

Assessing Environmental Information Disclosures and the Effects of Chinese Nonferrous Metal Companies

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Abstract

Corporate environmental information disclosures (EIDs) are important policy tools for environmental protection. This paper assesses and longitudinally examines EID changes in Chinese listed nonferrous metal companies from 2008 to 2012 through their annual, social responsibility, environmental, and sustainability reports. Using content analysis and multivariate regression methods, we find a significant increase in the quantity and quality of corporate EIDs post-2010, though the overall level is still not high. Company size, profitability, and government regulation significantly and positively affect EID. In addition, we find that state-owned enterprises are more likely to disclose environmental information than private ones.

Keywords: environmental information disclosure, nonferrous metal listed companies, content analysis, China

Introduction

In the last three decades China has witnessed a high rate of growth in economics with a high environmental price, which has caused a loss equivalent to 8% of its annual GDP [1]. As the world's largest emitter of CO₂, SO₂, and COD [2, 3], China is home to 16 of the world's 20 most polluted cities. The highest PM2.5 level hit nearly 1mg/m³ in Beijing in 2013 – 40 times the guideline value set by WHO.

China has become the world's largest producer and consumer of major nonferrous metals for more than a decade. Though the nonferrous metal industry occupies an important place in the national economy, it is undeniable that this energy-intensive and environmental-polluting industry is the culprit damaging the environment and public health by heavy metal pollution, PM2.5, lead in blood, etc. (as shown in Fig. 1). More than 30 heavy metal pollution incidents broke out during 2009-11 nationwide, leading to 20 million hectares of contaminated arable land, accounting for 1/6 of total cultivated area. The soil-heavy metal of 13 provinces out of 18 main cultivated land distribution provinces exceeds the standard [4]. Nonferrous metal firms are both causes and solutions

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Fig. 1. Map of heavy metal pollution in China.

for such problems, and now they are urged to disclose adequate environmental information to lower the level of information asymmetry and to reduce their negative environmental impact.

Stringent environmental regulations are rendered under this severe circumstance, and corporate environmental information disclosure (EID) has become an important policy tool [5, 6]. In 2007 the first regulation, “Measures for Environmental Information Disclosure,” was issued by the Ministry of Environmental Protection of China (MEPC). A further regulation “Environmental Information Disclosure of Listed Companies Guideline (exposure draft),” published in 2010 by the MEPC, detailed the environmental information disclosures for all the listed companies.

Though many strict regulations are carried out, some environmental violations still emerge. For example, a leak of acidic wastewater with copper discharged by the largest gold producer in China, Zijin Mining – and unknown until nine days after the event – severely polluted the local river and caused great economic loss in 2010. This gives rise to a critical question: what are the status quo and determinants of corporate EIDs of Chinese nonferrous metal companies?

Therefore, our study of exploring the level and determinants of EIDs of listed Chinese nonferrous metal companies is significant. First, many previous studies [7] rely on a short window of observation (e.g., annual report data for one year) and such reliance may lead to biased conclusions on the factors affecting EID behavior. To fill this research gap, we adopt a longitudinal approach to examine EID patterns over a 5-year period (2008-12) and use pooled regression analysis to investigate the influence of various factors on EIDs. Secondly, since there are mixed findings on the effects of sectors on corporate EIDs [8], our study focuses on a single sector, the nonferrous metal industry, to control possible industry effects and gain more in-depth insights [9]. Finally, most of the previous studies were launched in developed countries, while there is a paucity of studies in exploring EIDs of Chinese companies and those of other emerging economies [6, 10]. Emerging economies such as China provide a rich setting for examining corporate EIDs, since most of them lack mandatory reporting requirements. Thus, investigating

environmental reporting in an emerging economy will add more insight to the literature as it may be quite different from developed countries [6, 11, 12].

The remainder of our paper proceeds as follows. Firstly, the theoretical analysis and research hypotheses are developed. Subsequently, the research method is described. Afterward, the empirical results are presented and discussed. Finally, we propose conclusions and implications.

Theoretical Analysis and Research Hypotheses

Evolution of EIDs over Time

Over the last two decades, China has formulated and modified relevant policies and regulations to create a favorable environment for EIDs. A series of laws and regulations undoubtedly bring regulatory pressure to corporate EIDs. Under pressure from various aspects, the level of EIDs increases rapidly. However, few relatively mature rules were promulgated before 2010. In September 2010 the ministry of environmental protection announced an “Environmental Information Disclosure of Listed Companies Guide (exposure draft)”, requiring listed companies of the 16 specified heavy pollution industries such as thermal power, steel, cement, etc., to disclose environmental information and publish environmental reports. In particular, those listed companies with environmental emergencies or serious environmental penalties should publish interim environmental reports daily. Compilation and disclosure of environmental information of the nonferrous companies should be conducive to the creditors, investors, the public, and the government management department to get better acquainted with the conditions of environmental protection.

Besides, the 12th Five-Year Plan (FYP) adopted by the Chinese government in March 2011 pays considerable attention to energy and climate change and establishes a new set of targets and policies for 2011-15. Article 6 gives a detailed account of green development and building a resource-conserving and environmentally friendly society.

With policy promotion, the public's awareness of environmental protection is increasing gradually. A number of the pressures are detailed in the Environmental Information Disclosure of Listed Companies Guide, which requests nonferrous companies to disclose their policies and practices, so the level of EIDs after 2010 is likely to increase. In light of the above, the following hypothesis is proposed:

H1: There is a significant increase in the EID level of Chinese nonferrous companies after 2010.

Company Size

Company size is connected with public pressure regarding environmental management [13], and particularly larger firms are more vulnerable to be under public supervision. The public is more likely to be aware of the existence and activities of larger firms than smaller ones, and so are more likely to urge these firms into disclosing environmental information. Large firms respond to this pressure by disclosing as much positive environmental information as they can [14]. Support for this truth has been found in other research [15] and in legitimacy theory [16].

Besides, the larger the firm is, the more heterogeneous resources it will possess, which enables it to take a series of measurements to protect the environment and manage environmental issues actively. In addition, larger companies tend to have more resources that can be devoted to managing their environmental impact and to achieving environmental protection and to promoting their activities, and also have proportionally lower information production costs [17]. Hence, they are more confident and active in disclosing environmental information. Accordingly, a second hypothesis is proposed as follows:

H2: Company size is positively related to the EID level of Chinese nonferrous companies.

Profitability

The higher the profitability, the more redundant resources the firm possesses, which promotes it to increase its investment in environmental activities to improve environmental performance. Accordingly, the firm is more confident and willing to disclose relevant environmental information in order to achieve higher corporate value. The economic performance can influence corporate financial capability to undertake costly measures regarding social and environmental demands. High profitable firms are seemingly more credible to the public, which raises societal expectations of responsibility [18]. These firms are found to be more likely to resolve environmental issues that appear. Also, firms with good economic performance produce more environmental disclosures of specific pollution occurrences [19].

Liu and Anbumozhi [6] found that the better the firm's economic performance, the more information on environmental pollution control cost and investment it discloses. Above all, previous studies support a positive

association between corporate economic performance and corporate environmental disclosure [20], indicating that the more profit a firm has, the higher the level of EID. Therefore, the following hypothesis is proposed:

H3: Profitability is positively related to the EID level of Chinese nonferrous companies.

Government Regulation

Government laws and regulations are the most direct and threatening pressure on corporations [21]. In an environment with highly developed laws and strict law enforcement, the expected cost of violating laws is much higher than the expected return, encouraging corporations to obey the law, so there is a strong relationship between laws and EID [22, 23].

As a transition economy, the Chinese government still plays a vital role in business operations. A series of laws on environmental protection have been promulgated since 1978. Government regulation can significantly shape corporate EIDs [24]. Patten and Trumpeter found that firms regarded environmental reporting as an effective tool for reducing exposure to regulatory threats. Liu and Anbumozhi [6] demonstrated that the EID of Chinese listed companies was tailored to the government's requirements. Accordingly, in order to cope with the regulatory pressure, more and more listed enterprises disclose environmental information that is consistent with the government's provisions. Besides, firms tend to perform more efficiently in EIDs when they receive enough institutional support. Thus, the following hypothesis is proposed:

H4: Government regulation is positively associated with the EID level of Chinese nonferrous companies.

Ownership

According to the investor, firms can be divided into two categories: privately owned enterprises (POEs) and state-owned enterprises (SOEs). A state-owned firm is controlled or owned by central or local government, by which it is supported [6]. Different ownership types have different effects on investment decisions, operating efficiency, and financial performance.

As POEs and SOEs have distinct owners, backgrounds, and roles in China, there is a huge difference in responding to government policies and regulations, resulting in different EID activities. Unlike the pursuit of profit maximization of POEs, SOEs not only play an economic role, but also undertake various social and political missions as they are owned by governments, on the behalf of governments in business activities, and controlled by the managers appointed by the Chinese Communist Party [25, 26]. For example, in the nonferrous metal industry, the SOEs are often responsible for national security, market stability, environmental protection, etc. Especially under increasingly stringent environmental regulations, CEOs who reject corporate social and environmental responsibility are less likely to hold a post in SOEs [26]. Also, SOEs not only represent their own image, but the

image of government. Therefore, they tend to engage in more EIDs to demonstrate their social responsibility [27, 28]. Therefore, they have to take more active actions toward environmental responsibilities and will be more proactive to disclosing relevant environmental information. Studies also revealed such relationships. For example, Zeng et al. [28] find that SOEs engage in higher levels of EIDs. Accordingly, the last hypothesis is proposed as follows:

H5: State-owned nonferrous listed companies are more likely to disclose EIDs than private ones.

Data and Methodology

Data and Sample

This study chooses to investigate the Chinese nonferrous industry for several reasons. The first is that the industry plays an important role in the Chinese economy by providing basic raw materials for other sectors such as national defense industries, the aviation industry, etc., contributing 7.87% to GDP in 2011. Another reason is its high-energy-consuming and pollutant-emitting nature. In 2011 the industry consumed 151.38 million tons of standard coal and emitted more than 300 million tons of greenhouse gases. Last but not least, the launch of the “Guidance of Energy-conservation and Emission-reduction of Nonferrous Metal Industry” in 2013 by the Ministry of Industry and Information Technology of China reflects the seriousness and urgency of the industry to be more environmentally friendly. Given its prominence in the Chinese economy, the environmental sensitivity of the industry, and recent initiatives stressing the importance of sustainable development, it is a high priority to explore the status and antecedents of environmental disclosures. Therefore, there is an urgent need to study the EID of the nonferrous metal listed companies.

The investigated samples in the nonferrous metal industry were selected from public companies listed on ‘A’ stock in the Shanghai and Shenzhen stock exchanges of China. The period 2008-12 was selected since it coincided with the publication of “Environmental Information Disclosure of Listed Companies Guide (exposure draft)” published in 2010, but made applicable from 2011. We examined the status of corporate EIDs three years (2008-10) prior to the expected implementation of the guide and over the next two years (2011-12). All 205 observations were received. The environmental information was collected from annual reports, corporate social responsibility (CSR) reports, environmental reports, and sustainability reports of the sampled companies.

Econometric Model

We explore the determinants of corporate EIDs from multiple perspectives (size, profitability, regulation, and ownership). The econometric model employed to test the hypotheses is as follows:

$$EID_i = \beta_0 + \beta_1 SIZE_i + \beta_2 PROFIT_i + \beta_3 GR_i + \beta_4 OT_i + \beta_5 AGE_i + \varepsilon_i$$

...where EID_i is environmental information disclosure level of firm i , $SIZE_i$ is the natural log of firm’s year-end total asset, $PROFIT_i$ is the return on equity of firm i , GR_i is the registration place of firm i , OT_i is the ownership type of firm i , AGE_i is the number of years since firm i was listed in the stock market, β_0 to β_5 are coefficients, and ε_i is the error term.

Variable Definition

Dependent Variable

Corporate EID refers to the practices that firms disclose information about their activities concerning the environment, environmental protection, and resource utilization [29]. It can be measured by the content and degree of detail given in environmental disclosure. To explore the factors influencing corporate EID strategy in China – whether or not to disclose and the extent to disclose – we need to clearly define what information is environmentally related [28].

Generally, environmental disclosure regulations vary from country to country. Considering the specific situation of China, our measurement of corporate EID is rooted in two sources. The first is the framework of the G4 Sustainability Reporting Guidelines issued by Global Reporting Initiative (GRI) in 2013, and the second is the “Environmental Information Disclosure Measurement” released by the Ministry of Environmental Protection of China (MEPC) in 2007. From a life cycle perspective, the GRI framework covers five aspects with 30 items. Concerned with environmental impacts, nine indicators are specified in MEPC’s notification. Cormier et al. [30] established a detailed evaluation criterion to measure the level of a firms’ EID. According to this criterion, the components for measuring EID include 37 items grouped into six categories: environmental expenditures and risks, laws and regulations, pollution abatement, sustainable development, land remediation and contamination, and environmental management. Zeng et al. [27] chose 10 components to measure the status of corporate EIDs in China, such as a firm’s environmental investment expenditure and technologies development, government-appropriate funds, finance allowance and tax rebate related to the environment, disposal and treatment of generated waste, information related to ISO environmental system authentication, and construction and operation of environmental improvement, etc. Based on an extensive literature review [6, 17, 31, 32] and considering the GRI framework, the regulation of the Ministry of Environmental Protection and the characteristics of nonferrous metal industry, we identified four categories and 10 items of EID as listed in Table 1.

We employed the content analysis method to assess the EID level of each firm, which is widely adopted in corporate social and sustainability reporting research [28,

Table 1. Components for measuring corporate EIDs.

NO.	Components of corporate EIDs
(1)	Environmental governance and policy
I ₁	Firm's environmental policies, strategies and goals
I ₂	Existence of an environmental management department
I ₃	ISO 14001 authentication and implementation
(2)	Environmental investment
I ₄	Investment for environmental technologies and facilities
I ₅	Environmental training for employees
(3)	Environmental performance
I ₆	Consumption of materials, water, energy, and other resources
I ₇	Type, quantity and destination of emissions, wastes, and effluents (especially heavy metal emissions)
I ₈	Disposal of generated waste
I ₉	Energy conservation and emission reduction
(4)	Other information
I ₁₀	Other related environmental information

31]. Environmental information was collected according to the above EID items through sampled corporate annual reports, CSR reports, environmental reports, and sustainability development reports. Each item is scored in the light of its disclosure level. The score ranges from 0 to 2, where 2 is assigned for detailed monetary or quantitative information, 1 for general and non-monetary information, and 0 for no information disclosed [28]. All the items were weighed evenly. The total score for each item is the level of a corporate's EID.

Table 2. Definition and operation of variables.

Nature of variables	Variable name	Variable symbol	Definitions of variables
Dependent variable	Environmental Information Disclosure	EID	the total score of the defined items of environmental information disclosed
Independent variables	Company size	SIZE	the natural log of firm's year-end total asset
	Profitability	ROE	return on equity of the firm
	Government regulation	GR	PITI index of the city where the firm is registered
Control variable	Ownership type	OT	The dummy variable, i.e., 1 for firms that are state-owned, 0 otherwise
	Age	AGE	Years since the firm was listed in the stock market
	Leadership structure	LS	The dummy variable, i.e., 1 for firms whose CEO is not the COB, 0 otherwise
	Board independence	INDEP	the percentage of independent directors on the board
	The percentage of first shareholders	PFSH	the percentage of first shareholders

Independent Variables

Company size. Larger firms with more resources for environmental efforts tend to disclose more environmental information [6]. Consistent with the prior studies, size was measured by the natural logarithm of the firm's year-end total assets as a proxy variable [29, 32].

Profitability. Return on equity (ROE) is a key indicator of a firms' profitability. Lots of studies showed that ROE can well explain and measure a firm's profitability [6]. Therefore, this study adopts ROE to present the profitability of the listed companies.

Government regulation. The Pollution Information Transparency Index (referred to as "PITI" hereinafter), jointly developed by the Institute of Public and Environmental Affairs (IPE) and the Natural Resources Defense Council (NRDC) to evaluate the EID status of 113 major cities in China since 2008, is based on eight indicators (such as the enterprises' violation records, inquiry suits, etc.) announced by local governments. Scores and rankings are assessed according to systematics, timeliness, integrity, and user-friendliness of the announcements. PITI not only reflects local environmental information transparency, but also reflects the local government regulations on EIDs, and is the most comprehensive and objective evaluation data of these regulations. Therefore, this paper adopts PITI as a measure of government regulation of EIDs.

Ownership type. Studies show that state-owned firms engage in more EIDs to demonstrate their social responsibility [27, 28, 32]. Ownership was a dummy variable (1 for a state-owned enterprise and 0 otherwise).

Control Variables

This study includes firm age, leadership structure, board independence, and the percentage of first shareholder (PFSH) as control variables. First, we control

Table 3. Descriptive statistics of corporate EIDs.

Year	Mean	Standard deviation	Min	Max
2008	6.220	3.328	0	11
2009	7.146	2.807	2	14
2010	8.220	2.669	1	13
2011	8.756	3.200	1	18
2012	8.854	2.780	1	17

for firm age since it affects a firm's EID [6], which is measured by the number of years since the company was listed on the Chinese Stock Exchange. Second, leadership structure takes into account the chief executive officer (CEO) and chairperson of the board (COB), which affects a company's quality of information disclosure [33]. A dummy variable was introduced: 1 refers to a company whose CEO is not the COB, 0 otherwise. Third, we include board independence, which refers to the percentage of independent directors on the board, which affects corporate social disclosure [34]. Forth, the controlling shareholder will be more actively involved in company management, so as to safeguard the rights and interests of themselves and the company. Holderness found that the greater the control by the shareholders, the stronger motivation they will have to increase firm value [35].

Definitions and operations of all variables are shown in Table 2.

Empirical Results and Analysis

Descriptive Statistics and Evolution of EID

Table 3 presents the descriptive statistics for the EID of Chinese nonferrous metal listed companies. As described in Table 3, the means of sampled companies' EIDs from 2008 to 2012 are 6.220, 7.146, 8.220, 8.756, and 8.854, respectively, suggesting that the EID level of sampled companies keeps improving over time. However, the overall level is not high and the score varies widely, which indicates that the EID level of the nonferrous metal industry is not optimistic.

Table 4 indicates the evolution of corporate EIDs during 2008-12. Specifically, the corporate EID of 2008-10 is compared with that of 2011-12. From Table 4, the mean of 2008-10 is 7.195, while it is 8.805 for 2011-12, showing a noticeable increase after 2010. What's more, the change

Table 4. Independent Samples test of corporate EIDs.

Group		N	Mean	Standard deviation	T	P
EID	2008-2010	41	7.195	2.718	-2.606	0.01
	2011-2012	41	8.805	2.874		

is significant at 1% ($P < 0.01$). So H1 is supported. This means that the adoption of the Environmental Information Disclosure of Listed Companies Guide brings regulatory pressure to corporate EIDs and promotes the improvement of EID. Overall, we find evidence of a significant increase in the level of EIDs after 2010 and H1 is supported.

Correlation Analysis

Table 5 provides the descriptive statistics and correlations of the variables. The maximum score of environmental information disclosure is 18, while the minimum is 0, suggesting that firms take very different initiatives toward EIDs.

The Pearson correlation matrix that maps the associations among the variables is reported in Table 5. According to Haniffa and Cooke [36], if all the correlation coefficients of the matrix are lower than 0.8 (or 0.9), the level of multicollinearity is acceptable. Table 5 shows that the highest correlation coefficient is 0.553, indicating no harmful correlation exists.

Results and Analysis of Multiple Linear Regressions

Ordinary least squares (OLS) regression was performed and the results are shown in Table 6. Model 1 is the regression model of the control variables and the dependent variable. Model 2 includes independent variables in the regression.

As reported in Table 6, Hypothesis 2 is supported as firm size (SIZE) shows a significantly positive association with environmental information disclosure ($\beta_1 = 0.292$, $p < 0.01$) in Model 2. Though different from Howard and Jaffee [37], who demonstrated an inverse relationship between firm size and sustainability goals, the result is consistent with most current research [30, 32]. Therefore, we hold that larger firms are more willing to disclose more environmental information because they not only have more resources and are able to shoulder more social responsibilities, but also have greater pressure and motivation in respect to EIDs.

Profitability (ROE) is positively related to EID ($\beta_2 = 0.150$, $p < 0.01$), so Hypothesis 3 is supported, which is consistent with many previous studies [18, 20]. This suggests that the highly profitable firm is more confident and willing to disclose relevant environmental information in order to achieve higher corporate value.

Hypothesis 4 is supported as government regulation (GR) shows a significantly positive association with EIDs ($\beta_3 = 0.154$, $p < 0.05$), indicating that the stricter the environmental policies that governments impose on companies, the more initiative the companies have in disclosing their environmental information, and consequently the EID level of the companies is higher [28].

Ownership type also shows a significantly positive association with EIDs ($\beta_4 = 0.478$, $p < 0.01$), suggesting that state-owned listed companies have higher EID levels than

Table 5. Descriptive statistics and correlation coefficient matrix for variables.

	Min	Max	EID	SIZE	ROE	GR	OT	AGE	LS	INDEP
EID	0	18								
SIZE	18.71	25.08	0.438**							
ROE	-0.595	0.847	0.295**	0.253**						
GR	10.20	85.3	0.014	-0.234**	0.037					
OT	0	1	0.553**	0.278**	0.136	-0.232**				
AGE	1	19	0.186**	0.415**	0.138*	0.166**	-0.035			
LS	0	1	0.055	-0.041	-0.134	-0.208**	0.201**	0.054		
INDEP	0.025	0.500	0.106	0.016	0.010	0.011	0.101	-0.199**	-0.231**	
PFSH	0.165	0.760	0.083	0.164*	-0.009	-0.264**	0.199**	-0.103	0.423**	-0.047

Notes: * P < 0.05; ** P < 0.01. Two-tailed.

private ones. So, Hypothesis 5 is supported, indicating that state-owned listed companies have better awareness of social responsibility and are more inclined to disclose high-quality environmental information [27].

Robustness Check

We undertook further steps to test the robustness of the results. Firstly, instead of the natural logarithm of a firm's year-end total asset, we employed the natural logarithm of total employees (NUM) to measure firm size, and then reran the regression as shown in Model 3. Similarly, instead of ROE we used earnings per share (EPS) as the substitute measure of profitability, and the regression results are shown in Model 4. Furthermore, Model 5 replaced SIZE and ROE with NUM and EPS simultaneously. As shown in Table 7, when adopting alternatives, the significance of the coefficients of firm size, profitability, government regulation, and ownership type were similar to the original results shown in Table 6, which confirms the robustness of our findings.

Table 6. Regression results.

Variables	Model 1	Model 2
SIZE		0.292**
ROE		0.150**
GR		0.154*
OT		0.478**
AGE	0.226*	0.042
LS	0.040	0.050
INDEP	0.164	0.068
PFSH	0.097	-0.032
Adj-R ²	0.051	0.427
F	3.738	33.836

Notes: * P < 0.05; ** P < 0.01.

Conclusions and Implications

In accordance with increasing concerns about environmental protection worldwide, the stakeholders' demands for corporate EIDs have been rising in recent years. In China, rapid environmental degradation has been well documented. Based on China's unique institutional context, this study chose listed companies of the nonferrous metal industry during 2008-12 as research samples; analyzed the environmental information disclosed in their annual, social responsibility, environmental, and sustainability reports; and empirically assessed the status and examined the determinants of EIDs through content analysis and multiple regression.

The empirical test results suggest that there is a significant increase of EID post-2010 of Chinese nonferrous metal listed companies since the enactment of the Environmental Information Disclosure of Listed

Table 7. Robustness test.

Variables	Model 3	Model 4	Model 5
SIZE		0.296**	
NUM	0.290**		0.288**
ROE	0.157**		
EPS		0.148**	0.151**
GR	0.155*	0.160**	0.149**
OT	0.473**	0.486**	0.483**
AGE	0.045	0.040	0.043
LS	0.048	0.049	0.047
INDEP	0.066	0.063	0.061
PFSH	-0.030	-0.027	-0.034
Adj-R ²	0.459	0.436	0.444
F	32.772	29.905	30.529

Notes: * P < 0.05. ** P < 0.01.

Companies Guide (exposure draft). As to the determinants, company size, government regulation, and profitability do significantly and positively affect EID. In addition, we find that state-owned companies are more likely to disclose environmental information than private ones.

The findings have important practical implications. First, it is necessary for the government to set up more mandatory regulations, introduce third-party audits, and develop detailed guidelines and standards for environmental reports to improve the quantity and quality of corporate environmental information disclosure of Chinese nonferrous metal listed companies. Second, more attention should be paid by firms and governments to the multiple determinants of EIDs. To be specific, firms should try to gain more resources to undertake greater environmental responsibilities. Furthermore, governments of less developed regions should set more stringent regulations to force firms to improve their EIDs, while especially non state-owned enterprises should take more proactive initiatives beyond regulations.

This study is subject to several limitations. First, it only focuses on the status quo and determinants of corporate EIDs, and the consequences (such as impact on corporate performance) have not been explored, but should be in the future. Besides, the study only examines nonferrous metal companies and the findings may not be applicable to other industries. Therefore, corporate EIDs in all sectors are worth future research.

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References

1. CHAN R.Y. Corporate environmentalism pursuit by foreign firms competing in China. *J. World Bus.*, **45** (1), 80, **2010**.
2. IEA. CO₂ Emissions from fuel combustion, 2008edn, International Energy Agency (IEA), Head of Communication and Information Office, **2009**.
3. REN S., HU Z. Effects of decoupling of carbon dioxide emission by Chinese nonferrous metals industry. *Energy Policy*, **43**, 407, **2012**.
4. Department of Nature and Ecology Conservation of Ministry of Environmental Protection. *Soil Pollution and Human Health*. Beijing: China Environmental Sciences Press. **2013** [In Chinese].
5. LI F.G., XIONG B., XU B. Improving public access to environmental information in China. *J. Environ. Manage.* **88**, 1649, **2008**.
6. LIU X., ANBUMOZHI V. Determinant factors of corporate environmental information disclosure: an empirical study of Chinese listed companies. *J. Clean. Prod.*, **17** (6), 593, **2009**.
7. CORMIER D., MAGNAN M. The economic relevance of environmental disclosure and its impact on corporate legitimacy: An empirical investigation. *Bus. Strateg. Environ.*, **2013**.
8. VAN DER LAAN SMITH J., ADHIKARIA., TONDKAR R. H. Exploring differences in social disclosures internationally: A stakeholder perspective. *J. Account. Public. Pol.*, **24** (2), 123, **2005**.
9. SIMPSON W.G., KOHERS T. The link between corporate social and financial performance: evidence from the banking industry. *J. Bus. Ethics*, **35** (2), 97, **2002**.
10. AHMAD N.N.N., MOHAMAD N.A. Environmental disclosures by the Malaysian construction sector: Exploring extent and quality. *Corp. Soc. Resp. Env. Ma.*, **21** (4), 240, **2014**.
11. LI D.Y., LIU J. Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *J. Bus. Res.*, **67** (1), 2793, **2014**.
12. HAN Y., LI D. Effects of intellectual capital on innovative performance: The role of knowledge-based dynamic capability. *Manage Decis.*, **53** (1), 40, **2015**.
13. DEEGAN C., GORDON B. A study of the environmental disclosure practices of Australian corporations. *Account. Bus. Res.*, **26** (3), 187, **1996**.
14. GONZÁLEZ-BENITO J., GONZÁLEZ-BENITO Ó. A review of determinant factors of environmental proactivity. *Bus. Strateg. Environ.*, **15** (2), 87, **2006**.
15. ALNAJJAR F.K. Determinants of social responsibility disclosures of US Fortune 500 firms: an application of content analysis. *Adv. Environ. Account. Man. Emerald Group Publishing Limited*. 163, **2000**.
16. BEWLEY K., LI Y. Disclosure of environmental information by Canadian manufacturing companies: a voluntary disclosure perspective. *Adv. in Environmental. Account. Man.*, **1** (1), 201, **2000**.
17. CLARKSON P.M., LI Y., RICHARDSON G.D., VASVARI F.P. Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Account. Org. Soc.*, **33** (4), 303, **2008**.
18. CORMIER D., MAGNAN M. Corporate environmental disclosure strategies: determinants, costs and benefits. *J. Account. Audit. Fin.*, **14** (4), 429, **1999**.
19. AL-TUWAIJRI S.A., CHRISTENSEN T.E., HUGHES K.E. The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach. *Account. Org. Soc.*, **29** (5), 447, **2004**.
20. CORMIER D., MAGNAN M. Environmental reporting management: a continental European perspective. *J. Account. Pub. Pol.*, **22** (1), 43, **2003**.
21. DARRELL W., SCHWARTZ B.N. Environmental disclosures and public policy pressure. *J. Account. Public. Pol.*, **16** (2), 125, **1997**.
22. POPP D., HAFNER T., JOHNSTONE N. Environmental policy vs. public pressure: Innovation and diffusion of alternative bleaching technologies in the pulp industry. *Research Policy*, **40** (9), 1253, **2011**.
23. ZIZZO D.J., FLEMING P. Can experimental measures of sensitivity to social pressure predict public good contribution? *Economics Letters*, **111** (3), 239, **2011**.
24. HUANG C.L., KUNG F.H. Drivers of environmental disclosure and stakeholder expectation: Evidence from Taiwan. *J. Bus. Ethics*, **96** (3), 435, **2010**.
25. KUO L., YE H.C., YU H.C. Disclosure of corporate social responsibility and environmental management: Evidence

- from China. *Corp. Soc. Resp. Env. Ma.*, **19** (5), 273, **2012**.
26. ZU L.R., SONG L.N. Determinants of managerial values on corporate social responsibility: Evidence from china. *J Bus. Ethics.* 88, 105, **2009**.
27. ZENG S.X., XU X.D., DONG Z.Y., TAM V.W.Y. Towards corporate environmental information disclosure: An empirical study in China. *J Clean Prod.* **18**, 1142, **2010**.
28. ZENG S.X., XU X.D., YIN H.T., TAM C.M., Factors that drive Chinese listed companies in voluntary disclosure of environmental information. *J. Bus. Ethics*, **109** (3), 309, **2012**.
29. GRAY R., KOUHY R., LAVERS S. Corporate social and environmental reporting: a review of the literature and a longitudinal study of UK disclosure. *Account. Audit. Account. J.*, **8** (2), 47, **1995**.
30. CORMIER D., MAGNAN M., VAN VELTHOVEN B. Environmental disclosure quality in large German companies: economic incentives, public pressures or institutional conditions? *Eur. Account. Rev.*, **14** (1), 3, **2005**.
31. AHMAD N.N.N., MOHAMAD N.A. Environmental disclosures by the Malaysian construction sector: Exploring extent and quality. *Corp. Soc. Resp. Env. Ma.*, **21**, 40, **2014**.
32. MENG X., ZENG S., SHI J.J., QI G., ZHANG Z. The relationship between corporate environmental performance and environmental disclosure: An empirical study in china. *J. Environ. Manage.* **145**, 357, **2014**.
33. CERBIONI F., PARBONETTI A. Exploring the effects of corporate governance on intellectual capital disclosure: an analysis of European biotechnology companies. *Eur. Account. Rev.*, **16** (4), 791, **2007**.
34. BEN-AMAR W., CHANG M., MCILKENNY P. Board Gender Diversity and Corporate Response to Sustainability Initiatives: Evidence from the Carbon Disclosure Project. *J. Bus. Ethics*, in press, **2015**.
35. HOLDERNESS C.G. A survey of blockholders and corporate control. *Econ. Policy R.*, **9** (1), **2003**.
36. HANIFFA R.M., COOKE T.E. The impact of culture and governance on corporate social reporting. *J Account Public Pol.* **24**, 391, **2005**.
37. HOWARD P.H., JAFFEE D. Tensions between firm size and sustainability goals: Fair trade coffee in the United States. *Sustainability.* **5**, 72-89, **2013**.

