disclosure would still be unhelpful in determining the accuracy of the undiscounted DL, at least the user could get a sense of how far out the obligation is and the company's ultimate estimate:

*If you knew the undiscounted amount, you could see it is a primary-loaded estimate or a back-end-loaded estimate quickly by comparing it to the discounted estimate.* (Preparer 10)

*The discount rates used and the methodology needs to be understood; otherwise, we have no understanding of how that final number was arrived at, let alone how it compares to any other companies.* (NGO 1)

As discussed above (and shown in Table 5), the archival results from the disclosure analysis of discount rates shows that Canadian firms are much more likely to disclose the discount rate (the reason for this increased likelihood came out in the interviews, which demonstrates the benefit of using a multi-method approach in which both archival data and field research are combined.) According to an interviewee from one of the Canadian Securities regulators, in Canada disclosure of the discount rate and the undiscounted amount is considered to be mandatory. The interviewee explained that, under pre-IFRS GAAP, this disclosure was required, and although IAS 37 does not dictate this disclosure, it falls under IAS 1 as a significant judgement.

*I think people have carried that forward. From my perspective, I think that falls under IAS 1. ...I don't think anyone even questioned that because it was already disclosed, so companies are not trying to hide it.* (Regulator 3)

In Canada, securities regulation is under provincial jurisdiction, so there are officially ten securities regulators. A comment from an auditor who works outside of the jurisdiction of Canadian securities regulators supports Regulator 3's position:

*I think if that provision is significant in the context of the financial statements, companies should be disclosing the basic assumptions that they are using, one of which is the discount rate.* (Auditor 4a)

Beyond the discount rate however, many of the interviewees want to see more about the "basic assumptions" to which Auditor 4a alluded. Paragraph 85 of IAS 37 describes the nature of the obligation, the expected timing, and discussion of uncertainties, captured in two of the interviewees' comments:

*One of the biggest drivers of the decommissioning provision clearly is cost, but it's also timing.* (Auditor 4a)

*None of them [companies] says it costs x to dismantle it, and we will do phase one in this time period and phase two in that time period. And I don't know how to bundle [these things] together and discount it. They are not willing ever to disclose that; they usually say it's too commercially sensitive.* (Roundtable User 1)

From this overview of disclosure, we conclude that a certain degree of comparability is afforded if the undiscounted DLs and the discount rate are provided. However, there is a great deal of diversity in practice internationally, and there is demand for more disclosure related to paragraph 85 in IAS 37.

**Research Question 3 – conceptual aspects of the discounting of provisions from the interviewees**

A number of issues come into play with regard to research question 3. Are DLs similar to a financial liability? Are DLs fair value estimates? What is the appropriate benchmark? All interviewees took it for granted that DLs are different from financial liabilities and that the general public is the ultimate owner of the liability in the event no clean-up occurs. In many jurisdictions, a seller may see DLs come back if a buyer defaults on them, another key factor that differentiates them from financial liabilities:

*If they sell an asset, they continue to track the buyer almost from a credit-worthiness perspective. They assess whether certain liabilities will come back to them because they know that, in the end, it could. I know some have legally come back to different companies.* (Auditor 11)

Not all of the interviewees were convinced that these arguments link the DLs theoretically to a risk-free rate, but it was an opinion held by a number of interviewees:

*My own personal approach to this would be that, for the kind of liabilities we are talking about, I would not adjust for our own credit risk. It would be absurd to say, "I have a liability but, hey, there's some chance that I don't have to pay it." I find that quite hard to stack up.* (Roundtable Regulator 1)

An opposing view was also offered:

*It is clear that the restoration costs are the result of a business's operation, so one might think that this is part of the company's regular operation. Therefore, these costs should also be factored [when determining discount rates].* (Auditor 2)

At the roundtable and in several interviews, discussion arose concerning whether DLs can be fair-valued and, if so, what that would imply for the discount rate:

*I could go even lower if I said what I would pay for somebody to take this off my hands because they're going to have something akin to the certainty equivalent, plus they'll have a profit margin, so they'll want even more money. If I took that amount and then tried to "present value it out to the cashflows," I'd have to use an even lower discount rate, possibly even negative.* (Standard-setter 1)

The general conclusion is that it is simply not possible to give a fair value in these estimates since there may not be a willing buyer, and when there is no buyer, there is no feasible fair value. Therefore, what is being discounted in IAS 37 is an assumption based on the company actually engaging in the clean-up (although certain tasks would likely be contracted out).

The theoretical concept of a negative discount rate harkens back to the economics literature discussed in section 2. A negative discount rate suggests that the present value of the liability today would be greater than the sum of future cash flows at their nominal values. Several other interviewees touched on discount rates below the risk-free rate:

*How far you discount the costs and liabilities for future generations is a moral issue, and if anything, I want a negative discount rate.* (Expert 3)

*This goes against the grain of caring a lot about your children and your grandchildren. We just think it doesn't matter—it's after us—so most philosophers and economists agreed this should be a very small number.* (Roundtable Expert 1)

Related to the issue of intergenerational concerns is the duration of these liabilities, which came out quite a few times in an applied sense. For example, in the nuclear industry the duration is measured in terms of centuries:

*How about duration? How do you match it? In nuclear you've got some very long timelines, don't you? Do you just go and look at a thirty-year bond, if you can find one?* (Auditor 11)

Then moving back to the theoretical sense, what does duration imply for determining the present value of these liabilities on the balance sheet?

*To me, there's a lot of interest in valuation and social things attached to any liability that is markedly longer-lived in some sense, at least in the duration sense, than equity.* (Roundtable Standard Setter 1)

On the other hand, again in an applied sense, DLs are becoming medium- to short-term liabilities:

*In reality, for many years an awful lot of people have seen decommissioning as something that is over the hill and far away and that is almost not going to happen in our lifetime, so how much effort do we have to put into it? I think there is a considerable sharpening of minds as some of this becomes slightly near return, and that this will be one of the largest cashflows for many of these organisations over future years.* (Auditor 4a)

Finally, we touch on the theoretical benchmark for the discount rate. The risk-free rate is predominantly stated as government bonds, and if there is a credit adjustment, it is based on the firm's cost of debt. There are problems with which risk-free rate to use, but the consensus is that the cash flow should be matched with the discount rate. Of course, duration is a major issue, as just discussed. The other aspect is currency. For example, South African DLs should be benchmarked based on the South African risk-free rate, which also implies using a South African inflation rate:

*It's a question of matching the discount rate with the currency of the provision.* (Roundtable Preparer 3)

However, such matching can sometimes be difficult:

*What we end up with in some countries is there is no such thing [as a risk-free rate]. If we were in some small African nation, finding a risk-free rate would be virtually impossible.* (Auditor 6)

Here, the general conclusion is that the risk-free benchmark is another source of diversity in practice. The theoretical objective is to match to the currency of the cash flow to the discounting, but doing so is not always possible.

## 5. Summary and implications

### *Research questions*

This report presents the key findings of an empirical investigation into diversity in firms' recognition and note disclosures of DLs, with a focus on discount rates. The evidence is based on a multi-method approach that combines an archival analysis of disclosure practices on a sample of international firms in the O&G, mining, and utilities sectors with semi-structured interviews with stakeholders like preparers, users, civil society, experts, regulators, and standard-setters.

With this design, the study addresses three research questions:

1. Is there significant diversity in the choice of discount rate in accounting for decommissioning and environmental liabilities and, if so, what are the firm- and country-level factors that might explain it?
2. What are the disclosure practices in accounting for DLs?
3. Given the social impacts of DLs, what are the theoretical bases and objectives in the application of discounting?

### *Summary of key findings*

In line with prior research on international and industry differences in accounting practices (Nobes, 2013; Stadler and Nobes, 2014), the evidence from this study's quantitative analysis suggests significant diversity in practice across both industry sectors and countries in the choice of discount rate and DL disclosures in reporting discount rates. Specifically, companies in the O&G and mining sectors are more likely to adjust the discount rate than companies in the utility sector, and the mining sector tends to use a wider range of discount rates and to report somewhat higher rates than do the O&G and utilities sectors. Firms that are domiciled in Australia, Canada, South Africa and the UK tend to be more likely to report discount rates above the 75<sup>th</sup> percentile than the rest of the sample. The multi-variate analysis suggests that the determinants of disclosure of discount rates and/or adjusted discount rates vary across industry sectors. The only common driver of disclosure of discount rates across sectors, reasonably enough, is enforcement of regulations. Other country-level disclosure determinants are GDP, environmental protection rankings, and the risk-free rate. Another firm-specific driver of disclosure of discount rates is Big 4 auditors. Firm size also has a positive impact on the willingness to disclose discount rates, though only in the mining and utility sectors. The analysis of determinants of firms' choice of the discount rates used also shows that enforcement is negatively associated with the level of the discount rate, and country-level risk-free rates are positively associated with discount rate levels in the mining and utilities sectors.

Finally, the results indicate that Canada, where O&G and mining companies are predominant, is a special case, in all likelihood because Canada has a high number of O&G and mining firms. Many of these firms are smaller exploration-phase firms that are likely to carry few DLs, and reporting of discount rates (and the undiscounted DL), which was obligatory under Canadian GAAP preceding the adoption of IFRS in 2011, has continued based on the expectations of Canadian securities regulators.

The rich empirical data from the interviews and roundtable corroborate and/or explain these findings. The interviews reveal that disclosure practices vary even among large companies, that the choice of discount rate choice is important, and that this choice requires a great deal of deliberation. The question concerning whether to use risk-free rates or adjust discount rates for firm risk is an accounting policy choice, similar to the choice of depreciation rates of non-current assets. Notably, the interpretation of IAS 37 with respect

to discount rates as a policy choice contradicts the IFRS Interpretations Committee (2011) conclusion related to discount rates for DLs. The interview material also reveals that users need more disclosure—not only details about the discount rates used, but information about undiscounted amounts, what is included in estimated cash flows, and how and when resources will be used— if they are to assess the true nature of the liability.

The answer to which discount rate is appropriate in which situation is not perfectly clear, but there is consensus that these types of liabilities differ markedly from financial liabilities. Many interviewees, as well as the ecological economics literature, agree that a low discount rate is the most appropriate if one considers the welfare of future generations. However, from an applied point of view, this point could be debatable if disclosure of such things as the discount rate, undiscounted liability, and timing were required. Such information would allow users to make their own assumptions about the present value of DLs.

### ***Further discussion and implications for future research***

The scope of our data is limited in that it focuses on binary terms like whether the discount rate has been adjusted and whether the reporting contains a particular disclosure. The discussion presented above and the excerpts from the interviews are meant to bring a more nuanced approach by enhancing these data.

Other considerations could be explored from the theoretical and applied perspectives in the context of IAS 37. For example, pension accounting focuses on the appropriate discount rate (or expected rate of return) for the pension asset. If DLs were regulated similarly to defined-benefit pension obligations, then a DL could be matched with a DL asset made up of other assets, similar to a pension fund. If such a matching asset existed, then there could be a new discussion on the correct discount rate since it could be argued that the present value of the DL should be based on the matching asset's expected return. However, the authors are aware of no such cases, and little research has been done on the funds firms set aside in relation to DLs. In some industries, such as nuclear, these funds can be significant, but DLs around the world are virtually unfunded at present.

The concepts of prudence and conservatism in accounting could be considered in the context of DLs, which is related to the precautionary principle used in policy making considerations, especially when environmentally related. The precautionary principle proposes that, if some potential outcomes are extremely bad, it is best to deal with them under the worst-case scenario. Thus, the precautionary principle has implications for the expected value that should be applied to DLs and the consideration of their funded status in relation to possible outcomes.

This study does not delve into detail on the specifics of the DL estimation, so future research could consider this aspect of the topic. For pollution-prone industries, DLs are material items, so they are key audit matters by definition. The interplay among the auditor, the audit firm, the auditee, and the auditee's professionals is another aspect of the 'black box' that remains unexplored.

The timing of the DL is also key in the recognition and expensing of the DL. There is great advantage for firms in delaying the cash outflow for DLs since doing so allows for deeper discounting. However, climate change may bring these outflows forward in time. If climate change objectives are to be met, some assets will be stranded (Bebbington et al., 2019), which implies the need for an earlier clean-up and earlier recognition of the undiscounted clean-up. On the other hand, a mining tailings pond, for example, could be a source of "rare earths" and mined well past the end of the mine's expected life, thus delaying the need for the clean-up. Even in emerging sectors like renewables, the actual versus expected life of a wind turbine or solar panel could vary widely. Although such variance affects other items,

such as the depreciation/depletion of related assets to the DL, an adjustment to the DL also adjusts a future cash liability, not a previously purchased capital asset.

Finally, future research could explore and compare disclosure practices related to decommissioning and clean-up plans that are reported in sustainability reports, vis-à-vis the information reported in annual reports. We believe it is unlikely that firms' sustainability reports will discuss the financial implications of decommissioning plans, but, from a research perspective, exploring whether explanations are consistent and whether they enhance the information reported in the financial statements may provide further insights into the 'black box'.

Several avenues for future research could be directed at the specifics of DLs, such as information about the key inputs used to estimate the liability. However, without adequate disclosure on DLs, there are no specifics on DLs to be explored. For the most part, these key inputs remain a 'black box' for investors and other key stakeholders.

### ***Implications of the research for standard-setters and policy-makers***

The key question for standard-setters that arises from our findings is whether IAS 37 was written with the intention that the basis for calculating the discount rate should be an accounting choice or whether it is acceptable that such has turned out to be the case in practice. If this practice is not acceptable, then standard-setters may need to clarify what is the appropriate basis for the discount rate—what adjustments, if any, firms should consider and/or whether they should be using risk-free rates instead.

Even if it is acceptable that the basis for calculating the discount rate is an accounting choice, the issue remains concerning how to ensure transparent disclosure to inform the users' decisions, allow comparability across firms, and inform public policy. From the evidence gathered in both archival and interview data, it appears there is insufficient guidance in IAS 37—or, more generally speaking, within IFRS—on what should be disclosed in relation to DLs. In the meantime, detailed information is essential for those who use financial information, such as investors, creditors and analysts, but also for regulators, policy-makers, and the broader society. For example, a recent report of the UK National Audit Office (2019) highlights the relevance to public policy of the accounting choices behind DLs. The report states that the Oil & Gas Authority's estimates of future decommissioning costs to operators is between £45bn and £77bn. As the Department for Business, Energy, & Industrial Strategy monitors the financial health of these operators and has so far required nine O&G operators to set aside a total of £884 million to ensure they have sufficient funds available to cover the costs of decommissioning, transparency about how DLs are estimated and accounted for is clearly imperative. The report also highlights that taxpayers are ultimately liable for the cost of decommissioning assets that operators cannot decommission (National Audit Office, 2019, p. 10), which makes DLs and the companies' accounting choices an issue of relevance to the public interest.

### ***Implications of the research for preparers and auditors***

The findings in this study suggest a demand for enhanced disclosures related to DLs. Through descriptive statistics on the discount rates used and examples of complete disclosures, the study provides preparers and auditors a benchmark without which it is difficult for stakeholders to take informed decisions. In particular, we document that disclosure of the discount rate, (undiscounted) future estimated cash outflows, and timing of the decommissioning are the three essential items of information that stakeholders need. Furthermore, a discussion of any major uncertainties surrounding these three items warrants a comprehensive and complete reporting practice to enhance understanding from the user's perspective.

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## Appendix I:

### *Identifying the discount rate, the inflation rate and adjustments*

We firstly combine the texts about decommissioning liability policy, accounting policy and other relevant notes identified in the annual reports. We then identify 3 to 5 words that are adjacent to “*\*rate, adjusted\*, risk\*, \*cash\*, \*inflation\**” using the collocation analysis.<sup>12</sup> We also add other relevant terms by reading some of the notes. This process yields the following dictionaries which will then be used in to identify these each disclosure item.

Item	Terms
Discount rate	<i>'discount rate*', 'pre tax', 'interest rate*', 'discounted rate'</i>
Inflation rate	<i>'inflation rate*', 'real discount', 'real interest', 'inflation factor*', 'inflation and discount rate'</i>
Risk free rate	<i>'risk free'</i>
Adjustment	<i>'credit adjusted', 'appropriate risk*', 'adjusted discount rate*', 'adjusted risk free', 'adjusted rate*', 'adjusted pre tax', 'adjusted credit', 'rate adjusted', 'risk* specific', 'reflect risk*', 'credit risk*', 'creditadjusted', 'risk* inherent', 'liability specific'</i>
Cash flow adjustment	<i>'estimate* adjusted', 'adjusted amount cash', 'cash flows adjusted', 'adjusted undiscounted amount cash', 'inflation adjusted', 'inflationadjusted', 'risk* adjusted cash', 'current prices adjusted', 'escalated'</i>

**Extracting inflation rate:** To extract inflation rate, we firstly standardise various expressions of inflation rate by replacing them with the term “inflation rate”. Then we extract the rate that follows this term. We manually check each text that contains inflation rate to correct for any unsuccessful extraction and the presence of multiple inflation rates.

<sup>12</sup>The Asterix means represent the n gram words that we try to identify.

## Appendix II:

### *Interview guidelines*

**Questions** (were tailored according to the interviewee group, e.g. preparers, standard setters, experts, regulators, users, etc.).

#### **Accounting for DLs**

1. Why and when decommissioning liabilities (DLs) should enter the balance sheet?
2. How do you choose the discount rate for DLs and what are the key/most important assumptions?
3. How do you measure the risk adjustment? Where do you adjust for risk?
4. How do you determine discount rates for very long durations?
5. Can you describe the process undertake to estimate the DLs?
6. How do you audit the information on decommissioning liabilities? What does the process entail?
7. What is your opinion about the current standard for DLs?
8. What are the greatest challenges in the process of accounting for DLs?

#### **Disclosure**

9. How do you convey in the annual report (e.g. to external stakeholders/readers) any changes in the assumptions/accounting for DLs?
10. Who do you think will use about this information and why?
11. What do you think should be disclosed for any stakeholders to understand the accounting behind the DLs?

#### **Accounting and Disclosure (users)**

1. What is decommissioning-restoring?
2. What should “accounting for DLs” convey to stakeholders/users of the financial statements?
3. Why do you care about this information? How do you use it?
4. What is the most valuable piece of info you need and how do you assess that information? (do you believe this considering the future?)
5. How would you assess current disclosure practices on DLs? Where do you retrieve the relevant info you need?
6. Do you have an opinion about which discount rate should be used for DLs and what should the discounting incorporate?
7. Is there anything wrong with the present regulation/standard setter? What are the pros and cons? Does the standard as is allow comparability?
8. What are the greatest challenges in interpreting disclosure on accounting for DLs?

## ABOUT THE AUTHORS

**Giovanna Michelin** Giovanna Michelin is Professor of Accounting at the University of Bristol. She obtained her PhD from the University of Padova. Giovanna is a well-established international scholar in the field of corporate governance and sustainability accounting and reporting, with more than 40 publications in leading academic journals. Her work has explored how corporate governance drives corporate social responsibility activities and reporting, and the role of sustainability information for market participants and other stakeholders. She is currently a member of the *European Accounting Association Management Committee*, Co-editor of *Accounting Forum*, and a Council member of the *Centre for Social and Environmental Accounting Research* (University of St. Andrews).

**Mari Paananen** is an Associate Professor of Accounting at the School of Business, Economics and Law at the University of Gothenburg. She obtained her PhD from the University of North Texas. Her research has focused on capital market effects of financial reporting and more recently on disclosure quality related to environmental liabilities. She is also involved in research using textual analysis to predict Internet traffic effects on credit rating changes among U.S. firms, the economic impact/consequences of social networks and the magnitude and reasons for balance sheet management among small and medium sized (SME) companies. She has published her research in various international journals, and she is a member of the editorial board of the *Accounting Forum*, *Journal of International Accounting*, *Auditing and Taxation*, and *Accounting in Europe*.

**Thomas Schneider, CPA, CMA** is an Associate Professor of Accounting in the School of Accounting and Finance at the Ted Rogers School of Management. He obtained his PhD from the University of Waterloo and he is a Chartered Professional Accountant. Thomas Schneider's research focus is on social and environmental accounting. It ranges from exploring the capital market effects of environmental related accounting rules and securities regulations to the triple bottom-line implications of energy policy at the grass-roots level. His work has been published in various leading journals, and he is on the editorial boards of *Accounting Forum*, *Sustainability Accounting, Management and Policy Journal*, *Social and Environmental Accounting Journal* and *Contemporary Accounting Research*. He is also a member of the Expert Group on Resource Management (EGRM) of the United Nations Economic Commission for Europe.





#### **Contact us**

CA House, 21 Haymarket Yards, Edinburgh, UK, EH12 5BH  
+44 (0) 131 347 0100  
[connect@icas.com](mailto:connect@icas.com) | [icas.com](https://www.icas.com)



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