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The market-value effects of GHG emissions, assurance and assurance provider: an international study

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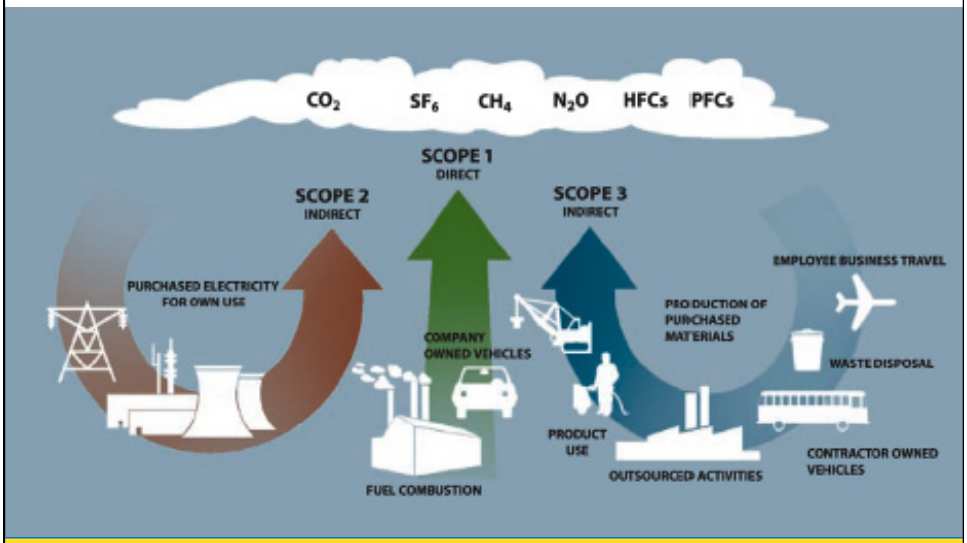
GHG Emissions and its Sources



Objective and Research Questions

- To examine whether the assurance of greenhouse gas (GHG) disclosures and the choice of assurance provider matter to the capital markets.
- Specifically, this paper address the following research questions:

(1) Whether disclosure of GHG emissions in a cross country context has a negative effect on market value consistent with prior literature (Matsumura et al. 2014, Griffin et al. 2012 and Clarkson et al. 2014)

(2) Is this negative effect moderated by third party assurance?

(3) Is the moderating effect different between assurance provided by accountants and environmental consultants?

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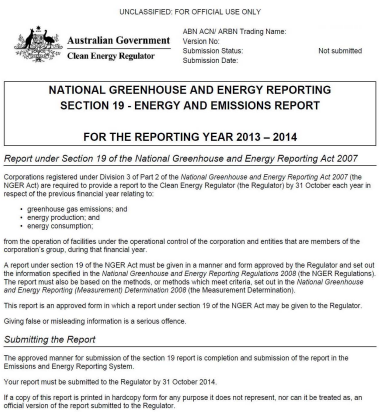
Regulatory Report: NGER Report



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Australian Government
Clean Energy Regulator

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NATIONAL GREENHOUSE AND ENERGY REPORTING
SECTION 19 - ENERGY AND EMISSIONS REPORT

FOR THE REPORTING YEAR 2013 – 2014

Report under Section 19 of the National Greenhouse and Energy Reporting Act 2007

Corporations registered under Division 3 of Part 2 of the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) are required to provide a report to the Clean Energy Regulator (the Regulator) by 31 October each year in respect of the previous financial year relating to:

- greenhouse gas emissions; and
- energy production; and
- energy consumption;

from the operation of facilities under the operational control of the corporation and entities that are members of the corporation's group, during that financial year.

A report under section 19 of the NGER Act must be given in a manner and form approved by the Regulator and set out the information specified in the *National Greenhouse and Energy Reporting Regulations 2008* (the NGER Regulations). The report must also be based on the methods, or methods which meet criteria, set out in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (the Measurement Determination).

This report is an approved form in which a report under section 19 of the NGER Act may be given to the Regulator.

Giving false or misleading information is a serious offence.

Submitting the Report

The approved manner for submission of the section 19 report is completion and submission of the report in the Emissions and Energy Reporting System.

Your report must be submitted to the Regulator by 31 October 2014.

If a copy of this report is printed in hardcopy form for any purpose it does not represent, nor can it be treated as, an official version of the report submitted to the Regulator.

Example NGER Report

GHG emissions	Energy Consumption	Energy Production
2,500,000 tCO2-e	3,000,000 GJ	500,000 GJ

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Contributions

Our study responds to the call for studies to investigate the capital market impact of GHG emissions assurance (Matsumura et al. 2014) and in doing so, contributes to the accounting literature in several ways.

- ❑ Extends the prior environmental performance and capital market research by documenting:
  - The negative impact of GHG emissions on the firm's market value in a global context, and
  - The mitigating role of both assurance and the quality of the assurance provider on this relationship between market value and disclosure

Contributions

- ❑ Addresses the inherent problems incurred in assessing the value of audits in the context of publicly listed firms due to an absence of the availability of a control sample of unaudited firms.

- ❑Provides insights on the dichotomous auditing market (i.e. accountants and environmental consultants) for GHG assurance

Overview of Results

- GHG emissions negatively affect a firm's market value.
- On average, for every additional thousand metric tonnes of GHG emissions, the market value is decreased by $42,000. This translates to a $300 million reduction in market value when comparing firms in the first quartile (Q1) and third quartile (Q3) of GHG emissions.
- The negative relationship between the market value and GHG emissions is moderated for firms whose GHG emissions are assured and more so for assurance conducted by the accountants.

Literature Review and Hypothesis Development

- Disclosure of environmental performance information (e.g., GHG emissions) reduces the information asymmetry and agency costs between managers and capital market participants (Clarkson et al. 2008) but it is a costly decision (Verrecchia 1983) as this information is proprietary in nature (Li et al. 1997).
- Firms with good environmental performance should be valued by the capital market and reward this with a higher share price while the capital market should discount firms with poor environmental performance through a lower share price.
- Financial consequences of GHG emissions are long term and irremediable (Lash and Wellington 2007).

GHG Emissions Assurance and Market Value

- Firm's disclosure of GHG emissions clearly signals to the market that certain costly hidden obligations are not explicitly recognised in the firm's liabilities (Hughes 2000; Clarkson et al. 2004; Clarkson et al. 2013).

- GHG emissions are negatively associated with the firm value (Chapple et al. 2011; Griffin et al. 2012; Matsumura et al. 2014).

- Firms' carbon allowances are not associated with firm valuation but the allocation shortfalls are negatively associated with the firm valuation (Clarkson et al. 2014).

- GHG emission reduction is a global issue (Lash and Wellington 2007; Bebbington and Larrinaga-Gonzalez 2008) and firms from different countries are addressing this as part of their overall business strategy (Kauffmann et al. 2012).

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Literature Review and Hypothesis Development

H1: GHG intensity is *negatively* associated with the firm's market value

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GHG Emissions Assurance and Market Value

- Assurance increases the credibility of information regardless of whether it is financial or nonfinancial (Elliott 1998).

- Investors are increasingly concerned about the legitimacy of the disclosed GHG emissions information and as such they are demanding the proof of performance claims regarding GHG emissions by firms (Carbon Disclosure Project, 2011).

- Different institutional and regulatory bodies are also creating pressures on firms to obtain independent third party assurance.

- Obtaining independent assurance on GHG emissions is a costly issue (Simnett et al. 2009) because it includes money costs as well as potential losses of proprietary information (Kim et al. 2011).

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GHG Emissions Assurance and Market Value

- Firms take the decision to purchase such assurance if the benefits exceed its costs (Dye 1985; Verrecchia 1983).
- Independent third party assurance on GHG emissions:
  - Acts as a monitoring device.
  - Signalling theory (Titman and Trueman 1986; Spence 2002; Connelly et al. 2011).
  - Improve investors' confidence in the reported information (Simnett et al. 2009; Casey and Grenier 2014).

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GHG Emissions Assurance and Market Value

H2: The *negative* relationship between the level of GHG emissions and market value is *lower* for firms with GHG emissions assurance.

GHG Emissions Assurance Provider and Market Value

- Two distinct groups of professional are engaged in providing assurance on GHG emission reports: the accounting profession, and environmental consultants (Simnett et al. 2009; Huggins et al. 2011).
- In case of the accounting profession, most of the GHG emissions assurance services come from the Big N assurers (Simnett et al. 2009; Huggins et al. 2011).
- Accounting profession is considered as higher quality assurance providers (Huggins et al. 2011; Simnett et al. 2009):
  - ✓ Have strong profile as providers of high quality professional services in the field of corporate reporting.
  - ✓The presence of their strong 'global' standards, as well as the independence, ethical requirements and quality control mechanisms for regulating the accounting profession (Simnett et al. 2009).
  - ✓Reputational capital (Simnett et al. 2009) and global reach (Carson 2009) is also higher for Big N accounting firms.

GHG Emissions Assurance Provider and Market Value

- Environmental consultants:
  - ✓Have a higher level of subject matter expertise.
  - ✓Lack the desirable characteristics of an accounting assurance team.
- Higher quality assurance provided by higher quality assurers is highly valued by capital market participants (Datar et al. 1991; Ghosh and Moon 2005).
- In the financial audit context, using theoretical modelling, Titman and Trueman (1986) show that a higher quality auditor leads to a higher firm value.
- Francis et al. (1999) show that firms with greater information uncertainty are more likely to hire higher quality auditors to increase the credibility of their financial statements.

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GHG Emissions Assurance and Market Value

H3: The *negative* relationship between the level of GHG emissions and market value is *lower* for firms with GHG emissions assurance by the accounting profession.

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Sample and Data

- Global 500 Firms with GHG emissions disclosures to CDP for the five years period from CDP2007 to CDP2011.
- Retain all firms that drop out of the Global 500 index in any particular year over the five years.
- GHG emissions and assurance data sources:
  - ✓CDP
  - ✓Global Reporting Initiative (https://www.globalreporting.org),
  - ✓ Corporate Register (http://www.corporateregister.com),
  - ✓Social Funds (http://www.socialfunds.com)
  - ✓ Firms' websites for environmental and/or sustainability reports, or annual reports (where environmental or sustainability reports were not available)

Sample and Data

- Financial and nonfinancial data sources:
  - ✓Compustat Global and North America
  - ✓CRSP
  - ✓I/B/E/S
  - ✓FactSet
  - ✓Asset4
  - ✓Bloomberg

Research Models

❑ To address our research questions and at the same time control for selection bias, we use Heckman's (1979) two stage model.

❑ The first stage model:

$$Prob\ (DISC_{i,t}/ASSUR_{i,t}/PROVIDER_{i,t} = 1) = \beta_0 + \beta_1 CDP_{i,t-1} + \beta_2 EI_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 ROA_{i,t-1} + \beta_5 COMPETITION_{i,t-1} + \beta_6 FIN_{i,t-1} + \beta_7 TOBINQ_{i,t-1} + \beta_8 LEV_{i,t-1} + \beta_9 EP_{i,t-1} + \beta_{10} ETS_{i,t-1} + \beta_{11} INSTOWN_{i,t-1} + \beta_{12} SUSTCOM_{i,t-1} + \beta_{13} SRI_{i,t-1} + \beta_{14} FAGE_{i,t-1} + \beta_{15} LTG_{i,t-1} + \beta_{16} FOREIGN_{i,t-1} + \beta_{17} ESI_{i,t} + \beta_{18} CFIN_{i,t} + \beta_{19} STAKE_{i,t} + \beta_{20} ENFORCE_{i,t} + \beta_{21} CDISC_{i,t} + \beta_{22} ENVPERF_{i,t} + \sum YEAR_{i,t} + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad (1)$$

Research Models

❑The second stage model:

❑ For H1:

$$MVE_{i,t} = \beta_0 + \beta_1 BVE_{i,t} + \beta_2 AE_{i,t} + \beta_3 EMISSION_{i,t} + \beta_4 ESI_{i,t} + \beta_5 CFIN_{i,t} + \beta_6 STAKE_{i,t} + \beta_7 ENFORCE_{i,t} + \beta_8 CDISC_{i,t} + \beta_9 ENVPERF_{i,t} + \beta_{10} IMR\_DISC_{i,t} + \sum YEAR_{i,t} + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad (1)$$

❑ For H2:

$$MVE_{i,t} = \beta_0 + \beta_1 BVE_{i,t} + \beta_2 AE_{i,t} + \beta_3 EMISSION_{i,t} + \beta_4 EMISSION_{i,t} \times ASSUR_{i,t} + \beta_5 ASSUR_{i,t} + \beta_6 ESI_{i,t} + \beta_7 CFIN_{i,t} + \beta_8 STAKE_{i,t} + \beta_9 ENFORCE_{i,t} + \beta_{10} CDISC_{i,t} + \beta_{11} ENVPERF_{i,t} + \beta_{12} IMR\_ASSUR_{i,t} + \sum YEAR_{i,t} + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad (2)$$

❑ For H3:

$$MVE_{i,t} = \beta_0 + \beta_1 BVE_{i,t} + \beta_2 AE_{i,t} + \beta_3 EMISSION_{i,t} + \beta_4 EMISSION_{i,t} \times PROVIDER_{i,t} + \beta_5 PROVIDER_{i,t} + \beta_6 ESI_{i,t} + \beta_7 CFIN_{i,t} + \beta_8 STAKE_{i,t} + \beta_9 ENFORCE_{i,t} + \beta_{10} CDISC_{i,t} + \beta_{11} ENVPERF_{i,t} + \beta_{12} IMR\_PROVIDER_{i,t} + \sum YEAR_{i,t} + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad (3)$$

Measurement of Research Variables

- *MVE,* is the market value of common equity (in millions of dollars), computed as the number of shares outstanding multiplied by the price per share of the firm's common stock at three months after the fiscal year end scaled by the number of common shares outstanding.

- *EMISSION* which is the total amount of GHG emissions measured in thousands of metric tons scaled by total revenue in millions of dollars at the end of the fiscal year.

- *ASSUR* = An indicator variable 1 if the GHG emissions report is assured, and otherwise 0.

- *PROVIDER* = An indicator variable 1 if the GHG emissions report is assured by accounting profession, and otherwise 0.

Definition of Variables

Panel A: GHG emissions disclosures, assurance and provider decision model variables	
CDP_{t-1}	An indicator variable that is equal to 1 if the firm responds to the Carbon Disclosure Project (CDP) in year *t-1*, and 0 otherwise.
EI_{t-1}	A measure of environmental or sustainability index. It is an indicator variable 1 if the firm is included in the Dow Jones Sustainability Index in year *t-1*, and 0 otherwise.
$SIZE_{t-1}$	The natural logarithm of the firm' s market value of equity at the beginning of the fiscal year *t*.
ROA_{t-1}	Total return on assets measured as the ratio of income before extraordinary items divided by total assets at the beginning of the fiscal year *t*.
$COMPETITION_{t-1}$	The Herfindahl-Hirschman Index (HHI) multiplied by -1. It is computed by summing the squares of the market shares of the 50 largest firms in an industry. The market share of a firm is computed by dividing the sale of a firm in year *t* by the total sales of all the 50 largest firms in an industry in that year. If an industry has fewer than 50 firms, then all firms have been used to compute the market share of each firm. Industry is defined based on the 4 digit GICS codes.
FIN_{t-1}	The amount of debt or equity capital raised by the firm in the fiscal year *t-1*. It is measured as the issuance of common and preferred shares minus the purchase of common and preferred shares plus the long term debt issuance minus the long term debt reduction scaled by total assets at the beginning of the fiscal year *t-1*.
$TOBINQ_{t-1}$	The market value of common equity plus the book value of preferred stock plus the book value of long term debt, scaled by the book value of total assets at the end of fiscal year *t-1*.
LEV_{t-1}	The leverage ratio, measured as the ratio of total debt divided by total assets at the end of fiscal year *t-1*.
EP_{t-1}	The relative environmental performance score of a firm, measured as the ASSET4 environmental performance data at the end of fiscal year *t-1*.
ETS_{t-1}	An indicator variable that equals 1 if the firm participates in any emissions trading schemes in year *t-1*, and 0 otherwise.
$INSTOWN_{t-1}$	The percentage of shares held by the institutional investors at the end of the fiscal year *t-1*.
$SUSTCOM_{t-1}$	An indicator variable that equals 1 if the firm has a sustainability committee, and 0 otherwise at the end of the fiscal year *t-1*.
SRI_{t-1}	An indicator variable that is equal to 1 if the firm promotes socially responsible investment, and 0 otherwise at the end of the fiscal year *t-1*.
$FAGE_{t-1}$	The natural logarithm of the firm age. It is computed based on the total number of years a firm was included in the Compustat database at the end of the fiscal year *t-1*.
$LITG_{t-1}$	A measure of firm' s litigation risk. It is an indicator variable 1 if a firm faces an environmental fine, and 0 otherwise at the end of the fiscal year *t-1*.
$FOREIGN_{t-1}$	An indicator variable 1 if a firm has a foreign operation, and 0 otherwise at the end of the fiscal year *t-1*.

Control Variables Definition

Panel B: Market valuation model variables	
BVE_t	Book value of common equity in millions of dollars at the fiscal year end scaled by number of common shares outstanding in millions at the end of the fiscal year.
AE_t	Abnormal earnings in millions of dollars, defined as the earnings to common equity less the cost of equity capital, based on price and earnings growth, times beginning of period book value of common equity scaled by the number of common shares outstanding in millions at the end of the fiscal year.
Panel C: Country-specific control variables	
$CFIN_t$	A measure of country-level financial opaqueness. This is computed as the mean rank score of a country's average CIFAR rating for the year 1991, 1993, and 1995, multiplied by -1 (Dhaliwal et al. 2012).
$STAKE_t$	A measure of a country's stakeholder-orientation. Following Dhaliwal et al. (2012), this is computed as the mean rank score of employment laws, social security laws and collective relations laws indices, as developed by Botero et al. (2004), and human rights laws indices, as developed by La Porta et al. (2003).
$ENFORCE_t$	A measure of country-level legal and public enforcement. Following Dhaliwal et al. (2012), this is the mean rank score of the legal enforcement (La Porta et al. 1998) and public enforcement (La Porta et al. 2006) .indices.
$CDISC_t$	A measure of country-level disclosure quality. This is measured as the mean rank score of a country's global competitiveness index from 2006 to 2010, as developed by the World Economic Forum.
$ENVPERF_t$	Environmental performance at country-level measured as the mean rank score of the country-level environmental performance index, as developed by Yale University in 2006, 2008 and 2010.
Panel D: Other control variables	
ESI_t	An indicator variable 1 if a firm operates in an environmentally sensitive industry, and 0 otherwise. The classification of environmentally sensitive industries follows by Cho and Patten (2007).
IMR_DISC_t	The inverse Mills ratio generated from the first stage model of the GHG emissions disclosure decision model.
IMR_ASSUR_t	The inverse Mills ratio generated from the first stage model of the GHG emissions disclosure assurance decision model.
$IMR\_PROVIDER_t$	The inverse Mills ratio generated from the first stage model of the GHG emissions assurance provider decision model.
YEAR	Dummy variables for year of data.
INDUSTRY	Industry dummy variables that equals to 1 if firms is from the nominated industry group, and 0 otherwise.

Table 1

Sample Selection and Industry Distribution

Panel A: Sample Selection	
No. of firms in the Global 500 index over 5 years (CDP2007-CDP2011)	2,500
Add firms that dropped from the index over the sampling period	1,100
Sub total	3,600
Less firms that merged or de-listed over the sampling period	114
Less firms dropped due to price to book ratio<0.01 and >15	161
Sub total	**3,325**
Less missing financial data	391
Less insufficient country variables	200
Total available firm-year observations for disclosure decisions model	**2,734**
Less firms with non-disclosure of GHG emissions	524
Firms with disclosure of GHG emissions	2,210
Less firms with insufficient data for the computation of abnormal income	182
Total available firm-year observations for market value and assurance purchase decisions model	**2,028**
Firms without assurance of GHG emissions	(1,042)
Total available firm-year observations for assurance provider decisions and market value effect of assurance provider model	**986**

Country Statistics

	Country	No. of firm-year observations	Observations with GHG emissions disclosures		Observations with third party GHG emissions assurance		Observations with accounting profession assurance providers	
			Number1	Percent	Number2	Percent	Number3	Percent
1	Australia	64	59	2.91	40	67.80	14	35.00
2	Austria	15	10	0.49	5	50.00	4	80.00
3	Belgium	28	21	1.04	10	47.62	9	90.00
4	Brazil	26	23	1.13	17	73.91	17	100.00
5	Canada	144	105	5.18	30	28.57	16	53.33
6	Chile	6	4	0.20	0	0.00	0	0.00
7	Colombia	2	2	0.10	0	0.00	0	0.00
8	Denmark	15	14	0.69	9	64.29	4	44.44
9	Finland	12	10	0.49	8	80.00	4	50.00
10	France	157	139	6.85	109	78.42	101	92.66
11	Germany	132	113	5.57	65	57.52	51	78.46
12	Greece	5	3	0.15	0	0.00	0	0.00
13	India	40	20	0.99	15	75	8	53.33
14	Ireland	23	15	0.74	7	46.67	1	14.29
15	Israel	7	2	0.10	0	0.00	0	0.00
16	Italy	61	51	2.51	41	80.39	33	80.49
17	Japan	299	236	11.64	73	30.93	49	67.12
18	Korea	31	22	1.08	17	77.27	8	47.06
19	Malaysia	6	2	0.10	2	100.00	0	0.00
20	Mexico	17	7	0.35	3	42.86	3	100.00
21	Netherlands	46	43	2.12	33	76.74	30	90.91
22	Norway	24	16	0.79	10	62.50	8	80.00
23	Portugal	9	9	0.44	9	100.00	9	100.00
24	Singapore	31	7	0.35	0	0.00	0	0.00
25	South Africa	15	14	0.69	10	71.43	10	100.00
26	Spain	70	67	3.30	63	94.03	47	74.60
27	Sweden	50	46	2.27	13	28.26	9	69.23
28	Switzerland	95	65	3.21	42	64.62	23	54.76
29	Thailand	6	6	0.30	0	0.00	0	0.00
30	Turkey	8	4	0.20	0	0.00	0	0.00
31	Taiwan	16	4	0.20	3	75.00	0	0.00
32	U.K.	181	163	8.04	136	83.44	72	52.94
33	U.S.	1,093	726	35.80	216	29.75	15	6.94
	Total	**2,734**	**2,028**	**100**	**986**	**48.62**	**545**	**55.27**

Who audits GHG statements?

	CDP2007	CDP2008	CDP2009	CDP2010	CDP2011	Total	Percentage
Accounting profession							
Deloitte & Touche	13	15	15	17	21	81	14.86
Ernst & Young	17	19	25	29	31	121	22.20
KPMG	18	22	27	45	41	153	28.07
PwC	19	24	31	38	44	156	28.62
Joint Accounting Firms	5	7	5	5	8	30	5.50
Other	0	1	1	1	1	4	0.73
Sub-total	**72**	**88**	**104**	**135**	**146**	**545**	**100**
Percentage	**52.55**	**50.29**	**54.45**	**58.44**	**57.94**	**55.27**	
Environmental consultants							
Bureau Veritas	8	11	11	15	14	59	13.38
CH2M Hills	2	2	2	2	2	10	2.27
Corporate Citizenship	4	4	4	3	2	17	3.85
Det Norske Veritas	5	9	7	10	13	44	9.98
ERM	7	12	13	14	9	55	12.47
ICF International	0	4	4	4	1	13	2.95
LRQA	1	2	3	3	8	17	3.85
SGS	3	5	7	8	9	32	7.26
WSP Environment & Energy	2	1	0	1	8	12	2.72
Other	33	37	36	36	40	182	41.27
Sub-total	**65**	**87**	**87**	**96**	**106**	**441**	**100**
Percentage	**47.45**	**49.71**	**45.55**	**41.56**	**42.06**	**44.73**	
Number of observations with GHG emissions assurance	**137**	**175**	**191**	**231**	**252**	**986**	

ASSURANCE STATEMENT

Deloitte.

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Independent limited assurance statement to the Directors of Downer EDI Limited in relation to the 2013 Sustainability Report

We have carried out a limited assurance engagement on the subject matter detailed below (the "Subject Matter") presented in Downer EDI Limited's ("Downer") 2013 Sustainability Report in order to state whether anything has come to our attention that would cause us to believe that the Subject Matter has not been reported and presented fairly, in all material respects, in accordance with the reporting criteria detailed below ("Reporting Criteria").

Subject Matter and Reporting Criteria

The Subject Matter and Reporting Criteria for our limited assurance engagement for the year ended 30 June 2013 is as follows:

Selected Sustainability Indicators

We assessed whether the following selected sustainability indicators were prepared in accordance with Downer's policies, procedures and methodologies:

- Environment
  - Total direct emissions of greenhouse gases (Scope 1)
  - Total indirect emissions of greenhouse gases (Scope 2)
  - Total energy consumed and produced
  - Total number of significant environmental spills (>100 litres or kilograms)
  - Total number of environmental infringements/fines
- Occupational Health & Safety
  - Total Recordable Injury Frequency Rate (TRIFR)
  - Total number of safety prosecution/fines

GRI Application level 'B+'

We assessed whether Downer's self-declared Global Reporting Initiative ("GRI") application level of "B+" was in compliance with the GRI Guidelines and related information, publicly available at GRI's global website at www.globalreporting.com, in particular the requirements to achieve GRI application level "B+".

Downer's responsibilities

The Directors of Downer are responsible for the preparation and presentation of the Subject Matter in the 2013 Sustainability Report in accordance with the Reporting Criteria. This responsibility includes establishing and maintaining internal controls relevant to the preparation and presentation of the Subject Matter in the 2013 Sustainability Report that is free from material misstatement, whether due to fraud or error; selecting and applying appropriate reporting criteria; maintaining adequate records and making estimates that are reasonable in the circumstances.

Deloitte's responsibilities

Our responsibility is to express a limited assurance conclusion as to whether we have become aware of any matter causing us to believe that the Subject Matter has not been prepared, in all materials respects, in accordance with the Reporting Criteria.

We conducted our procedures to provide our limited assurance conclusion in accordance with Australian Standards on Assurance Engagements ASAE 3000 *Assurance Engagements Other than Audits or Reviews of Historical Financial Information* ("ASAE 3000"), issued by the Australian Auditing and Assurance Standards Board. The procedures selected depend on our judgment, including an assessment of the risks of material misstatement of the Subject Matter, whether due to fraud or error. In making these risk assessments, we consider internal control relevant to Downer's preparation and presentation of the Subject Matter in the 2013 Sustainability Report in order to design assurance procedures that are appropriate in the circumstances, but not for the purpose of expressing a conclusion on the effectiveness of Downer's internal controls.

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ASSURANCE STATEMENT

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Assurance work performed

In order to form our conclusion we undertook the following limited assurance procedures:

- Interviewed relevant Downer management to understand the overall governance structure in respect of the 2013 Sustainability Report
- Analysed and inspected on a sample basis, the key systems, processes and procedures and controls relating to the collation, validation, presentation and approval process of the information included in the 2013 Sustainability Report.
- Performed site visits to a number of facilities and divisional offices to assess the site-based and divisional processes
- In respect of the Occupational Health and Safety data and Environment data, interviewed responsible management, assessed the systems and processes in place and reviewed evidence on a sample basis for reported data.
- Compared the content of Downer's 2013 Sustainability Report against the criteria for a GRI self-declaration at "B+" level

A limited assurance engagement is restricted primarily to enquiries and analytical procedures and the work is substantially less detailed than undertaken for a reasonable assurance engagement. As such the level of assurance is lower than would be the case for a reasonable assurance engagement. We believe that the assurance evidence we have obtained is sufficient and appropriate to provide a basis for our assurance conclusion.

Inherent limitations

Non-financial information, including the Subject Matter may be subject to more inherent limitations than financial information, given both its nature and the methods used for determining, calculating and sampling or estimating such information. Qualitative interpretations of relevance, materiality and the accuracy of data are subject to individual assumptions and judgements. The Subject Matter should be read in the context of Downer's Reporting Criteria as set out in the 2013 Sustainability Report.

Use of our report

Our assurance report has been prepared solely for the directors of Downer. We disclaim any assumption of responsibility for any reliance on this report or on the Subject Matter to which it relates, to any person other than the directors of Downer or for any purpose other than that for which it was prepared.

Independence

In conducting our engagement, we have complied with the independence requirements of APES 110 *Code of Ethics for Professional Accountants*, issued by the Accounting Professional and Ethical Standards Board.

Matters relating to electronic presentation of information

Our limited assurance engagement included web-based information that was available via web links as of the date of this statement. We provide no assurance over changes to the content of the 2013 Sustainability Report after the date of this assurance statement.

Conclusion

Based on the procedures performed, nothing has come to our attention that causes us to believe that the Subject Matter has not been prepared and presented fairly, in all material respects, in accordance with the Reporting Criteria.

Deloitte Touche Tohmatsu

DELOITTE TOUCHE TOHMATSU

PR Dobson
Partner
Sydney, 3 February 2014

UNSW AUSTRALIA

Mean and Median Test of Differences

	Decision to disclose GHG emissions						Decision to purchase assurance						Decision to select assurance provider					
	DISC=1		DISC=0		t-stat	Wilcoxon	ASSUR=1		NON-ASSUR=0		t-stat	Wilcoxon	ACCOUNTING=1		CONSULTANT=0		t-stat	Wilcoxon
	Mean	Median	Mean	Median	p-value	p-value	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
$EMISSION_t$ *(in millions)*	18.600	1.236	-	-	-	-	29.219	1.991	8.487	0.668	**0.000**	**0.000**	38.284	1.903	18.016	2.242	**0.000**	**0.047**
MVE_t *(in billions $)*	39.819	25.396	23.136	19.029	**0.000**	**0.000**	44.749	30.469	35.154	22.999	**0.000**	**0.000**	41.771	29.614	48.428	31.428	**0.012**	**0.071**
BVE_t *(in billions $)*	21.237	13.078	11.050	8.121	**0.000**	**0.000**	24.381	14.797	18.262	11.773	**0.000**	**0.000**	26.223	16.079	22.103	13.862	**0.017**	**0.013**
AE_t *(in billions $)*	0.544	0.623	0.220	0.441	**0.038**	**0.000**	0.686	0.756	0.410	0.529	**0.057**	**0.000**	0.279	0.592	1.189	0.911	**0.000**	**0.000**
CDP_{t-1}	0.868	1.000	0.361	0.000	**0.000**	**0.000**	0.927	1.000	0.817	1.000	**0.000**	**0.000**	0.903	1.000	0.949	1.000	**0.005**	**0.005**
EI_{t-1}	0.444	0.000	0.055	0.000	**0.000**	**0.000**	0.598	1.000	0.308	0.000	**0.000**	**0.000**	0.623	1.000	0.555	1.000	**0.025**	**0.025**
$SIZE_{t-1}$	10.230	10.125	9.791	9.800	**0.000**	**0.000**	10.343	10.250	10.139	10.030	**0.000**	**0.000**	10.318	10.218	10.367	10.311	0.337	0.313
ROA_{t-1}	0.064	0.049	0.075	0.054	**0.001**	**0.027**	0.065	0.052	0.061	0.045	0.238	**0.093**	0.059	0.045	0.075	0.062	**0.000**	**0.000**
$COMPETITION_{t-1}$	-0.043	-0.036	-0.045	-0.037	0.143	**0.050**	-0.042	-0.036	-0.045	-0.036	**0.010**	**0.010**	-0.040	-0.034	-0.045	-0.036	**0.000**	**0.000**
FIN_{t-1}	0.011	0.001	0.023	0.000	**0.013**	0.585	0.022	0.005	0.000	-0.001	**0.000**	**0.000**	0.029	0.006	0.013	0.003	**0.007**	**0.004**
$TOBINQ_{t-1}$	1.158	0.918	1.624	1.154	**0.000**	**0.000**	1.152	0.916	1.182	0.921	0.428	0.740	0.997	0.870	1.317	1.069	**0.000**	**0.000**

Mean and Median Test of Differences

	Decision to disclose GHG emissions						Decision to purchase assurance						Decision to select assurance provider					
	DISC=1		DISC=0		t-stat	Wilcoxon	ASSUR=1		NON-ASSUR=0		t-stat	Wilcoxon	ACCOUNTING=1		CONSULTANT=0		t-stat	Wilcoxon
	Mean	Median	Mean	Median	p-value	p-value	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
LEV_{t-1}	0.236	0.225	0.206	0.165	**0.000**	**0.000**	0.248	0.244	0.225	0.210	**0.001**	**0.000**	0.258	0.244	0.226	0.230	**0.000**	**0.001**
EP_{t-1}	78.096	88.220	34.122	21.385	**0.000**	**0.000**	85.121	91.335	70.977	81.675	**0.000**	**0.000**	86.984	91.900	83.000	90.930	**0.000**	**0.007**
ETS_{t-1}	0.249	0.000	0.023	0.000	**0.000**	**0.000**	0.365	0.000	0.126	0.000	**0.000**	**0.000**	0.409	0.000	0.318	0.000	**0.002**	**0.002**
$INSTOWN_{t-1}$	43.122	40.700	48.038	53.900	**0.000**	**0.001**	40.094	34.250	47.340	52.950	**0.000**	**0.000**	32.359	27.400	48.870	55.350	**0.000**	**0.000**
$SUSTCOM_{t-1}$	0.581	1.000	0.134	0.000	**0.000**	**0.000**	0.672	1.000	0.491	0.000	**0.000**	**0.000**	0.668	1.000	0.693	1.000	0.383	0.383
SRI_{t-1}	0.128	0.000	0.034	0.000	**0.000**	**0.000**	0.153	0.000	0.108	0.000	**0.003**	**0.003**	0.164	0.000	0.129	0.000	0.111	0.111
$FAGE_{t-1}$	3.086	2.996	2.864	2.944	**0.000**	**0.000**	3.017	2.944	3.145	3.045	**0.000**	**0.000**	2.875	2.944	3.202	3.068	**0.000**	**0.000**
$LITG_{t-1}$	0.142	0.000	0.004	0.000	**0.000**	**0.000**	0.181	0.000	0.103	0.000	**0.000**	**0.000**	0.172	0.000	0.193	0.000	0.379	0.379
$FOREIGN_{t-1}$	0.825	1.000	0.668	1.000	**0.000**	**0.000**	0.892	1.000	0.776	1.000	**0.000**	**0.000**	0.918	1.000	0.848	1.000	**0.000**	**0.000**
ESI_t	0.333	0.000	0.116	0.000	**0.000**	**0.000**	0.378	0.000	0.259	0.000	**0.000**	**0.000**	0.406	0.000	0.389	0.000	0.585	0.584
$CFIN_t$	-20.123	-21.500	-19.726	-21.500	0.190	0.875	-20.365	-21.500	-19.987	-21.500	0.306	**0.003**	-19.267	-19.500	-21.724	-21.500	**0.000**	**0.000**
$STAKE_t$	14.903	13.625	11.5332	8.875	**0.000**	**0.000**	16.786	13.875	13.202	8.875	**0.000**	**0.000**	19.616	21.875	13.070	10.500	**0.000**	**0.000**
$ENFORCE_t$	22.027	24.000	24.8034	29.250	**0.000**	**0.000**	20.909	23.250	23.318	28.750	**0.000**	**0.000**	18.349	20.500	23.922	28.750	**0.000**	**0.000**
$CDISC_t$	24.947	26.400	27.0615	31.200	**0.000**	**0.000**	22.707	23.400	27.062	31.200	**0.000**	**0.000**	20.206	23.000	26.032	29.200	**0.000**	**0.000**
$ENVPERF_t$	17.095	17.167	13.7812	11.000	**0.000**	**0.000**	18.318	20.500	15.873	11.000	**0.000**	**0.000**	20.137	21.000	16.194	12.500	**0.000**	**0.000**

Descriptive Statistics

	N	Mean	Std. Dev.	Q1	Median	Q3	Max
Total Emission in Co_2-e million metric tonnes	2028	18.600	59.700	0.247	1.236	7.378	476.000
MVE (in billion $)	2028	39.819	38.635	16.776	25.396	46.716	200.716
BVE (in billion $)	2028	21.237	23.663	7.659	13.078	23.919	141.816
AE (in billion $)	2028	0.544	3.263	-0.212	0.623	1.594	10.761
TA (in billion $)	2028	180.518	387.774	21.510	40.221	119.871	2153.076
REVENUE (in billion $)	2028	36.570	41.752	11.125	21.507	46.161	277.243
EMISSION	2028	0.583	1.378	0.012	0.047	0.393	8.512
ASSUR	2028	0.486	0.499	0	0	1	1
PROVIDER	986	0.553	0.497	0	0	1	1

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Determinants of GHG Emissions Disclosures, Assurance and Assurance Provider (Heckman First Stage Model)

	Predicted Sign	DV=DISC	DV=ASSUR	DV=PROVIDER
CDP_{t-1}	+	0.643***	0.412***	-0.249
		(7.598)	(3.424)	(-1.144)
EI_{t-1}	+	0.552***	0.533***	0.245**
		(4.849)	(7.560)	(2.281)
$SIZE_{t-1}$	+	0.209***	0.097**	0.050
		(3.042)	(1.966)	(0.706)
ROA_{t-1}	+	0.837	0.312	-1.070
		(1.079)	(0.418)	(-1.013)
$COMPETITION_{t-1}$	?	2.051	5.013***	10.274***
		(0.953)	(2.926)	(3.750)
FIN_{t-1}	+	-0.749**	0.690*	-0.664
		(-2.020)	(1.667)	(-1.374)
$TOBINQ_{t-1}$	-	-0.207***	-0.081	-0.069
		(-4.091)	(-1.380)	(-0.726)
LEV_{t-1}	+	-0.359	0.172	0.059
		(-1.393)	(0.686)	(0.146)
EP_{t-1}	+	0.016***	0.008***	0.001
		(10.280)	(3.922)	(0.188)
ETS_{t-1}	+	0.301*	0.416***	0.025
		(1.811)	(5.118)	(0.222)
$INSTOWN_{t-1}$	+	0.005**	0.006***	0.004
		(2.449)	(3.241)	(1.340)
$SUSTCOM_{t-1}$	+	0.436***	0.281***	0.034
		(4.465)	(3.618)	(0.267)
SRI_{t-1}	+	0.348*	0.407***	0.526**
		(1.889)	(2.691)	(2.156)
$FAGE_{t-1}$	+	0.031	-0.194***	-0.463***
		(0.461)	(-2.753)	(-3.934)

UNSW AUSTRALIA

Determinants of GHG Emissions Disclosures, Assurance and Assurance Provider (Heckman First Stage Model)

	Predicted Sign	DV=DISC	DV=ASSUR	DV=PROVIDER
$LITG_{t-1}$	+	1.062***	0.099	0.322**
		(3.754)	(0.960)	(2.165)
$FOREIGN_{t-1}$	+	-0.044	0.104	0.190
		(-0.461)	(0.983)	(1.133)
ESI_t	+	0.801**	-0.002	0.122
		(2.439)	(-0.012)	(0.405)
$CFIN_t$	-	-0.027**	-0.043***	0.002
		(-2.575)	(-5.028)	(0.182)
$STAKE_t$	+	0.021**	0.038***	0.053***
		(2.133)	(5.069)	(5.256)
$ENFORCE_t$	-	-0.031***	-0.024***	-0.040***
		(-3.437)	(-2.890)	(-3.493)
$CDISC_t$	+	-0.018***	-0.057***	-0.043***
		(-2.608)	(-9.756)	(-4.603)
$ENVPERF_t$	+	-0.007	-0.022***	0.030***
		(-0.796)	(-2.903)	(2.958)
INTERCEPT	?	-3.002***	-1.104**	1.851**
		(-3.974)	(-1.976)	(2.296)
Industry Fixed Effects		*YES*	*YES*	*YES*
Year Fixed Effects		*YES*	*YES*	*YES*
N		2,734	2,028	986
Likelihood ratio		-702.448	-1036.865	-460.306
Pseudo-R^2		0.474	0.262	0.321
Partial-R^2 (CDP_{t-1})		0.053***	0.006***	0.002
Partial-R^2 (EI_{t-1})		0.002***	0.029***	0.004**

Heckman (1979) Second-Stage Regression Results of GHG Emissions and Market Valuation

	Predicted Sign	Model I MVE	Model II MVE	Model III MVE
BVE_t	+	1.445***	1.444***	1.441***
		(44.955)	(44.906)	(29.569)
AE_t	+	3.134***	3.113***	2.505***
		(5.651)	(5.602)	(3.341)
$EMISSION_t$	-	-2.564***	-4.009***	-3.355***
		(-5.190)	(-4.932)	(-4.124)
$EMISSION_t$*$ASSUR_t$	+		2.434***	
			(2.910)	
$ASSUR_t$	?		-1.343	
			(-0.829)	
$EMISSION_t$*$PROVIDER_t$	+			2.610**
				(2.580)
$PROVIDER_t$	?			-7.179***
				(-2.611)
ESI_t	?	1.747	1.087	4.511
		(0.537)	(0.331)	(0.846)
$CFIN_t$	?	-0.218**	-0.353***	-0.351***
		(-2.051)	(-3.018)	(-2.780)
$STAKE_t$	?	-0.041	0.066	0.358***
		(-0.293)	(0.499)	(2.654)
$ENFORCE_t$	?	0.188	0.162	0.174
		(1.165)	(0.998)	(0.864)
$CDISC_t$	+	0.054	-0.135	-0.057
		(0.496)	(-1.028)	(-0.317)
$ENVPERF_t$	+	-0.150	-0.208*	-0.484***
		(-1.191)	(-1.747)	(-2.750)
IMR_DISC_t	?	10.129***		
		(2.873)		
IMR_ASSUR_t	?		6.353***	
			(2.961)	
$IMR\_PROVIDER_t$	?			1.774
				(0.549)
INTERCEPT	?	13.725**	12.691*	15.525*
		(2.111)	(1.869)	(1.684)
Year Fixed Effects		*YES*	*YES*	*YES*
Industry Fixed Effects		*YES*	*YES*	*YES*
N		2028	2028	986
Adj. R^2		0.967	0.967	0.946

Change in Provider Model

	(1)	(2)	(3)
	MVE	MVE	MVE
BVE_t	1.456***	1.462***	1.417***
	(27.185)	(27.473)	(29.764)
AE_t	2.751***	2.739***	2.731***
	(3.420)	(3.444)	(3.957)
$EMISSION_t$	-1.670***	-2.016***	-1.845***
	(-3.196)	(-3.908)	(-2.840)
$EMISSION_t \times PROVIDER\_CHNG_t$	2.567**	2.294	2.905*
	(1.983)	(1.506)	(1.734)
$PROVIDER\_CHNG_t$	0.643	2.347	-0.326
	(0.200)	(0.685)	(-0.088)
ESI_t		4.597	0.604
		(0.802)	(0.097)
$CFIN_t$		-0.313**	
		(-2.318)	
$STAKE_t$		0.043	
		(0.303)	
$ENFORCE_t$		0.366*	
		(1.739)	
$CDISC_t$		0.011	
		(0.072)	
$ENVPERF_t$		-0.492***	
		(-2.763)	
INTERCEPT	19.958***	10.311	25.325***
	(4.724)	(1.177)	(3.584)
Year Fixed Effects	YES	YES	YES
Industry Fixed Effects	YES	YES	YES
Country Fixed Effects	NO	NO	YES
N	849	849	849
adj. R^2	0.934	0.935	0.938

Sensitivity Tests and Robustness Checks

- A double-selection bias may arise in the assurance choice model (Equation 3):
  - The first selection bias is related to the firms' decision to disclose GHG emissions information, and
  - The second selection bias may arise from the firms' decision to purchase GHG emissions assurance.

- A double-selection bias may also be present in the assurance provider model (Equation 4):
  - The first bias arising from the firms' decision to purchase GHG emissions assurance, and
  - The second bias from the firm's decision to choose an accounting profession assurance provider.

- A double-selection model developed by Tunali (1986) is used for Equation (3) and (4).

Sensitivity Tests and Robustness Checks

Double-Selection Model Second-Stage Regression Results of GHG Emissions and Market Valuation

	Predicted Sign	Model I	Model II
		MVE	MVE
BVE_t	+	1.444***	1.440***
		(44.987)	(29.864)
AE_t	+	3.116***	2.500***
		(5.605)	(3.345)
$EMISSION_t$	-	-3.931***	-3.108***
		(-4.762)	(-3.847)
$EMISSION_t \times ASSUR_t$	+	2.289***	
		(2.679)	
$ASSUR_t$	?	-1.552	
		(-0.960)	
$EMISSION_t \times PROVIDER_t$	+		2.446**
			(2.473)
$PROVIDER_t$	?		-7.078***
			(-2.599)
ESI_t	?	1.676	4.388
		(0.513)	(0.828)
$CFIN_t$	?	-0.282**	-0.461***
		(-2.367)	(-3.024)
$STAKE_t$	?	0.008	0.362***
		(0.060)	(2.674)
$ENFORCE_t$	?	0.168	0.211
		(1.051)	(1.015)
$CDISC_t$	+	-0.025	-0.118
		(-0.154)	(-0.617)

Double-Selection Model Second-Stage Regression Results of GHG Emissions and Market Valuation

	Predicted Sign	Model I	Model II
		MVE	MVE
$ENVPERF_t$	+	-0.178	-0.556***
		(-1.426)	(-3.091)
IMR_DISC_t	?	6.911	
		(1.363)	
IMR_ASSUR_t	?	2.506	4.835
		(0.869)	(1.401)
$IMR\_PROVIDER_t$	?		-0.972
			(-0.254)
INTERCEPT	?	13.139*	13.515
		(1.949)	(1.459)
Year Fixed Effects		*YES*	YES
Industry Fixed Effects		*YES*	YES
N		2028	986
Adj. R^2		0.967	0.946

Sensitivity Tests and Robustness Checks

- Results are robust when we apply the valuation model by Collins et al. (1997).
- Results are also robust when we exclude Scope 3 GHG emissions from the total GHG emissions.
- Results are robust when total GHG emissions are scaled by total assets instead of total revenue.
- Exclusion of U.S. Firms.
- Exclusion of Financial Industry
- Control for Country fixed effects

Results

- GHG emission disclosure negatively affect the market value of the firm consistent with prior literature.
- On average, for every additional thousand metric tonnes of GHG emissions, the market value is decreased by $42,000. This translates to a $300 million reduction in market value when comparing firms in the first quartile (Q1) and third quartile (Q3) of GHG emissions.
- The negative relationship between the market value and GHG emissions is moderated by
  - Third party assurance
  - Moderating effect is greater for assurance conducted by the big accounting firms and this is robust when we focus only on those firms that switch the audit firm from environmental consultants to big accounting.

Thank you!

"I'd rather we don't mention this in the annual report."