

Mercury Accounting and Accountability under the Minamata Convention

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Table of Contents

List of Tables	vi
List of Figures	vii
List of Appendices	vii
Abstract	viii
Declaration	xi
Dedication	xii
Acknowledgements	xiii
Status of Thesis Papers	xiv
Abbreviations and Acronyms	xvi
<i>Chapter 1</i>	1
Introduction	2
1.1 Introduction	2
1.2 Mercury toxicity	4
1.3 Mercury reduction initiatives	6
1.4 Mercury reporting	8
1.5 Summary of previous literature	9
1.6 Theoretical perspectives summary	12
1.7 Summary of the papers	17
1.7.1 Summary of paper 1 – To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?	19
1.7.2 Summary of Paper 2 – Is the Quality of Mercury Accounting via the National Pollutant Inventory Sufficient to meet Australia’s Minamata Convention Reporting Commitments? ...	19
1.7.3 Summary of Paper 3 – Compliance with Mercury Reporting Provisions under the Minamata Convention: An Assessment from a Developing Country Perspective	21
1.7.4 Summary of Paper 4 – Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach	22
1.8 Contribution of this thesis	24
1.9 Conclusion	27
<i>Chapter 2</i>	28
Literature Review	29
2.1. Introduction	29
2.2. Research on Mercury	32
2.2.1 Research on the Minamata Convention	35
2.2.2. Research on other Multilateral Environmental Agreements	37

2.3. Specific Gaps in the Literature on Mercury	40
2.3.1. Paper 1: Mercury reporting – the global perspective.....	40
2.3.2. Paper 2: Mercury reporting – a developed country perspective	41
2.3.3. Paper 3: Mercury reporting – a developing country perspective	43
2.3.4. Paper 4: Corporate mercury disclosures	46
2.4 Conclusion	50
References.....	51
 <i>Chapter 3</i>	 62
Theoretical Frameworks	63
3.0. Introduction.....	63
3.1. Accountability.....	63
3.2 Public Sector Accountability.....	67
3.3. Accountability and Qualitative Characteristics of Accounting	70
3.4. Materiality.....	74
3.5 Summary and Conclusion	80
References.....	82
 <i>Chapter 4</i>	 88
To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?	89
Abstract.....	89
1. Introduction.....	90
2. Literature Review.....	93
2.1 Background to the Minamata Convention	94
2.2 Evaluation of the Minamata Convention	97
3. Theoretical Framework: Accountability	99
4. Method	101
4.1 Explanatory Case Study	101
4.2 Data	102
4.3 Data Analysis	103
5. Findings.....	105
5.1 Completeness.....	107
5.2 Verifiability	109
5.3 Comparability.....	111
5.4 Timeliness	112
5.5 Understandability	114

5.6 Accuracy.....	115
6. Accountability.....	117
7. Conclusion	119
References.....	122
 <i>Chapter – 5</i>	 130
Is the Quality of Mercury Accounting via the National Pollutant Inventory Sufficient to meet Australia’s Minamata Convention Reporting Commitments?.....	132
Abstract.....	132
1. Introduction.....	132
2. Background and Context.....	134
3. Literature Review.....	137
4. Theoretical Framework	139
4.1. Accountability theory.....	139
4.2. Conceptual framework of accounting	142
5. Method	145
6. Findings.....	147
6.1. Understandability	148
6.2. Accuracy.....	149
6.3. Verifiability	149
6.4. Comparability	150
6.5. Timeliness	151
6.6. Completeness.....	152
6.7. Resource constraints.....	152
7. Imposed, felt and adaptive accountability.....	153
8. Conclusions.....	157
References.....	161
 <i>Chapter 6</i>	 167
Compliance with Mercury Reporting Provisions under the Minamata Convention: A Developing Country Perspective	168
Abstract	168
1. Introduction and Motivation	169
2. Multilateral Environmental Agreements and the Minamata Convention.....	172
3. Literature Review.....	174
4. Theoretical Framework: Accountability	178
5. Methods.....	181
6. Findings and Analysis.....	184

6.1 Developing country accountabilities under the Minamata Convention.....	184
6.2 The accountability of Bangladesh under the Minamata Convention.....	188
7. Summary and Conclusion	195
References.....	198
Appendix 1 Email interview questions	207
 <i>Chapter 7</i>	 209
Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach	210
Abstract.....	210
1. Introduction.....	211
2. Literature Review.....	213
3. Theoretical Framework.....	216
4. Methods.....	220
4.1 Best-Practice Corporate Mercury Disclosure Framework	220
4.2 Data Collection	222
4.3 Data Analysis	225
5. Findings.....	225
6. Discussion	229
7. Summary and Conclusion	231
References.....	236
Appendices.....	242
 <i>Chapter 8</i>	 248
Summary and Conclusions	249
8.1. Introduction	249
8.2. Sufficient Resources at the National And Global Level Are Required	253
8.3. Improved Country-Level Information Capture and Reporting Is Required	254
8.4. Mercury-Specific Corporate Reporting Guidelines Are Required	256
8.5. Wider Implications for SEA Research	257
8.6. Areas for Further Research.....	259
8.7. Final Notes	261
Consolidated Reference List	263
Appendix 1.Ethics Approval Letter	287

List of Tables

Chapter 1

Table 1. The history of Intergovernmental Negotiating Committee (INC) meetings, COP1, and topics discussed.....	7
Table 2. A brief summary of the four papers included this thesis.....	17

Chapter 3

Table 1. Previous studies using qualitative characteristics in the context of environmental reporting.....	72
Table 2. Definitions of the qualitative characteristics.....	73

Chapter 4/Paper 1

Table 1. Summary of the status of accountability of the qualitative characteristics.....	107
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Chapter 5/Paper 2

Table 1. Prior work utilising qualitative characteristics in relation to environmental reporting...	142
Table 2. Overview of interviews.....	147

Chapter 6/Paper 3

Table 1. The category of interviewees, the target sample and the sample interviewed.....	183
Table 2. Details of the sample interviewed including category, age range, and education.....	183
Table 3. Initiatives taken by different organisations for awareness development in Bangladesh	190

Chapter 7/Paper 4

Table 1. Criteria for evaluating mercury disclosures of the major emitting corporations.....	221
Table 2. Country ranking of mercury emissions and availability of PRTRs.....	223
Table 3. Corporate sample selection.....	224
Table 4. Corporate mercury-reporting frequency.....	226
Table 5. Summary of the qualitative mercury reporting practices of the companies under five different jurisdictions.....	227
Table 6. Corporate mercury emission concentration.....	230
Table 7. Disclosure of materiality assessment process and reporting assurance by mercury-reporting companies.....	230
Table 8. Disclosure of materiality assessment process and reporting assurance by mercury non-reporting companies.....	231

List of Figures

Chapter 3

Figure 1. A hierarchy of the qualitative characteristics of accounting information.....	72
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Chapter 5/Paper 2

Figure 1. Imposed and felt accountability within the NPI mercury reporting process.....	156
---	-----

List of Appendices

Chapter 6/Paper 3

Table 1. Appendix 1 Email interview questions.....	207
--	-----

Chapter 7/Paper 4

Appendix 1. Comparative mercury reporting practices of Australian companies.....	242
Appendix 2. Comparative mercury reporting practices of Canadian companies.....	243
Appendix 3. Comparative mercury reporting practices of E.U. companies.....	244
Appendix 4. Comparative mercury reporting practices of U.K. companies.....	245
Appendix 5. Comparative mercury reporting practices of U.S. companies.....	246
Appendix 6. Country ranking of mercury emissions.....	247

Abstract

This thesis explores how the quality of mercury reporting can be improved, with particular reference to the Minamata Convention. Mercury is one of the world's most toxic elements, with a diversified impact on human health and the environment. In a global approach to reducing mercury pollution, the Minamata Convention is currently being developed by the United Nations Environment Programme (UNEP). As with other multilateral environmental agreements (MEAs), the Minamata Convention also includes reporting provisions as a mechanism of reducing mercury emissions. No study on mercury has previously been conducted from a social and environmental accounting (SEA) perspective, though studies in other disciplines focusing on mercury's toxicity and impact have mentioned quality issues in mercury reporting. To address this gap, this study examines the quality of mercury reporting from four perspectives: global mercury reporting under the Minamata Convention, country-level mercury reporting from the perspective of a developed country (Australia), country-level mercury reporting from the perspective of a developing country (Bangladesh), and corporate mercury disclosures. This thesis contributes to the understanding of current challenges posed by mercury reporting processes and identifies several means of overcoming those challenges. This is a thesis by publication consisting of four papers, which are briefly described below:

Paper 1 evaluates whether the reporting provisions will improve countries' accountability for mercury emissions as parties to the Convention. This qualitative case study used accountability theory and the qualitative characteristics of accounting information as an analytical framework. Data comprised relevant literature along with UNEP technical reports for identifying the quality challenges to mercury information, the proceedings of all the seven Intergovernmental Negotiating Committee (INC) meetings, the first conference of the parties (COP1), and the reporting format, for justifying the level of accountability the Convention may currently achieve. This study also finds that the mercury reporting process and mercury disclosures are significantly lacking in quality which leads to a deficit in discharging reporting accountability of the parties to the Convention. Consequently, there is a significant risk in using the reported mercury information for decision making. This paper makes a novel contribution by identifying the weaknesses of the reporting framework (that is, lack of sanctions) and suggesting possible ways (positive sanctions/ felt accountability) for overcoming those limitations based on the background discussions in INC meetings, the reporting provisions of the Minamata Convention, and the reporting format in terms of qualitative characteristics, as well as exploring the reporting accountabilities of the parties to the Minamata Convention.

Paper 2 evaluates whether Australian mercury accounting (primarily sourced from the National Pollutant Inventory) is of sufficient quality to meet Australia's reporting obligations under the Minamata Convention. This study used accountability theory (O'Dwyer and Boomsma, 2015) and qualitative characteristics of accounting information (FASB, 1980) to assess the quality of the existing

reporting regime. Data comprises eight interviews with 11 interviewees including researchers, regulators, and corporate mercury reporters, as well as documentary analysis. The findings are that although Australian mercury accounting is expected to be sufficient to meet Australia's reporting obligations, there are some reporting deficiencies regarding timeliness, comparability, completeness, reliability and accuracy of mercury data, particularly in relation to governmental (as opposed to corporate) reporting responsibilities. Finally, a consistent theme is that of budgetary pressures undermining the quality of mercury reporting in terms of both scope and verification. This paper contributes to identifying the key challenges to high-quality mercury reporting in Australia and highlighting ways to overcome those obstacles by improving felt and imposed accountability.

Paper 3 explores mercury reporting from a developing country's perspective. The reporting capabilities of one such developing country (Bangladesh) are examined with regard to how well it complies with the reporting provisions of the Minamata Convention and to what extent the constraints faced by developing countries are acknowledged in the Convention, since the literature has identified that compliance with these agreements by governments, especially of developing countries, is a serious concern. This paper is a qualitative analysis of the opinions collected through email interviews from seven interviewees representing a variety of relevant stakeholders, as well as of the sections of the Convention that specifically relate to developing countries. While Bangladesh has some capability for complying with the reporting provisions of the Minamata Convention, it needs more support from UNEP and developed countries. The Convention and the surrounding discussions acknowledge these challenges and the need for help, but whether the level of support provided will be sufficient remains unclear. Presently, while there are specific instances of raised awareness about mercury – such as among Bangladeshi dentists and dental colleges – there is limited awareness among government administrators, researchers, regulators and the general public. This study contributes by exploring the national reporting of an MEA in a developing country context. In addition, the study develops the element of capability within the theory of accountability, an element that is surprisingly absent from most previous discussions of accountability.

Paper 4 evaluates the current voluntary mercury disclosure practices of the major emitting companies. A disclosure index is created which comprises best-practice mercury disclosure and is based on GRI 305: Emissions, the reporting format for mercury under the Minamata Convention, the relevant literature, and sample disclosures of the companies. The study evaluates the mercury reporting of 81 companies (100 facilities) from five jurisdictions (Australia, Canada, the European Union, the United Kingdom, and the United States of America) which are identified as major mercury emitters from pollutant inventory data. Findings include the following: (a) only a handful of the mercury-emitting companies disclosed mercury information in an annual report, sustainability report, environmental performance report and/or on their website, despite them being major emitters; (b) the volume and dimensions of mercury disclosure were significantly different among the reporting companies, as

there are no standards on mercury reporting; (c) companies from the USA and Australia understood the significance of mercury emissions as companies from these two jurisdictions disclosed more mercury information than their counterparts from other jurisdictions did. Further analysis revealed that 46% of mercury-disclosing companies, compared to 26% of non-disclosing companies, provided details of their materiality assessment process. These companies also had their environmental reports externally assured. This paper contributes to developing a best-practice mercury reporting framework and provides evidence that regulators need to both provide specific corporate mercury reporting standards and encourage (or ideally compel) adherence to those standards.

Collectively, the four papers show that while there is a mandatory mercury reporting structure in some jurisdictions, the reporting process and the reported information suffer from significant quality challenges in terms of meeting user needs for eliminating the mercury emissions. To achieve the objective of the Convention, imposed and felt accountability of accurate reporting by the corporations, the countries, and the global structure as a whole need improvement. This thesis contributes to the limited previous literature on the quality challenges of mercury reporting and exploring the ways to overcome those hurdles. Specific suggestions include the introduction of a verification process for country reports to the UNEP Secretariat, incorporating all the areas of emissions in the remit of the Convention, imposing sanctions for non- or poor reporting, developing mercury accounting and reporting standards for corporations, and improving the level of felt and imposed accountability of the parties involved. As this thesis represents the first research study to focus on mercury reporting from an accounting perspective, there are a number of future research trajectories. Future research is needed to develop mercury reporting structures for corporations; to conduct reviews of national mercury accounting and reporting standards in countries other than Australia; and to further develop the reporting practices of parties to the Minamata Convention.

Declaration

I certify that the work presented in this thesis, entitled “Mercury Accounting and Accountability under the Minamata Convention”, has not previously been submitted for a higher degree to any other university or institution.

I also certify that the thesis is an original piece of research, and that it has been written by me. Any assistance and support that I have received in my research work and in the preparation of the thesis itself have been appropriately recognised.

In addition, I certify that the sources of information used, and the extent to which the work of others has been utilised, are acknowledged in the thesis. The research presented in this thesis was approved by the Macquarie University Ethics Review Committee (Human Research), approval number 5201500389.

The following section summarises my contribution and the contribution of the supervisors in this thesis:

My specific contribution: leading and managing the project, initiating conceptual ideas underpinning the paper, collecting necessary data, leading the interview sessions, and writing the papers. Specifically, my contribution in developing the conception is 80% and in writing is 85%.

The specific contribution of Principal Supervisor, Dr James Hazelton, Associate Professor, Department of Accounting and Corporate Governance: initiating conceptual ideas underpinning the paper, supporting me all the way through the project, guiding interview sessions, and reviewing and editing paper drafts.

The specific contribution of Associate Supervisor, Professor Peter Nelson, Department of Environmental Sciences: proposing the area of study, identifying and managing the key interviewees, checking the scientific aspects of the papers, and reviewing the paper drafts.

Md. Hafij Ullah

Sydney, Australia

March 2019

Dedication

To

my parents

The source of all my inspiration

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I would like to take this opportunity of thanking the examiners of this thesis for their consenting to examine this work, dedicating their time to going through the insights of each chapter, and providing invaluable suggestions for improvements.

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Status of Thesis Papers

This thesis consists of four papers, the status of which is as stated below:

Paper 1: Global Mercury Accountability

Ullah, M. H., Hazelton, J. & Nelson, P. (2016). To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?

The *second* version of this paper was presented at the refereed conference, the Australasian Centre on Social and Environmental Accounting Research Conference (A-CSEAR), 7–9 December 2016, University of South Australia, Australia.

The *first* shortened version of this paper was also presented at the refereed conference, 28th Centre on Social and Environmental Accounting Research Congress, 23–25 August 2016, St. Andrews University, St. Andrews, Scotland.

Paper 2: A Developed Country's Mercury Accountability

Ullah, M. H., Hazelton, J. & Nelson, P. (2016), Is the Quality of Mercury Accounting via the National Pollutant Inventory Sufficient to Meet Australia's Commitments to the Minamata Convention?

This paper has been submitted to the Accounting, Auditing & Accountability Journal (AAAJ), Emerald Publishing Group, the UK. (ABDC Ranking #A). First submission: 15 November 2017, Revised and resubmitted: 20 April 2018. A second opportunity to revise and resubmit was provided on 12 September 2018.

A previous version of this paper was presented at the refereed conference, 8th Asia-Pacific Interdisciplinary Research in Accounting (APIRA) Conference at RMIT University, 13–15 July 2016.

Paper 3: A Developing Country's Mercury Accountability

Ullah, M. H. & Hazelton, J. (2017), Compliance With Mercury Reporting Provisions under the Minamata Convention: An Assessment from a Developing Country Perspective

This paper was presented at the refereed conference, the Australasian Centre on Social and Environmental Accounting Research Conference (A-CSEAR), 7–9 December 2017, University of South Pacific, Fiji.

Paper 4: Corporate Mercury Disclosure

Ullah, M. H., Hazelton, J. & Nelson, P. (2015), Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach

The *first* version of this paper was presented at the refereed conference, 14th Australasian Centre on Social and Environmental Accounting Research Conference, December 10–11 2015, Macquarie University, Sydney, Australia.

List of contributors and their contributions

Position	Contributors	Contributions
Candidate	Md. Hafij Ullah PhD Student, Dept. of Accounting and Corporate Governance Macquarie University	• Leading and managing the project • Initiating conceptual ideas behind the paper • Collecting necessary secondary data • Contacting with interviewees • Leading the interview sessions • Exploring theories, methods, and analysing data • Presenting papers in the conferences • Writing the papers and chapters.
Principal Supervisor	Dr James Hazelton Associate Professor Dept. of Accounting and Corporate Governance Macquarie University	• Initiating conceptual ideas behind the paper • Supporting all the way through the project • Guiding interview sessions and asking supplementary questions • Guiding, reviewing and editing paper drafts.
Associate Supervisor	Dr Peter Nelson Pro-Vice Chancellor (Research and Development) and Professor, Dept. of Geographical Sciences Macquarie University	• Proposing the area of study • Exploring the access to the interviewees • Checking the scientific aspects of the papers • Reviewing and editing the paper drafts.

Abbreviations and Acronyms

AASB	Australian Accounting Standards Board
ACI	Activated carbon injection
AED	Aggregated emissions data
AMAP	Arctic Monitoring and Assessment Programme
ASGM	Artisanal small-scale gold mining
ATSDR	Agency for Toxic Substances and Disease Registry
BAT	Best available technique
CFL	Compact fluorescent lamp
CLRTAP	The Convention on Long-Range Transboundary Air Pollution
CDP	Carbon Disclosure Project
COP	Conference of the Parties
CSIRO	Commonwealth Scientific and Industrial Research
DEFRA	Department of Environment, Food, and Rural Affairs
EET	Emission estimation technique
E-PRTR	European Pollutant Release and Transfer Register
EPA	Environmental Protection Agency
ERT	Expert Review Team
ESDO	Environment and Social Development Organization
EU	European Union
FASB	Financial Accounting Standards Board
GEF	Global Environment Facility
GHG	Greenhouse gas
GPIC	Gulf Petrochemical Industries Company
GRI	Global Reporting Initiatives
GRULAC	Latin American and Caribbean Group
HAP	Hazardous air pollutants
Hg	Mercury
IASB	International Accounting Standards Board
ICMM	International Council on Mining and Metals
IEA	International Environmental Agreement
IIRC	International Integrated Reporting Council
IISD	International Institute for Sustainable Development

INC	Intergovernmental Negotiating Committee
IPCC	Intergovernmental Panel on Climate Change
IPEN	International POPs Elimination Network
KCGM	Kalgoorlie Consolidated Gold Mines
KPMG	Klynveld Peat Marwick Goerdeler
MEAs	Multilateral Environmental Agreements
MeHg	Methylmercury
MPRs	Minimum participation rules
NEPMs	National Environment Protection Measures
NFCMARS	National Forest Carbon Monitoring, Accounting and Reporting System
NGO	Non-governmental organisations
NPI	National Pollutant Inventory
NPRI	National Pollutant and Release Inventory
OECD	Organisation for Economic Cooperation and Development
OSPAR	Oslo and Paris Commissions
PI	Pollutant Inventory
POPs	Persistent Organic Pollutants
PROPER	Program for Pollution Control Evaluation and Rating
PRTRs	Pollutant Release and Transfer Registers
RTO	Retort oven
SARA	The Superfund Amendments and Reauthorization Act
SDEID	Sulphur Dioxide Emission Information Disclosure
SEA	Social and environmental accounting research
SER	Social and environmental reporting
SFAC	Statement of financial accounting concepts
SIC	Sulphur-impregnated carbon
SIP	Specific international programme
TRI	Toxic release inventory
UK	United Kingdom
UNEP	The United Nations Environmental Program
USEPA	United States Environmental Protection Agency
USA	United States of America
ZMWG	Zero Mercury Working Group

Chapter 1

Introduction

Introduction

1.1 Introduction

Responding to calls for social and environmental accounting (SEA) to engage with serious environmental problems (Gray & Laughlin, 2012; Guthrie & Parker, 2017) and explicitly consider the developing world (Belal & Roberts, 2010; Sobhani et al., 2012), this thesis examines three key aspects of mercury accounting and reporting¹: firstly, national reporting according to the requirements of the Minamata Convention; secondly, the reporting of emissions by developed (Australia) and developing (Bangladesh) countries to the Minamata Secretariat and their citizens via pollutant databases; and thirdly, voluntary reporting by large mercury-emitting companies.

Mercury is one of the world's most toxic substances. Scientists began to understand the severe toxic effect of mercury in the 1950s after the Minamata incident, in which more than 2,200 people suffered mercury poisoning (Minamata Disease Research Group, 1968; Yorifuji et al., 2012). Mercury harms the nervous system and, at a significant level of exposure, damages kidneys, lungs, babies in the womb, hearing, and memory (NPI, 2014). A 2001 listing of the "Top 20 Hazardous Substances" identified mercury as the third most hazardous substance after arsenic and lead (ATSDR, 2001), and a listing of the top 10 toxic pollution problems identified mercury pollution from artisanal gold mining as the most severe (Worstpolluted, 2014). As an element, mercury cannot be broken down or changed into new substances that are not themselves harmful to people and the environment (UNEP, 2011).

Mercury emissions are transboundary in nature (WHO, 2007), as emissions from one country may spread to others via air or water (Rahman, 2011; Siddiquei et al., 1992). As different national and regional agreements for controlling mercury had failed to achieve the expected results (Selin & Selin, 2006), the Minamata Convention, a global approach to reducing mercury pollution, was initiated in 2013 by the United Nations Environment Programme (UNEP, 2013b). The Convention aims to reduce the production, use, emissions, storage, and disposal of mercury as well as encouraging the remediation of contaminated sites, and includes proposals for national reporting on mercury emissions (UNEP, 2017). The Convention has now been signed by 128 countries (including Australia) and ratified by 92 countries (UNEP, 2018).

Studies primarily researching mercury emissions have also commented on mercury reporting (AMAP/UNEP, 2013; Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga,

¹ This thesis concentrates on reporting, which signifies the whole process of providing information to the stakeholder, including disclosures, whereas disclosures portray only a part of the reporting process. Only the fourth paper of this thesis specifically studies "corporate mercury disclosures".

2009; UNEP, 2013a; Walcek et al., 2003) and have raised concerns regarding the understandability, accuracy, verifiability, reliability, completeness, and comparability of disclosed mercury information.

Despite these concerns, mercury reporting has yet to be addressed by SEA research (Bebbington & Larrinaga, 2014; Deegan, 2017; Gray et al., 2014; Mathews, 1997) and is therefore an example of what Deegan (2017, p. 85) refers to as “very real social and environmental problems ‘out there’ that need to be addressed and probably rather urgently”. This thesis examines mercury accounting and accountability under the Minamata Convention and addresses the following key research questions:

- Paper 1: Firstly, *To what extent will the reporting provisions of the Minamata Convention ensure the accountability of the countries for mercury emissions?* and secondly, *How can these reporting provisions be improved?*
- Paper 2: *Is the Australian National Pollutant Inventory’s mercury accounting and reporting adequate to meet the reporting obligations under the Minamata Convention?*
- Paper 3: *To what extent will Bangladesh be accountable for compliance with the reporting requirements of the Minamata Convention?*
- Paper 4: Firstly, *What is a best practice corporate mercury disclosure framework?* and secondly, *To what extent do the current disclosure practices of the highest mercury-emitting companies comply with the best-practice disclosure framework?*

The following section elaborates on mercury and its impact to explain the rationale behind the study. Mercury, one of the most toxic substances known (Worstpolluted, 2014), cannot be destroyed or converted into any non-harmful substance (UNEP, 2011). Moreover, mercury can spread around the globe after emission because of its transboundary nature (WHO, 2007), and therefore, different national and regional agreements for mercury must be coordinated to achieve a successful outcome (Selin & Selin, 2006). It is for this reason that the Minamata Convention was initiated as a global approach to mercury control (UNEP, 2013b). As with other multilateral environmental agreements (MEAs), reporting provisions have been asserted as a mechanism of accountability for controlling mercury.

The remaining sections of this chapter consider the rationale for focusing on mercury, the regulatory initiatives that have been taken to reduce mercury emissions, and the status of mercury reporting. Following this discussion, summaries are provided of the chapters that follow: namely the Literature Review (Chapter 2), Theoretical Perspectives (Chapter 3), the four papers (Chapters 4–7), and the Summary and Conclusions (Chapter 8) of the thesis.

1.2. Mercury Toxicity

Mercury is a naturally occurring metallic element (UNEP, 2011; USEPA, 2014). It is identified in water, air, and soil (USEPA, 2014), and it appears in the forms of elemental, organic, and inorganic substances (Goyer, 1996). Inorganic (or ionic) mercury compounds include a class recognised as mercury salts such as mercuric sulphide (HgS), mercuric oxide (HgO), and mercuric chloride (HgCl₂), while the organic form of mercury is seen in substances such as phenylmercury, methylmercury, and dimethylmercury, which occur when mercury combines with carbon (UNEP, 2011).

Atmospheric mercury emissions come from three sources: new emissions from natural (i.e., geogenic) sources, new emissions from anthropogenic sources, and re-emission of historically deposited mercury, which originally came from both anthropogenic and natural sources (AMAP/UNEP, 2013). Natural sources include mercury released from the Earth's crust by the continuous and ubiquitous natural weathering of mercury-containing rocks or by geothermal activity, or mercury emitted during episodic events such as volcanic eruptions (AMAP/UNEP, 2013). Anthropogenic sources indicate mercury released as a result of human activities, and consist of unintentional and intentional emissions (AMAP/UNEP, 2013; UNEP, 2010). Significant sources of unintentional air emissions include fossil-fuel burning in power generation and heating systems, pig iron and steel manufacturing, non-ferrous metal production, cement manufacturing, large-scale gold production, and the production of commercial mercury (AMAP/UNEP, 2013). Significant sources of air emissions from intentional-use activities include artisanal and small-scale gold mining (ASGM), cremation of deceased persons² who have had dental work using mercury amalgam, secondary steel manufacture, diffuse discharges from product use (e.g., medical apparatus such as thermometers, switches, batteries, lamps, etc.), and waste disposal (including burning of waste containing embedded mercury) (AMAP/UNEP, 2013; USEPA, 2014). Re-emissions comprise emission of mercury to the atmosphere from the Earth's surfaces (soil, rocks, snow and ice, surface waters (including ocean surface water), and vegetation), which have previously taken in mercury either from atmospheric deposition or through another transmission pathway (AMAP/UNEP, 2013).

Mercury has a greater diversity of effects on humans and the environment than any other element (ATSDR, 2001; Goyer, 1996; WHO, 1990, 1991). The toxic effects of mercury have been studied since the 1950s following the Minamata incident (Minamata Disease Research Group, 1968), which occurred in Minamata Bay, Japan, where more than 2,200 people were diagnosed as suffering from severe mercury poisoning, and tens of thousands more were affected by high

² According to the Hindu as well as other religions, human beings are burnt (cremated) after death.

amounts of mercury exposure (Yorifuji et al., 2012). All types of mercury are harmful to the nervous system, and high-level exposure can destroy the kidneys and the brain (NPI, 2014). A range of severe problems stemming from mercury exposure includes changes in vision, shyness, tremors, irritability, hearing, memory problems and other neurological impacts, chest pain, shortness of breath, and fluid in the lungs (NPI, 2014). Methylmercury is significantly neurotoxic, and its negative impacts are observed in different organ systems up until death (Bjornberg et al., 2003).

Mercury exposure can also cause long-term harm to the developing fetuses of pregnant women. Research in New Zealand observed that the children of mothers who had had greater contact with mercury when pregnant scored lower in academic attainment, language improvement, reasoning, and common intellect (Crump et al., 1998; Kjellstrom et al., 1986). Similarly, a study in the Faroe Islands found that seven-year-old children with greater prenatal mercury exposure had worse records for attention, language capacities, memory, eye-hand coordination, and other fine motor skills (Grandjean et al., 1997). Further tests on those children showed that the effects of the mercury were still present at the age of 14 (Groth, 2012 cited in Debes et al., 2006).

The primary cause of human mercury exposure is the ingestion of mercury-affected seafood, but mercury exposure can also occur from breathing mercury-affected air, drinking mercury-affected water, and ingesting mercury-affected food and/or soils (Zhang & Wong, 2007). Methylmercury is the most common form of mercury exposure because of its ability to accumulate in organisms through the food chain, especially in a marine environment (UNEP, 2011). Methylmercury exposure therefore typically occurs from eating fish at the apex of the food chain such as marlin, swordfish, and shark (USEPA, 1997; Weihe et al., 2005).

The environmental effect of mercury is also a considerable concern for policy makers. In a marine environment, although fish accumulate methylmercury, and waterborne exposure to mercury is not recognised as a severe problem for mature fish, mercury exposure negatively impacts the early life of fish in terms of growth, development, and hormonal condition (UNEP, 2011). On land, mercury exposure can affect many varieties of fauna. For example, mercury use in seed dressing in the 1950s and 1960s resulted in a severe decrease in the number of hawks and eagles in some areas of North America (Ramel, 1974). Methylmercury also poses a substantial reproductive risk to mammals because of its ability to violate the placental barrier (AMAP/UNEP, 1998).

After presenting a summary of mercury and its significant impact on human health and on the environment, the following section delineates the role of corporations, regulators, pollutant databases, and parties to the Minamata Convention regarding mercury emissions.

1.3. Mercury-Reduction Initiatives

National, regional and international agreements have been made to combat the adverse effects of mercury. The first global initiative for reducing mercury emissions came into effect in the 1970s in the form of agreements for shared bodies of water. Standards addressing mercury issues (particularly in relation to water quality) include that of the Organization for Economic Cooperation and Development (OECD) in 1973, the Stockholm Declaration in 1972, the Oslo Convention in 1972, the Paris Convention in 1974, the Helsinki Convention in 1974, the Mediterranean Action Plan in 1975, the Barcelona Convention in 1976, the Dumping Protocol in 1976, the Protocol on Land-Based Sources in 1980, the Convention on the Protection of the Rhine Against Chemical Pollution in 1976, the OSPAR (Oslo and Paris) Convention in 1992, and the CLRTAP (Convention on Long-Range Transboundary Air Pollution) Protocol on Heavy Metals in 1998. The Basel Convention, issued in 1989, was also a formal regulation for abatement of mercury emissions, although that convention particularly focused on stopping the transboundary movement of different hazardous elements (Selin & Selin, 2006).

Realising the toxicity and hazards of mercury, the UNEP recently initiated a global agreement on mercury, the Minamata Convention (2013), as a comprehensive global approach to eliminating and reducing mercury emissions (Selin, 2013). The Minamata Convention is much more comprehensive than the Basel Convention, and covers actions to reduce mercury production (such as banning new mercury mines and phasing out current mining), use (by reducing mercury usage in processes and products), and emissions (by introducing control measures for air, land and water releases), as well as storage and disposal of mercury and the remediation of contaminated sites (UNEP, 2017). It should be noted that there are some exclusions to the convention, most notably military products but also some lighting, religious, and medical products (UNEP, 2013b). Governments were first invited to sign the Convention at the conference of the country delegates in 2013, and the Convention has since been signed by 128 countries and ratified by 92 (UNEP, 2018). The first Conference of the Parties (COP1) was held on 24–29 September 2017, and the Convention is now in force starting from 16 August 2017 (UNEP, 2018). Further details on the development of the Convention are provided in Table 1.

Table 1. The history of Intergovernmental Negotiating Committee (INC) meetings, COP1, and topics discussed

INC	Date	Place	Topics
INC 1	7 to 11 June 2010	Stockholm, Sweden	The formal launch of negotiations that adopted the rules and procedures under which it would operate
INC 2	24 to 28 January 2011	Chiba, Japan	Discussion of the draft elements of a comprehensive approach to mercury. Contact groups worked on three topics: storage, waste, and contaminated sites; ASGM; and emissions to air and releases to water and land (UNEP, 2017).
INC 3	31 October to 4 November 2011	Nairobi, Kenya	A completed review of the new draft text of the comprehensive and suitable approach to mercury, prepared based on INC2 opinions. Six contact groups developed new articles on ASGM: storage, wastes and contaminated sites; and awareness-raising, research and monitoring, and communication of information (UNEP, 2017).
INC 4	27 June to 2 July 2012	Punta del Este, Uruguay	Discussions on a possible compromise text on elements with diverging opinions preparing additional documentation, including a draft of the final act (UNEP, 2017).
INC 5	13 to 18 January 2013	Geneva, Switzerland	Discussions on draft resolutions on elements of the final act to be adopted, including how to promote and prepare for the early implementation of the mercury instrument; arrangements for the interim period including arrangements for financial and technical assistance; and secretariat arrangements (IISD, 2013). Discussions on the draft and agreed text of a global legally binding instrument on mercury and published as the “Minamata Convention on Mercury”.
INC 6	3 to 7 November 2014	Bangkok, Thailand	Discussions on, among other things, importing of mercury; registering of exemptions; reporting and monitoring; rules of procedure and financial rules for the COP; direction and assistance to countries with ASGM; storage, wastes, and management of contaminated sites; and operation of the financial mechanism (IISD, 2014).
INC 7	10 to 15 March 2016	Dead Sea, Jordan	Discussions on, among other things, processes for export and import of mercury; the procedure of the financial instrument; and draft rules of procedure and draft financial guidelines for the COP. Participants also reflected on some other issues including identification of inventory of mercury and mercury compounds and origins of supply, and best available techniques and best environmental practice for controlling emissions (IISD, 2016).
COP1	24–29 September 2017	Geneva, Switzerland	Discussions on, among other things, the location of the permanent secretariat, finalisation of the reporting period, finalisation of the reporting format,

			thresholds, contaminated sites, financial rules, the specific international programme (SIP), the Implementation and Compliance Committee, the Programme of Work and budget, and emissions guidance. The major decisions taken include that Geneva will remain as the temporary location until COP2; a 4-year cycle for full reports and a 2-year cycle for partial reports; and finalisation of and agreement on the final reporting format. However, COP1 could not agree with the Global Environmental Facility (GEF) on the financial mechanism because of disagreements on the eligibility of obtaining GEF funds for the projects (IISD, 2017).
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After thorough discussions in INC meetings 1–7, UNEP finalised the provisions, including the mercury reporting provisions. The MEA Secretariats use reporting provisions as a strategy for reducing pollutants.

1.4. Mercury Reporting

As with other MEAs (*e.g.* the Basel Convention, the Kyoto Protocol, the Montreal Protocol), the Minamata Convention also has extensive reporting requirements in addition to the steps taken for mercury reduction. Each country must report to the COP through the Secretariat on the measures it has implemented and the effectiveness of those measures in achieving the goal of the Convention [Article 21]. Parties will have to provide information, where relevant, on: (a) mercury supply [Article 3]; (b) mercury imports and exports [Article 3]; (c) manufacture, supply in commerce and trade of mercury-added goods [Annex A]; (d) actions adopted to phase out mercury-added products, and the amount already reduced; (e) proof of progress in reduction and eradication of atmospheric emissions and releases [Articles 8 and 9]; (f) financial and technical support [Articles 13 and 14]; (g) assessment of the development of implementation plans [Article 15]; (h) progress reports on implementation plans; and (i) other data or reports as required by the Convention (UNEP, 2013b). The draft reporting format was approved in IISD (2016), and the final reporting format was approved in UNEP (2017a).

National reporting under the Minamata Convention will be drawn from information collected by national governments, which is typically captured in databases that contain information about mercury as well as a range of other pollutants. Pollution databases are one of the key mechanisms for collecting, recording and reporting pollution from both point sources (*e.g.*, factories) and diffuse sources (*e.g.*, cars). Such pollution databases are often referred to as Pollutant Release and Transfer Registers (PRTRs) and have been adopted by many developed countries, including Australia, Belgium, Canada, Denmark, Finland, Germany, Japan, Mexico, the Netherlands, the UK and the US, and some international and regional organisations including the EU, the OECD, UNEP, UNITAR, and the WHO have all developed PRTRs. Although the objectives of these

PRTRs are almost identical, the pollutants covered, measurement approaches, and reporting thresholds differ, which hinders global comparability of the reported data (Mee, 2011). For example, Lloyd-Smith (2008) identified that the Australian PRTR, the National Pollutant Inventory (NPI) provides relatively limited information (93 substances), whereas the U.S. PRTR includes 600 substances, and the Canadian one includes 176 substances.

As noted above, commercial activities are an important source of mercury emissions. Corporate reporting of emissions may take two main forms. In jurisdictions with PRTRs, corporate mercury emissions above a certain threshold are mandatorily reported to the government agency administering the PRTR, and this information is subsequently made publicly available.

1.5. Summary of Previous Literature

Although earlier SEA studies such as that of Gray (2002) called for an expansion of the SEA research agenda, more recently, Gray and Laughlin (2012, p. 228) suggested that SEA research has moved too far from its original mission, in that “Researchers appear to be less willing to examine the fundamental issues that originally motivated the development of the field.” Similarly, Guthrie and Parker (2017) ask why SEA researchers are paying little attention to the issues relating to the sustainability of the planet. To date, SEA research has explored many environmental challenges including carbon (Haslam et al., 2014; Nurunnabi, 2016), water (Hazelton, 2015; Tello et al., 2016), human rights (Cooper et al., 2011; Hazelton, 2013a), and biodiversity (Adler et al., 2018; Boiral & Heras-Saizarbitoria, 2017). However, no previous study has been conducted on mercury from an SEA perspective, despite the fact that (as noted above) mercury has been recognised as one of the world’s most toxic substances (ATSDR, 2001; Goyer, 1996; WHO, 1990, 1991).

Previous research has explored mercury from various perspectives including mercury sources, pathways, emissions, and impacts on human health and the environment (AMAP/UNEP, 2013; Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009; UNEP, 2013a; Walcek et al., 2003). Of particular relevance to this thesis, previous research on mercury points out different quality deficiencies in mercury reporting processes and disclosures. For example, Nelson et al. (2009), Telmer and Veiga (2009) and Strezov et al. (2010) have questioned the understandability and accuracy of global mercury information; UNEP (2013a) and AMAP/UNEP (2013) have expressed concerns about comparability between countries; AMAP/UNEP (2013) and Telmer and Veiga (2009) have questioned completeness; and Nelson (2007) has argued that there is an absence of verifiability of Australian mercury data.

Previous research into MEAs (of which the Minamata Convention is an example) has attempted to identify factors that significantly influence success. For example, in the context of the

Stockholm Convention, Yoder (2003) recommends the practical provisions and wider participation as the dominant success factors. In a review of the Montreal Convention, Zhao and Ortolano (2003) identify the importance of government, monetary motivation, local government participation, and administrative ability. On the other hand, lack of resources and capabilities hinder implementation of the MEAs, particularly in the developing countries (Ambalam, 2014). Moreover, lack of or deficiency in several key factors such as administrative capabilities (Kannan, 2012; Zaelke et al., 2005), appropriate policies and plans (Kannan, 2012; Zoeteman & Harkink, 2005), necessary equipment and skilled human resources (Raustiala, 1997) and scientific resources (Chayes & Antonia, 1995; Economic Commission for Africa, 2007; Kannan, 2012) significantly impact on compliance with the provisions of the MEAs by developing countries.

Previous research has also specifically explored the Minamata Convention, but no previous studies have examined the adequacy of the reporting provisions. For example, Eriksen and Perez (2014) provide an overview of the negotiation history, identifying the difficulties in the negotiation process and factors behind the success of the negotiations, the main elements of the Minamata Convention, and the main factors behind the Convention. Spiegel et al. (2018) study the impact of the Convention on ASGM in Indonesia and highlight how lack of interconnection of researchers, regulators, and labour forces may hinder implementation of the global efforts in the local context. Buccella (2014) - (Buccella, 2014) examined illegal gold mining in Peru and identified the likely impact of implementation of the Minamata Convention on Peru, and Hilson et al. (2018) evaluate the likely impact of the Convention on gold mining in Sub-Saharan Africa. Selin (2013, pp. 6-7) emphasises how the Minamata Convention may reduce mercury emissions, and for this suggests five important measures required to support improved mercury abatement and bolster the Convention: timely ratification and building of awareness; funding and other necessary supports; support for developing nations; support for mercury abatement-related research; and expansion of monitoring and data presentation for decision making,. Ancora et al. (2016) study the Convention from a scientific point of view, suggesting cost-effective compliance options for atmospheric mercury control in Chinese coal-fired power plants. However, no study concentrates on the accountability of the parties for high-quality mercury reporting. This gap is addressed by the research question posed in Paper 1 (Chapter 4): *To what extent will the reporting provisions of the Minamata Convention ensure the accountability of the countries for mercury emissions?*

Research gaps also exist in relation to the capability of developing and developed countries of reporting in accordance with the Convention. Previous research suggests that even in the developed world, mercury reports lack in quality in terms of accuracy, understandability, completeness, timeliness, comparability, and verifiability (AMAP/UNEP, 2013; Nelson, 2007;

Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009; UNEP, 2013a; Walcek et al., 2003). There exists, therefore, a significant research gap concerning whether mercury reporting under the Convention will be adequate in the context of a developed country. To explore this question Paper 2 (Chapter 5) uses Australia as a case study. As mercury data is primarily collected from PRTRs, the Australian version of which is the NPI, the research question in Paper 2 is as follows: *Is the Australian National Pollutant Inventory's mercury accounting and reporting adequate to meet the reporting obligations under the Minamata Convention?*

Previous research suggests that more research from an SEA perspective should focus on developing countries. As they are most vulnerable to the environmental challenges addressed by SEA research (Belal & Roberts, 2010; Sobhani et al., 2012). Moreover, developing countries face particular challenges in complying with and implementing MEAs, including inadequate regulations (Barrios, 2004; Kuasirikun, 2005; Lodhia, 2003) and constraints on the implementation of the laws (Hossain & Alam, 2016; Nurunnabi, 2016). Commentators such as the German Advisory Council on Global Change (2001) argue that the key constraints are the lack of both resources and capability. Specifically, the lack of factors such as policies (Zoeteman & Harkink, 2005), planning, and administrative arrangements (Kannan, 2012), tools and human resources (Raustiala, 1997; Selin et al., 2018), capacities, and financial, technical and scientific resources (Economic Commission for Africa, 2007; Kannan, 2012; Selin et al., 2018) prevent developing countries from incorporating environmental issues in their national agendas and complying with the MEAs. The question therefore arises as to whether developing countries would be able to implement the Minamata Convention, and in particular its reporting requirements. This gap is addressed by the research question posed in Paper 3 (Chapter 6): *To what extent will Bangladesh be accountable for compliance with the reporting requirements of the Minamata Convention?*

A further research gap exists in relation to voluntary corporate mercury reporting, as the few previous studies that focus on mercury disclosures have considered reporting at a global level (Evers et al., 2016) or a national level (Strzelecka-Jastrzab, 2018). Corporations are major emitters of mercury globally; for example, Winalski et al. (2005) found that just three chlorine plants emit one-third of all of the UK's mercury releases. Corporate mercury reporting is largely voluntary, although countries having PRTRs require corporations to submit limited information, which is then hosted on a government website. This information, however, does at least enable the identification of large mercury emitters. Previous studies have found that corporations do not disclose the emissions of the toxic substances sufficiently in their reports (Centner, 2013). But few previous studies have used an independent data source (such as the PRTR) to determine the extent to which gaps in reporting are a result of low emissions or inadequate reporting.

Furthermore, authors such as Fonseca et al. (2014) suggest the need for the continuous improvement of GRI standards, but no standard fully covers the issues around mercury emissions. To address these research gaps, Paper 4 (Chapter 7) explores the following research questions: *What is a best practice corporate mercury disclosure framework?* and *To what extent do the current disclosure practices of significant mercury-emitting companies comply with this framework?*

Considering the toxicity of mercury, the global efforts to eliminate mercury, the current state of capabilities and funding opportunities at national, regional and global level, the status of compliance of developing countries with different MEAs, and the level of mercury emissions of the corporations, SEA researchers have enough space for contribution in this niche of research. This thesis therefore endeavours to answer the overall research question: *How can the reporting provisions be improved to ensuring accountability?*

The following section elaborates on the theoretical perspective, based on which the findings of the study are explained.

1.6. Summary of Theoretical Perspectives

The key theoretical concept of this thesis is accountability. Accountability is a multi-faceted term (Steccolini, 2004), which within SEA is not limited to owners but also includes society at large. One facet of accountability is transparency (facilitated via reporting), which is a necessary but not sufficient condition for accountability. In much SEA work it is considered that transparency is impossible without the threat of sanctions (Fox, 2007). However, sanctions are largely ineffective in the MEA context because of the sovereignty of the parties (i.e. nation states). In this context, rather than formal, imposed accountability mechanisms it is felt accountability (that is, the feeling and understanding of the significance of reporting of the parties and positive sanctions), which is likely to be more effective. In addition, as MEA signatories comprise both developed and developing countries, accountability depends on their respective responsibility to provide assistance and capability. This situation adds new dimensions to accountability, as developed countries are accountable for meeting their donation commitments, and developing countries are accountable to the developed countries and to the global citizens for using those donations, and reporting them, appropriately (Gupta & Asselt, in press). In relation to reporting, the qualitative characteristics of accounting provide a useful framework for evaluation of reporting quality. Especially problematic for SEA is the characteristic of completeness, given that total transparency is impossible, as everything cannot be disclosed in a given report. A process of materiality assessment is therefore used to identify those issues that are significant and need disclosing, the primary mechanism for which is stakeholder consultation (GRI, 2016; Mullerat,

2005). This approach may be problematic for the disclosure of substances such as mercury, as such broad-based societal concerns may not be identified by immediate stakeholders (Mullerat, 2005).

Based on the literature on the right to information, accountability and materiality, this thesis recognises that stakeholders have a right to information on mercury pollution. The literature on the right to information outlines the situations under which stakeholders have a right to environmental information (Hazelton, 2013a). The literature on accountability reflects how transparency and reporting are necessary, but not sufficient, elements of accountability (Fox, 2007). The typologies of accountability, namely felt, imposed, and adaptive accountability, situate the context in which the entities report (O'Dwyer and Boomsma (2015). Finally, the literature on materiality describes what information reporting standards such as the GRI consider it necessary to report (Edgley et al., 2015). All these three perspectives reflect the significance of mercury reporting and disclosures to the stakeholders.

The stakeholders, not only limited to the owners but also including society at large, have the right to information, and the entities have the responsibility to provide this information to facilitate informed decision making. Accountability in the SEA context refers to the responsibility to justify past actions, to recognise the social and environmental rights of current and future stakeholders, and to provide the necessary information for facilitating actions and decision making in relation to the reporting entity. In the case of corporations, society has the right to know the volume of emissions, the emissions the emitters could reduce, and the emissions that could not be reduced, and why not (Adams, 2004). Accountability ensures justice in society, meaning that a person or organisation who is not accountable is behaving unjustly (Hall et al., 2017). Development of more accountability would be expected to create a greater sense of corporate responsibility, which would be a motivation to reduce social and environmental damage.

Transparency is a necessary, but not sufficient, condition for accountability, and may be considered as a subset of accountability. In the conventional view, transparency creates and facilitates accountability (Fox, 2007). Transparency of the reported information increases the accountability of organisations' impacts on society (GRI, 2018). However, transparency and accountability differ based on the perspectives of capacity and responsibility of developed and developing countries (Gupta & Asselt, in press). Transparency in terms of having the qualitative characteristics of "access, timeliness, relevance, and quality" is essential to ensure just capital markets (Vishwanath & Kaufmann, 2001, p. 41). However, complete transparency and accountability in reporting are very difficult, if not impossible, from a perspective where there is a significant question regarding measurement. Messner (2009, p. 918) also agreed that "forcing"

the reporting entity to be accountable for some issues that are “very difficult or impossible to justify” is “violence.”

Reporting as a measure of transparency may provide public access to more information, but may not ensure accountability (Fox, 2007). In this regard, Fox divided transparency and accountability each into two classes, namely “opaque transparency” and “clear transparency”, and “soft accountability” and “hard accountability” respectively, for specifically identifying which type of transparency leads to which type of accountability (Fox, 2007, p. 663). Opaque transparency provides unreliable information that does not reflect the organisation’s actual situation and hence does not lead to accountability of the reporting entity. Clear transparency provides reliable information that reflects the behaviour of the reporting entity, but this type of transparency cannot guarantee hard accountability without the intervention of regulators. Clear transparency therefore coincides with soft accountability, whereas hard accountability can be achieved through clear transparency with the intervention of factors such as the imposition of sanctions. Fox (2007) did not refute that transparency leads to accountability; however, the emphasis on the imposition of sanctions recognises the need for the power of the stakeholders in influencing reporting: that is, a call for mandatory social and environmental reporting.

The conceptual model of accountability was further developed by O'Dwyer and Boomsma (2015) who drew on previous literature (Ebrahim, 2003, 2009) to distinguish three mechanisms of accountability: imposed, felt, and adaptive accountability. Although mandatory reporting (imposed accountability) is applied in most reporting contexts, in some situations such as a country’s report to the UN, felt accountability, and in a different situation, adaptive accountability, may work better. For example, the conventional understanding of accountability as “the imposed accountability regimes” is articulated as a “formal oversight and control imposed” on a person or organisation (O'Dwyer & Boomsma, 2015, p. 40). On the other hand, felt accountability regimes visualise accountability as a voluntary act in which an individual or organisation feels a responsibility to certain ethics or missions (Belal & Owen, 2007; Ebrahim, 2009; Fry, 1995). Roberts (1991, p. 365) defined felt accountability as “a social acknowledgement and an insistence that one’s actions make a difference to both self and others”. Finally, an adaptive accountability regime combines the formal aspects of imposed accountability and the ethical aspects of felt accountability (Ebrahim, 2009). In the context of MEAs, felt and adaptive accountability could both be implemented, but not imposed accountability because of the sovereignty of the country parties.

The concept of accountability applies to both the public (government) and private (corporate) sectors. Accountability in the public and private sectors differs because of their different contexts, particularly regarding the stakeholders they are accountable to, the structure and activities of the

entities, and the acts, rules, and regulations they are governed by. Among others, the ability to facilitate action, awareness of the people (democratic environment), capability (resources), and commitment of the reporting entity, corporation or country are required to ensure accountability. Sanctions are also an important prerequisite for accountability in a corporate setting, which raises important questions for the operation of accountability in a context where few sanctions are available. Bovens (2007) and Mulgan (2000) identify sanctions as a key element of accountability, and Fox (2007) argues that transparency may not assure hard accountability if sanctions are not imposed by regulators. However, sanctions are ineffective in the context of MEAs because of the sovereignty of the countries. Recently, the study of Gupta and Asselt (in press) focused on how ineffective sanctions damage the concept of accountability and also create distance between developed and developing countries. Moreover, assisting and donating to the developing countries also initiates another dimension of accountability wherein developed countries are accountable both to the respective convention's secretariat for reporting, and to the developing countries for meeting their donation commitments. On the other hand, developing countries are accountable to the respective secretariat for reporting, for utilising that assistance and for reporting appropriately on it.

The qualitative characteristics of accounting information provide a useful framework for evaluating reporting quality (Shahwan, 2008). Qualitative characteristics of accounting information and accountability are interrelated. Although qualitative characteristics of accounting information are used for financial reporting, different researchers including Comyns and Figge (2015), O'Dwyer et al. (2005), Stanwick and Stanwick (2006), and Burritt and Saka (2006) applied these qualitative characteristics in evaluating social and environmental information. The qualitative characteristics ensure reporting transparency, and transparency confirms accountability (GRI, 2011, 2018). However, this relationship is not straightforward, as delay may improve accuracy but will deter timeliness. Moreover, the qualitative characteristics of accounting information, particularly the materiality principle, guide what to report and how to report it.

Entities deal with thousands of issues, and their activities encompass and impact on hundreds of aspects of the society. Questions therefore arise as to what extent the organisation should inform society and be accountable to it. It is true that companies should evaluate the impacts of their actions and identify the probable effects of their future actions on the community (Bebbington et al., 2014; Dillard, 2007). However, they will not report everything, and it is not possible to disclose all issues in the reports. Nevertheless, those reports should not exclude the important information. Reporting accountability thus recognises that the entity will report the information

that is significant for understanding of the entity, and also which has a significant impact on the decisions of the stakeholders.

The concept of materiality facilitates the entities in ascertaining the material issues to be included in their reports. The material items are those which, as GRI (2016, p. 10) defined, “[reflect] the organisation’s economic, environmental, and social impacts, or [influence] the decisions of stakeholders.” The concept of materiality in SEA encompasses the social and environmental impacts of the organisation on the wider community in addition to the economic impacts that are emphasised by investors. The materiality concept focuses on the material issues among hundreds of sustainability issues that the companies have to confront, resulting in “more relevant, more credible and more user-friendly” reports to the stakeholders, and enabling the companies to concentrate on strategies to alleviate those concerns (GRI, 2015, p. 4).

Materiality, particularly in SEA, is a dynamic concept that differs between companies and between stakeholder groups, and frequently changes over time. For example, the level of materiality differs among the management, auditors, and users of the reports because of the differences in their interest in the business (Edgley et al., 2015). The Accountability Principles Standard (AA1000) provides that the process of identifying “material issues will change over time as issues mature and understanding improves” (AccountAbility, 2008, p. 13). In the current context, therefore, material disclosures in SEA may include information on water and energy usage, greenhouse gas emissions, hazardous substances, biodiversity, waste management, stakeholder engagement, working environment, human rights and workers’ rights, and health and safety (AccountAbility, 2006a, 2006b; Edgley et al., 2015).

Determination of materiality in Social and Environmental Reporting (SER) largely depends on the magnitude of the item to the reporting entity and the influence of the item on the decision-making process of the stakeholders. Different organisations including the GRI, AccountAbility, IIRC, and KPMG recommended different approaches to ascertaining material items for reporting. Whereas AccountAbility suggests a three-step process for materiality assessment, GRI recommends a four-step approach, and IIRC a six-step process, while KPMG suggested a robust seven-step approach for materiality assessment and stakeholder engagement and feedback. All of these approaches emphasise the expectations of the stakeholders in determining the material issues.

The material information required to be disclosed may be identified based on “stakeholder consultation” (Mullerat, 2005, p. 535). Although stakeholder consultation is one of the favourable ways of identifying and selecting material elements, sometimes stakeholder consultation may not identify all material items. As Norris et al. (2014, p. 112) state, stakeholders mostly place

importance on the issues “they hear and talk about frequently without objective checks”, and all of the stakeholders may not be concerned about all material issues. Moreover, a recent study by Ceres (2018) on more than 600 companies from the US shows that only 14% of them engage stakeholders in the materiality assessment process. In this regard, Mullerat (2005, p. 535) suggested identifying MEAs to ascertain other important issues to be reported in the corporate sustainability report, stating that “such broad-based concerns may derive, for example, from national policy and international conventions” (Mullerat, 2005, p. 535). Both Mullerat (2005) and the GRI (2016) materiality assessment frameworks recommend incorporating additional sustainability issues and considering international agreements in prioritising material items for sustainability reporting.

The following section provides a summary of the papers that form the basis of this thesis.

1.7. Summary of the Papers

To address the gap in the current understanding of mercury reporting, this study addresses four main research questions via four different papers. Paper 1 explores the accountability of the parties to the Minamata Convention for controlling mercury emissions via a review of the reporting provisions of the Convention. Paper 2 explores Australia’s (as a developed country) accountability regarding mercury emissions and its status in meeting the reporting provisions of the Minamata Convention. Paper 3 evaluates the capabilities and constraints of a developing country (Bangladesh) in complying with mercury reporting provisions under the Minamata Convention. Finally, Paper 4 explores the accountability of corporations in regard to voluntary disclosure of mercury emissions. A summary of the four papers is presented in Table 2.

Table 2. A brief summary of the four papers included this thesis

Paper	Analysis	Methods, Data, and Findings
1	Global Accountability for Mercury Emissions	• <i>Approach:</i> Qualitative case study approach • <i>Context:</i> Global – All signatory countries • <i>Data:</i> Literature review, documentary analysis of all seven INC meetings, and the draft Minamata Convention national reporting template. • <i>Theory:</i> Qualitative characteristics of accounting information under the conceptual framework of accounting; imposed, felt and adaptive accountability • <i>Findings:</i> - The level of accountability in all of the quality criteria is either low or medium. - The level of accountability should be improved in all of the areas to accomplish the ultimate success of the Convention. - Improving the level of felt accountability of the parties can contribute to achieving the expected outcome of the Convention. However, there is a challenge in assessing the level of felt accountability of the regions or group of countries.

2	Developed Countries' Reporting of Mercury Emissions	• <i>Approach:</i> Qualitative study • <i>Context:</i> Australian NPI • <i>Data:</i> Eight Interviews, 11 interviewees • <i>Theory:</i> Imposed, felt, and adaptive accountability • <i>Findings:</i> - Australian mercury accounting under the NPI is developed, and sufficient to meet Australia's reporting obligations. - There are reporting deficiencies in several areas including understandability, comparability, and timeliness. - Regulatory budgetary pressures undermine the quality of governmental mercury data capture and reporting. The "felt responsibility" of regulators is thus unable to be fully discharged.
3	Developing Country's Reporting of Mercury Emissions	• <i>Approach:</i> Qualitative study • <i>Context:</i> Developing countries context • <i>Data:</i> Seven email interviews • <i>Theory:</i> Accountability theory from the perspectives of capability, commitment, and sanctions • <i>Findings:</i> - The government, researchers, regulators, and the general public of Bangladesh are not aware of mercury and its impacts. - Bangladesh has capabilities, accountabilities, and commitments, to some extent, for complying with the reporting provisions of the Minamata Convention. - However, it needs more <i>support from UNEP and developed countries</i>. - The Convention and the discussions in INC meetings confirm that the weaknesses have been acknowledged and necessary strategies have to some extent been formulated to address those deficiencies.
4	Corporate Reporting for Mercury Emissions	• <i>Approach:</i> Qualitative and quantitative study • <i>Context:</i> Covered five jurisdictions: Australia, Canada, the EU, the UK, and the US • <i>Data:</i> Annual reports, sustainability reports, websites of 100 facilities under 81 corporations • <i>Theory:</i> Accountability, right-to-know frameworks, and materiality • <i>Findings:</i> - Few companies disclosed mercury information, though just five of the highest-emitting companies emitted 41% of the global emissions (based on 20 facilities only). - Overall, Australian companies disclosed the highest number of the sample contents of the mercury information during 2013, followed by companies in the US. - The most disclosed contents include emission reduction strategies (including technologies), ongoing mercury monitoring and management plans, operational regulatory requirements, interactions and compliance.

Further details of each of the papers are presented in the following section.

1.7.1. Summary of Paper 1: To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?

Paper 1 evaluates whether the reporting provisions of the Minamata Convention will ensure the accountability of the countries for mercury emissions and how the reporting provisions can be improved to ensure that accountability. As noted above, reporting requirements include provision of information on mercury supply, mercury imports and exports, the manufacture and supply in commerce and trade of mercury-added goods, actions adopted to phase out mercury-added products and the amount already reduced, proof of progress in reduction and eradication, atmospheric emissions and releases, financial and technical support, assessment of the enrichments of the implementation plan, and a progress report on the implementation plan (UNEP, 2013b). Previous literature shows that there are quality limitations in the mercury reporting process and in the reported information (Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009; Walcek et al., 2003).

Paper 1 adopts a qualitative approach and uses secondary documentary analysis comprising relevant literature, UNEP technical reports, the proceedings of all seven INC meetings, and the reporting format. The paper uses a qualitative case-study approach for exploring the collected data. It applies the conceptual framework of accounting (qualitative characteristics of accounting information) for identifying the quality challenges of mercury reports and reported information (AASB, 2009; FASB, 1980) and deploys the theory of accountability to determine the level of accountability of the parties (O'Dwyer & Boomsma, 2015) to the Minamata Convention regarding mercury emissions and to identify means by which accountability can be improved.

Paper 1 finds that the discussions of the INC meetings depict that some countries expect a relaxed reporting structure, whereas some other countries are also concerned with various quality aspects of mercury reporting. The findings also show that the level of imposed accountability in all the quality criteria is either low or medium. Improving the level of imposed accountability or compensating for the weaknesses of imposed accountability by improving the felt accountability of the parties should support the achievement of the aims of the Convention. However, assessment of the level of felt accountability of the regions or group of countries is difficult.

1.7.2. Summary of Paper 2: Is the Quality of Mercury Accounting via the National Pollutant Inventory Sufficient to Meet Australia's Minamata Convention Reporting Commitments?

Paper 2 explores the quality of Australian information on mercury emissions captured within the Australian NPI (Australia's PRTR), and the extent to which this information will be sufficient to meet Australia's reporting obligations under the Minamata Convention. As with other global

multilateral agreements, signatories to the Minamata Convention must report to the Secretariat through the COP. Australia is a signatory to the Convention and will, therefore, have to comply with the Convention's requirements, which include reporting. Previous literature, including that by Nelson (2007), Nelson et al. (2009), Telmer and Veiga (2009) and Strezov et al. (2010), has observed the quality limitations of Australian mercury information. In response to this, this paper evaluates whether Australia's mercury accounting and reporting (primarily sourced from the NPI) is of sufficient quality to meet Australia's reporting obligations under the Convention.

Paper 2 examines the quality of the NPI's mercury reporting using the qualitative characteristics of accounting information (understandability, accuracy, comparability, verifiability, completeness, and timeliness) to assess the quality of the existing reporting regime (AASB, 2009; FASB, 1980). Accountability typologies including imposed, felt, and adaptive accountability (O'Dwyer & Boomsma, 2015) are used for in-depth analysis of the reasons for the lack of quality of mercury information. Data comprises eight interviews with 11 interviewees including researchers, regulators, and corporate mercury reporters, as well as documentary analysis.

The findings reveal a well-developed process for Australian mercury accounting, which interviewees generally believe is sufficient to meet Australia's reporting obligations. However, the research found reporting deficiencies, particularly in relation to diffuse emissions. The data provided to the users are not complete enough to understand the impact of exposure to the emissions. In addition, there is limited comparability between facilities, and even between years for a particular facility, due to lack of consistency of the methodologies used. There are also issues of reliability and accuracy given the inherent uncertainties in the estimation process. Finally, a persistent theme is that of federal government's budgetary pressures undermining the quality of mercury reporting in terms of both scope and verification.

Most of the previous SEA literature concentrated on the corporate setting; however, mandatory reporting regimes such as the NPI have attracted limited attention. This paper highlights the limitations of mercury accounting specifically, as well as providing insight into the reporting process for the numerous toxic substances reported under the Australian NPI. The study finds that while Australia is likely to meet its reporting obligations under the Minamata Convention, the Australian NPI's mercury reporting process could be considerably improved. Allocation of additional resources to the NPI would enable higher levels of estimation of diffuse emissions and more timely processing of such estimations, as well as improving the reliability and accuracy of point-source emissions.

1.7.3. Summary of Paper 3: Compliance with Mercury Reporting Provisions under the Minamata Convention: An Assessment from a Developing Country Perspective

Paper 3 explores mercury reporting from the perspective of developing countries, and specifically the reporting capabilities of one such developing country (Bangladesh) of complying with the reporting provisions of the Minamata Convention. The paper seeks to identify to what extent the constraints of developing countries are acknowledged in the Convention. Although MEAs have been considered as a mechanism for the long-lasting solution to complex environmental problems, the literature identifies that compliance with these agreements by governments, especially of developing countries, is a serious concern (Ambalam, 2014). The study identifies the constraints that may hinder the reporting capabilities of the developing countries from complying with the reporting provisions of the Minamata Convention, and which may also constrain the ultimate success of the Convention. This paper considers how accountability might operate within the context of a developing country signatory to an MEA. Unlike the corporate (or even public sector) contexts where much prior research has been conducted, this context offers limited potential for sanctions. It is also the subject of considerable debate as to the extent to which developing countries' performance (and accountability) is contingent on funding from developed countries. Consequently, multiple accountability relationships exist between the Secretariat (as a proxy for global citizens), developed countries, funding agencies, and developing countries.

This paper gives a qualitative analysis of the extensive documents concerning the development of the Minamata Convention along with primary interview data collected through eight email interviews with a variety of relevant stakeholders. The documents include the discussions from 2010 to 2016 (INC 1 to INC 7), two additional preparatory meetings in 2013, and the first conference of the parties (COP1) in 2017. Each of these meetings lasted several days, and various necessary documents were supplied to the delegates in advance of the meeting. The paper also considered 174 pages of text published by the International Institute for Sustainable Development (IISD)³ on the discussions in those meetings in the "Earth Negotiations Bulletin". In addition, other documents used include a report on availability of sustainability data in Bangladesh (GED, 2017) and an initial assessment of mercury exposure in Bangladesh (IPEN, 2015), as well as the Minamata Convention (UNEP, 2013b), and specifically the provisions relating to developing countries. Interview data collection, questionnaire preparation, contacting and follow-up of the interviewees, and analysis of the opinions of the interviewees were conducted based on the

³ All INC meeting (1-7) detailed reports are available on the website of International Institute of Sustainable Development: <http://www.iisd.ca/mercury/inc>

approaches suggested by Hewson et al. (2003), Murray and Sixsmith (1998), McCoyd and Kerson (2006), Morgan and Symon (2004), Fyfe et al. (2001), and Sills and Song (2002).

Paper 3 showed that the concerns raised by Gupta and Asselt (in press), that increases in transparency may not promote accountability because of the complex accountability relationships pertaining to funding mechanisms, are applicable to Bangladesh. The Convention and the discussions in INC meetings revealed that the needs of developing countries have been acknowledged and necessary strategies, to some extent, have been articulated to address those deficiencies. However, funding under the Convention is to be provided via a third party, and the exact details of this arrangement are yet to be finalised. The situation is complicated by the fact that the primary funding mechanism – the GEF – sits outside the Convention, which means that there are additional accountability relationships between the Convention and the GEF, and between the GEF and funding recipients. One of the critical outcomes of COP 1 was that the Memorandum of Understanding between the Convention Secretariat and the GEF has not yet been agreed. This situation means that the extent to which developing countries will be able to discharge the same reporting responsibilities as those of their developed counterparts remains questionable and highlights the interrelated nature of accountability between developing countries, developed countries, and funding agencies. In relation to the case of Bangladesh, while there is additional focus on reporting by Bangladesh (as evidenced by the grants provided) and raising of awareness, there remains much work to be done, and the belief is that considerably more resources would be required for Bangladesh's reporting obligations to be fulfilled.

1.7.4. Summary of Paper 4: Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach

Paper 4 explores the frequency and quality of voluntary disclosures of mercury emissions by corporations that are large mercury emitters. Although there are numerous sources of mercury, most of the mercury emitted around the world is emitted by corporations. Given the toxic impact of mercury on human health and the environment, are emitting corporations taking sufficient responsibility for their emissions? Do they disclose what they are emitting? What is the impact of these emissions? What are the measures taken by corporations for controlling their emissions? Previous literature depicts that corporations do not adequately disclose their activities. Gray (2005, p. 12) observed that

only a minority of companies report; reporting almost never offers a complete picture of organisational activity ... Social responsibility reporting is exceptionally selective ... Accountability is not discharged.

Corporations are expected to disclose environmental information as the public has the *right* to be informed (Belal & Owen, 2007; Hadden, 1989; Roe, 2000; Sarokin & Schulkin, 1991). Previous research recommends that reporting environmental information to the public can instigate reduction emission initiatives by industries as a result of stakeholder pressures (Blackman et al., 2004). One of the purposes of SEA is to improve the accountability of reporters (Belal et al., 2015; Tilt, 2009). The definition provided by Gray (2000, p. 250) states that

... The social account may serve a number of purposes, but discharge of the organisation's accountability to its stakeholders must be the clearly dominant of those reasons and the basis upon which the social account is judged.

The research question Paper 4 addresses is, *To what extent do major corporate mercury emitters voluntarily disclose information about their mercury emissions?* The accountability of the major mercury emitters is examined through their voluntary disclosures of mercury information in their annual reports, sustainability reports or environmental performance reports, or on their websites. Despite mercury being one of the most toxic substances known, no previous studies have been found that examine voluntary corporate mercury disclosures. A qualitative content analysis approach was used to evaluate, based on a “best practice” disclosure format, the 100 highest-emitting facilities in the world as identified from five PRTRs: the US’s TRI, the Australian NPI, the Canadian NPRI, the UK’s PI, and the EU’s E-PRTR. A total of 23 elements of best-practice disclosure were developed considering the GRI standard on emissions; the reporting format for mercury under the Minamata Convention; relevant literature including Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010) and Walcek et al. (2003); and sample disclosures of the companies including Barrick Gold Corp (the US), Kalgoorlie Consolidated Gold Mines (Australia), and EVRAZ Inc. NA Canada (Canada).

Paper 4 shows that only 32% of major mercury-emitting companies disclose mercury information, and even these disclosures provide limited mercury information. Across the sample, however, a range of mercury-related topics were discussed, including emission-reduction strategies (including technologies), ongoing mercury monitoring and management plans, operational regulatory requirements, interactions and compliance, total mercury emissions, other sources of mercury emissions other than mercury-added products and processes, the impact of mercury emissions, objectives and commitment to reduce mercury emissions, and changes in mercury emissions. The study suggests that there is a pressing need to develop a mandatory mercury accounting and reporting standard. The analysis of the materiality assessment and environmental reporting assurance of the sample companies shows that 46 per cent of the mercury-reporting companies disclose materiality assessment processes and also get external assurance on their environmental reports, and that only 26 per cent of non-mercury-reporting

companies disclose materiality assessments and obtain external assurance of their environmental reports. These findings suggest that adoption of corporate materiality assessment processes and/or external assurance may substantially increase the voluntary disclosure of mercury information. In terms of promoting global corporate disclosure, an additional finding was that significant differences among the PRTRs hinder the comparability of pollutant information. It is therefore suggested that greater harmonisation of PRTRs would facilitate global mercury reporting.

1.8. The Contribution of This Thesis

This thesis is positioned within the research tradition of SEA. SEA's origins stem from the early 1970s, when a movement developed with the aim of communicating the impacts of organisations' actions on particular groups in society or society as a whole – that, is a wider accountability to society (Bebbington et al., 2014; Gray et al., 1987). Since 1985, SEA has primarily focused on environmental issues, gradually incorporating sustainability aspects into its remit in response to social expectations and providing an avenue for organisations to outline their response to environmental change. Environmental accounting dominated social accounting in the 1990s, during which time sustainability and sustainable development were emerging areas of interest (Mathews, 1997). Previous literature (Deegan, 2017; Gray & Laughlin, 2012; Mathews, 1997; Parker, 2011) highlights that SEA research has made significant advances and covered a wide variety of social and environmental issues. However, environmental concerns around the world continue to evolve, and SEA has not yet contributed to some of these emerging issues. The pioneering SEA researchers, Deegan and Rankin (1997) and Guthrie and Parker (1990), were primarily focused on narrower SEA research, and SEA research has mirrored that narrow focus, emphasising environmental challenges including global warming, water, human rights, and deforestation. However, a key environmental challenge that has received little attention is mercury.

Previous literature (Deegan, 2017; Gray & Laughlin, 2012; Mathews, 1997; Parker, 2011) identified that SEA research has made significant progress during recent decades, but there is still a long way to go. A few studies have identified some critical issues to which SEA has not yet contributed (Deegan, 2017; Gray & Laughlin, 2012).

This thesis recommends three fundamental measures for strengthening mercury reporting, ensuring accountability of the reporting entities, and achieving the objectives of the Minamata Convention. Firstly, sufficient resources should be ensured at the national and global levels. Since the level of resourcing limits the quality of reporting (verification cannot be materialised due to lack of employees and funds) and the capability of the parties determines the level of accountability. Secondly, improvement in country-level information capture and reporting should

be facilitated. The current level of country-level reporting, even in developed countries, is lacking in providing high-quality information, and these limitations may jeopardise the achievements of the Convention. Finally, mercury-specific corporate reporting guidelines should be developed. Currently, there are no guidelines for corporate mercury reporting. Such reporting guidelines would be expected to improve the quality of corporate disclosure and facilitate corporations throughout the reporting process.

In addition to contributing to policy via suggesting improvements to the reporting of mercury under the Minamata Convention, this thesis seeks to contribute to the SEA in five ways. Firstly, by providing an initial exploration of this important environmental issue, given that mercury is one of the world's most toxic substances. It aims to fill the gap in the SEA literature, which to date has covered a wide range of social and environmental issues, including carbon (Bowen & Wittneben, 2011; Haslam et al., 2014; Stechemesser & Guenther, 2012; Uddin & Høltedahl, 2013), water (Hazelton, 2013b, 2014, 2015; Tello et al., 2016), climate change (Cooper & Pearce, 2011; Milne & Grubnic, 2011; Rankin et al., 2011) and biodiversity (Jones & Solomon, 2013; Samkin et al., 2014; Tregidga, 2013), but not mercury.

Secondly, this thesis explores how mandatory corporate mercury reporting can enhance accountability. While most SEA research investigates voluntary corporate reporting, this thesis (in Paper 2) explores mandatory corporate reporting to a governmental regulatory body, namely the Australian NPI. Given previous calls within the SEA literature for mandatory reporting (Adams, 2004; Gray & Milne, 2004), the study aims to provide some insight into the extent to which a mandatory reporting regime can enhance accountability. In addition to governmental mandatory reporting to a national reporting instrument, this study (in Paper 1) explores mandatory country-level reporting of mercury to a global regulatory body, namely the UNEP Secretariat.

Thirdly, this study problematises the ongoing narrative within SEA that only corporations are responsible for poor-quality reporting and disclosures of social and environmental information. In contrast, Paper 2 finds that the key problem is not mandatory corporate reporting, but rather the lack of high-quality governmental reporting. The paper shows that corporations are submitting their reports (detailing point-source emissions) in time to the regulators, but due to the governmental process, publication of data is somewhat delayed. Even more importantly, much diffuse-source information is either not collected or substantially delayed. Moreover, governmental resourcing is also observed to be a critical factor in determining the quality of environmental reporting (Mee, 2011). However, Paper 4 suggests that the stakeholder-focused corporate materiality assessment process has fundamental problems because this approach does not consider broad-based societal concerns (that is, MEAs), and consequently misses some of the material items in its disclosures.

Fourthly, this thesis shows how the conceptual framework of accounting can be a useful tool for assessing high-quality non-financial information accounting and reporting. We are only aware of the use of these characteristics by Comyns and Figge (2015), O'Dwyer et al. (2005), and Burritt and Saka (2006) for evaluating environmental management accounting information, the GRI (2011) and the NPRI (2017) for ensuring the quality of the environmental data that they provide for public use, and the OECD (2008) for ensuring the quality of the environmental information provided by PRTRs. This thesis used six of the qualitative characteristics of accounting information – understandability, accuracy/reliability, verifiability, comparability, completeness, and timeliness – and demonstrated how this tool could be used as a mechanism for ensuring the accountability of environmental reporters. None of the studies and regulators uses “verifiability” for environmental information. However, this thesis observes that verifiability, while lacking in the current reporting process, is the main significant criterion that ensures the quality of the data and the accountability of the reporters.

Fifthly, our study extends the theoretical understanding of accountability in the context of MEAs. The study identifies the complex nature of accountability in MEAs due to assistance by the developed countries to the developing countries, and the capability and responsibility of the parties to the MEAs. Paper 3 draws on the insights of Gupta and Asselt (in press) and shows that developed countries are accountable to the respective secretariats, and also to the developing countries for their donation commitments. On the other hand, developing countries are accountable to the Secretariat, to developed countries and to global citizens for using the assistance and reporting it appropriately. Paper 2 also shows that resourcing significantly influences the accountability of governmental reporting. Collectively, the findings of these two papers show that funding (resourcing and capability of the entity) is a determinant of accountability, but is an aspect of accountability that has been largely ignored by previous researchers.

Finally, this study also improves the understanding of the role of pollutant databases – a key government and community resource that been considered in a few prior studies in the SEA literature. Paper 2 uses the Australian PRTR (NPI), and Paper 4 utilises five PRTRs – the TRI in the US, the Australian NPI, the Canadian NPRI, the PI in the UK, and the E-PRTR in the EU – for evaluating the quality of the provided data. However, previous research focusing on PRTRs (Howes, 2001; Lloyd-Smith, 2008; Thorning, 2009), primarily utilises only data from PRTRs, rather than examining its quality. The approach of the PRTRs is similar, so the results may be relevant for researchers seeking to explore reporting of other pollutants and/or the operation of pollutant inventories in other jurisdictions.

1.9. Conclusion

This chapter has provided an overview of the toxicity of mercury, the implementation of the Minamata Convention to reduce mercury emissions, and the importance of research on mercury reporting given the concerns raised by the scientific community. A summary of the four research papers forming the basis of the thesis has been provided, and their contribution to the SEA literature discussed.

The remainder of the thesis is structured as follows. The next chapter (Chapter 2) reviews the relevant literature, and Chapter 3 presents the relevant theoretical framework. Each of the four papers is then presented as a stand-alone work in publishable format (Chapters 4–7). Following the four papers, the Conclusion section (Chapter 8) summarises the key insights gained from considering the four papers collectively. Limitations and areas for future research are then provided.

Chapter 2

Literature Review

Literature Review

2.1. Introduction

Though social and environmental accounting (SEA) has focused on different social and environmental issues since the early 1970s, there are some crucial environmental aspects that still remain unaddressed. From the mid-1980s to the mid-1990s SEA concentrated primarily on environmental issues and on describing the steps that organisations were taking in response to environmental change (Mathews, 1997). Wider sustainability elements were only gradually incorporated, leading authors such as Gray (2002a) to state that there remained significant scope for conducting further SEA research. More recently, however, Gray and Laughlin (2012, p. 228) suggest that SEA research has moved too far from its original mission, suggesting that “researchers appear to be less willing to examine the fundamental issues that originally motivated the development of the field”. Similarly, Guthrie and Parker (2017, p. 12) ask why SEA researchers are paying little attention to issues relating to the sustainability of the planet:

Why do we still pay so little attention to issues of social responsibility and accountability and the sustainability of the planet? Are these not the topics that accounting researchers should grasp? Should not accounting researchers assist their wider communities in building better awareness and understandings of these problems and how to solve them?

In recent years there has been important research undertaken on fundamental SEA issues. For example, SEA has engaged with core environmental issues such as carbon (Haslam et al., 2018; Matsumura et al., 2014; Qian & Schaltegger, 2017), water (Hazelton, 2015; Tello et al., 2016) and biodiversity (Adler et al., 2018; Cuckston, 2017), as well as core social issues such as human rights (Cooper et al., 2011; Hazelton, 2013a).

There is also demand, however, for more pragmatic contributions by the “new accounting” school. For example, Gray et al. (2014b) critique the impact of the current social accounting methods and envision a radical change in how social accounting could be integrated into actual sustainability practices. Gray et al. (2014b, p. 271) suggest that the existing social accounting method has “uncritically and unreflectively developed into a monolithic practice that in effect prevents any genuine accounting”. By contrast, SEA researchers not only produce quality publications but also create knowledge that would be beneficial, useful, usable, and actually applied by the practitioners (Gray et al., 2014b; Thomson, 2014). Furthermore, Lodhia (2014, p. 289)

also describes the significance of new accounting in the environmental challenges: “[N]ew accounting approaches ... suggest ways of reducing environmental impacts and negative social effects are put forward and analysed in actual practice.”

In particular, there have been calls for this new accounting to actively contribute to sustainable development. For example, Gray (2010) and Bebbington and Larrinaga (2014) critique the existing SEA literature for its weaknesses in contributing to the issues concerning sustainable development, and they argue that SEA risks becoming irrelevant. As Bebbington and Larrinaga (2014, p. 396) suggest, “There are some underlying elements of sustainable development that, if not recognized, might lead to accounting scholarship being decoupled from sustainable development concerns.”

In order to better align SEA research with sustainable development, there have been recent calls for research that explicitly engages with the U.N. Sustainable Development Goals (SDGs) (Bebbington & Unerman, 2018b). A number of SDGs directly or indirectly focused on mitigating environmental pollutants, the main challenges to sustainable development. Among others, SDGs 2, 3, 7, 9, 11, 12, 14, and 15 specifically set targets to reduce environmental pollutants. For example, SDG 3.9 seeks to “by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination” (UN, 2015).

As well as calls in relation to the topic of SEA research, there have also been calls in relation to the entities that are considered in SEA studies. Historically, the main focus of SEA has been corporations, and hence corporate disclosure studies have been the core subject in the field (Gray, 2002a; Gray & Laughlin, 2012; Guthrie & Parker, 2017; Mathews, 1997). Such research has yielded important insights. For example, the location of environmental information is changing (Guthrie et al., 2008; Tilt, 2008), but corporate accountability to the public is still in question (O’Dwyer & Unerman, 2008). Corporations do not disclose credible and sufficient information to the stakeholders (O’Dwyer et al., 2005), and they adopt policies that are socially and environmentally damaging while claiming to possess the “attributes of openness, honesty, transparency, being accountable and trusting/trustworthy” (Tregidga et al., 2014, p. 489).

Whilst research on this topic has been, and will continue to be, valuable, there is also increasing recognition that entities other than corporations also play an important – even central – role and therefore deserve greater attention in the accountability field. Consequently, calls for new accounting methods also suggest that SEA research should focus on the currently absent non-

market entities, including “churches, charities, NGOs, the World Bank, the United Nations (and its component organisations), states themselves, universities, health entities....”, where accountability is also significant (Gray et al., 2014b, p. 270).

As well as the topic and the entities involved, a further element that has received attention in reviews of SEA research is the location of study settings, and specifically the overemphasis on the developed as opposed to the developing world (Belal & Roberts, 2010; Sobhani et al., 2012). Guthrie and Parker (2017, p. 12) pose the following question:

We ask why accounting scholars are not at the forefront of pressing debates involving the futures of people in our societies and in different regions of the world where life is experienced as even more challenging than the Western world.

Various studies have depicted the vulnerabilities and challenges of people living in the developing world (Belal et al., 2013), including lack of awareness and inadequacy of regulations (Barrios, 2004; Kuasirikun, 2005; Lodhia, 2003), and administrative weaknesses in implementing rules and regulations (Hossain & Alam, 2016; Nurunnabi, 2016). Importantly, the recent studies of Siddiqui and Uddin (2016) and Sinkovics et al. (2016) highlight the role of the government in developing countries in upholding the human rights of the poor workers. In the first study, Siddiqui and Uddin (2016) investigate the case of the Rana Plaza disaster in Bangladesh and explore how the unethical inclination of the state towards private sector business may favour greedy political/business leaders and deprive the poor labourers of their fundamental human rights. In the second study, Sinkovics et al. (2016) examine the aftermath of the Rana Plaza disaster and observe that companies only place emphasis on meeting the measurable indicator goals over the other important factors because of the external pressure for compliance.

Responding to these various calls for extending SEA research, this thesis examines reporting in relation to mercury, one of the world’s most toxic substances, but one that has not previously received attention within SEA. Due to its significance as a major pollutant, mercury research responds to the calls of Gray and Laughlin (2012) and Guthrie and Parker (2017) for researchers to engage with core environmental issues. Given the SDG focus on pollutants, this research also responds to the calls for SDG-related research by Bebbington and Unerman (2018b). In addition, much of the thesis focuses on new accounting mechanisms beyond the corporate disclosures that are the typical mainstay of SEA, the reporting regime of the Minamata Convention in Papers 1–3, and the Australian National Pollutant Inventory in Paper

2. Finally, the research engages with a developing country context in Paper 1, and this context is the setting for Paper 3.

The remainder of this chapter is structured as follows. Section 2.2 provides an overview of previous research on mercury. Section 2.2.1 discusses research specific to the Minamata Convention, and broader research on MEAs is discussed in Section 2.2.2. Drawing on this overview of previous work, Section 2.3 then presents the research literature with an emphasis on gaps that specifically inform each of the papers comprising this thesis. Section 2.4 concludes the chapter.

2.2. Research on Mercury

Mercury is one of the worlds' most toxic substances and has attracted the attention of world policymakers in seeking to control its impact. In collaboration with the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry (ATSDR) has compiled a list called the "Top 20 Hazardous Substances", which identifies mercury as the third most hazardous substance after arsenic and lead (ATSDR, 2001). Similarly, mercury pollution from artisanal small-scale gold mining (ASGM) was listed as the world's most important pollution problem in 2013 (Worstpolluted, 2014). As an element, mercury cannot be damaged or condensed into new substances that are themselves not harmful to people and the environment (UNEP, 2011).

Not only are all forms of mercury toxic, but mercury also comes into contact with humans in diverse ways. Scientists have understood the severe toxic effect of mercury since the 1950s after the Minamata incident in Japan (Minamata Disease Research Group, 1968), where more than 2,200 people were severely impacted and tens of thousands more exposed to mercury poisoning (Yorifuji et al., 2012). Humans may come into contact with mercury primarily by breathing, drinking water, taking in fish and other diets, and digestion of soil (Zhang & Wong, 2007). Methyl mercury (MeHg) is the most poisonous form of mercury because of its capacity to develop inside organisms in the diet chain (UNEP, 2011). Exposure to it is strongly related to diets and generates from a specific class of freshwater fish and seafood (USEPA, 1997; Weihe et al., 2005). MeHg is, importantly, neurotoxic, and its negative impacts are observed in different organ systems until the end of life (Bjornberg et al., 2003).

Mercury exposure has many negative impacts on human health. All kinds of mercury are harmful to the nervous system, and high-level exposure can destroy the kidneys, the brain, and the developing foetus (NPI, 2014). Among others, different types of severe problems include

changes in vision, shyness, tremors, irritability, hearing problems and memory problems, because of mercury's impacts on the brain. Extreme exposure to mercury may cause deadly pain in the chest, shortness of breath, and development of fluid in the lungs (NPI, 2014). Studies have identified that offspring of mothers had more contact with mercury while pregnant tested lower on academic attainment, language improvement, reasoning activity, and common intellect (Crump et al., 1998; Kjellstrom et al., 1986; Kjellstrom et al., 1989).

Previous literature has considered a number of facets of mercury pollution, examples of which include

- mercury sources, forms, estimation, inventory, behaviour, speciation (Nelson et al., 2012; Nelson et al., 2009; Zheng et al., 2011);
- ASGM (Telmer & Veiga, 2009; Valdivia & Ugaya, 2011);
- the impact of mercury on overall environments (Bastos et al., 2006; Hylander & Goodsite, 2006; Zhang & Wong, 2007);
- the impact of mercury on the health of the human being (Groth, 2012; Valera et al., 2011);
- the effects of mercury on the womb and children (Bose-O'Reilly et al., 2010; Zahir et al., 2005);
- mercury tracing through hair (Bender, 2013; Chien et al., 2010; Endo & Haraguchi, 2010);
- dental amalgam in relation to mercury (Chirba-Martin & Welshhans, 2004; Richardson et al., 2011; ZMWG, 2012); and finally,
- mercury and consumption of fish (Agusa et al., 2005; Castilhos et al., 2006; Dolbec et al., 2001).

Though not their main focus, some studies identified various quality limitations of the mercury disclosures. These studies include UNEP (2013a), AMAP/UNEP (2013a), Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010), and Walcek et al. (2003). Information on mercury is in most cases not reliable, relevant, or well-understood. Data collection from ASGM is still a challenge because ASGM is unregulated and, in some cases, illegal (UNEP, 2013a). As a result, the relevant data on ASGM is usually not available through official networks (UNEP, 2013a). AMAP/UNEP (2013a) observed apparent discrepancies between reported emissions assigned to point sources in several national/regional pollution-release inventories, and they are of the view that it is because of estimation and

reporting procedures. Similarly, Mohapatra et al. (2007) established that audits of emission inventories depict significant differences between actual and estimated emissions. Research on global emissions uncovered significant underreporting of mercury discharges compared to the actual emission from waste furnaces (Hylander & Meili, 2003). Observing the inaccuracy of mercury data, Nelson et al. (2009) argued that “higher quality data should be collected”. This builds on the work of Walcek et al. (2003), who proposed the development of a central repository of data on hazardous air pollutants (HAP) with clearly defined requirements on reporting parameters as a solution to these errors and discrepancies. Furthermore, Nelson et al. (2009), Telmer and Veiga (2009), and Strezov et al. (2010) raised questions on the understandability of mercury data, stating that these data are not well understood due to inconsistencies in estimation and reporting.

Different factors negatively affect the comparability, consistency, and predictive value of mercury information. UNEP (2013a) and AMAP/UNEP (2013a) observed that comparative analysis of global mercury emissions during the last 25 years is impossible due to changes in reporting and estimating approaches, addition of new sectors, and differences in specification and classification of sectors. In addition, AMAP/UNEP (2013a) identified the approaches and underlying assumptions, release estimates and different databases/registers covering different industry sectors and economic activities considered in various national and global reporting systems as the constraints on comparability. Furthermore, changes in methods and units and lack of coordination among the States produced inconsistent results (Walcek et al., 2003). In view of this, UNEP (2013a) advocated for consistent methods of estimating and reporting, which is in line with the work of Nelson et al. (2009). In this regard, the goal of UNEP (2013a) is to build models for forecasting actual mercury emissions that may be the only ones used for policy decisions.

The verifiability, materiality, and adequacy of mercury information are also questionable. Nelson (2007) observed that the centralised reporting system of the NPI communicates data between industry and government provides very limited scope for verification of mercury information. Materiality, or a threshold level, underestimates the total mercury emissions because emissions below that level from a particular source are not considered for reporting (AMAP/UNEP, 2013a). AMAP/UNEP (2013a) expressed concern that information regarding global releases of mercury to aquatic systems is still incomplete and that these may be underestimated or overestimated (Telmer & Veiga, 2009). Nelson (2007) also expressed disappointment with the completeness of mercury information.

In response to such concerns, as noted in Chapter 1, the Minamata Convention was initiated by UNEP as a global approach to mercury control (UNEP, 2013b). Understanding the toxicity of mercury and its transboundary nature, and observing the failure of the national and regional agreements, the UNEP developed the Convention based on decade-long discussions and efforts by the global community (Selin, 2014). The Convention has been signed by 128 countries (including Australia) and ratified by 84 countries, and it is now in force as of 16 August 2017 (UNEP, 2017). As with other multilateral environmental agreements (MEAs), reporting provisions have been asserted as a mechanism of accountability for controlling mercury.

Various provisions of the Minamata Convention require the parties to provide information on mercury relevant to the Secretariat. Each party to the Minamata Convention must report to the Secretariat on the actions it has adopted and the effectiveness of those actions in achieving the ultimate goal of the Convention [Article 21] (UNEP, 2013b). Parties are expected to provide information, where relevant, on (a) mercury supply [Article 3]; (b) mercury import and export [Article 3]; (c) production, supply in commerce, and trade of mercury-added goods [Annex A]; (d) steps taken to phase out mercury-added products and the amount already reduced; (e) evidence of developments in reduction and eradication of atmospheric emissions and releases [Articles 8 and 9]; (f) financial and technical supports [Articles 13 and 14]; (g) evaluations of improvements to the implementation plan [Article 15]; (h) progress reports on the implementation plan; and (i) other data or reports as required by the Convention (UNEP, 2013b). A reporting format was approved in UNEP (2017a) for reporting of the required information. The format consists of four parts. Part A calls for general information on the party; Part B calls for information on (i) the measures taken by the reporting party to implement the relevant provisions of the Minamata Convention, and (ii) the effectiveness of such measures in meeting the objectives of the Convention. Part C requires the identification of possible challenges in meeting the objectives of the Convention. Part D seeks comment on the reporting format and possible improvements. Research that has engaged with the Convention (including the reporting elements) is discussed in the following section.

2.2.1 Research on the Minamata Convention

Previous research on the Minamata Convention has provided an overview of the development of the Convention, mercury control under the Convention and, importantly, compliance with and implementation of the Convention. For example, Eriksen and Perrez (2014) provide an overview of the negotiation history, identifying the difficulties in the negotiation process and factors behind the success of the negotiations, the main elements of the Minamata Convention,

and the main factors behind the Convention. Templeton and Kohler (2014) concentrate on the issues that facilitate the agreement to establish an implementation and compliance mechanism during the negotiation of the Minamata Convention. They suggest that agreement must consider the role of individual leaders in strategically guiding delegates to identify the points at which their interests converge. You (2015, p. 1) investigates the possible reasons for the general approach to mercury reduction and terms the Convention as “source-specific” because the reduction targets apply “to specific categories of pollution sources through the regulation of specific sectors of the economy and social life”.

Most previous studies emphasise the Convention’s impacts on different regions and industries, as opposed to accounting and reporting quality. For example, Spiegel et al. (2018), reporting on ASGM in Indonesia, highlight how the lack of interconnectedness of researchers, regulators, and labour forces may hinder implementation of the global efforts in the local context. Buccella (2014) examined illegal gold mining in Peru and identified the likely impact of implementation of the Minamata Convention on Peru, while Hilson et al. (2018) evaluate the likely impact of the Convention on gold mining in Sub-Saharan Africa. Rotondi and Smaczniak (2014) evaluate the likely impact of the Convention on the US and stated that the US’s regulatory structures are already in such a position that the implementation of the Convention will have little or no impact. Jarvis (2015) examines the impact of the implementation of the Minamata Convention on the EU and expects that the existing mercury strategies of the EU are similar to those of the Convention, so the EU will not require too many changes. And implementation of the Convention will benefit the EU, although there will be inevitable extra administrative costs and funding to the developing nations, protecting them from global anthropogenic mercury emissions. The study of Giang et al. (2015) on the impact of the Convention on coal-fired power generation in Asia found that India and China will significantly reduce mercury emissions even though they use current technologies, while the study by Ancora et al. (2016) on China found that by only spending one quarter of the US’s cost, China would be able to achieve the targets of the Convention. Finally, Meyer et al. (2016) describe how the Convention identified the importance of the commitment of the dental stakeholders, and their sustained efforts towards policy development from local to international level regarding mercury-free dental practices.

Some studies focused on the implementation of the Convention and cost-effective compliance options. For example, the study of Selin (2013, pp. 6-7) emphasises how the Minamata Convention may lead to a reduction in mercury emissions. The paper examined the key

provisions and specific implementation needs and suggested five important measures required to support improved mercury abatement and bolster the Convention: timely ratification and awareness creation, funding and other necessary supports, support for developing nations, support for mercury abatement-related research, and expansion of monitoring and data presentation for decision making. Ancora et al. (2016) studied the Convention from a scientific point of view, suggesting cost-effective compliance options for atmospheric mercury control in Chinese coal-fired power plants. They developed a best available technique (BAT) adoption model in the form of a decision tree, which showed the cost-effectiveness for each technological option, with the expectation that the BAT could provide early measures to help China meet the Minamata Convention's obligations.

Only a few papers concentrated on the accounting and reporting issues. For example, Strzelecka-Jastrzab (2018) investigate only the quantitative reporting data sources in Poland after reiterating the reporting requirements. The study found that the data available in Poland are inconsistent between the registers and are insufficient in meeting the requirements of the Convention. Moreover, the paper did not examine the detailed quality of the available data. Evers et al. (2016) propose a guide for short, medium and long-term evaluation of effectiveness and recommend the initiation of a technical document for the collection of relevant monitoring information. In examining the implementation of the Minamata Convention, Selin et al. (2018, p. 199) identify very malleable wording (using the word “shall,” “should” or “may”) of the convention despite it being a legally binding instrument. Similarly, Lin et al. (2017, p. 1070) express concern at the use of “very soft wording” such as “parties may” and “parties are encouraged to” in different operational articles of the Convention.

2.2.2. Research on other Multilateral Environmental Agreements

As the Minamata Convention is an MEA it is also relevant to consider research that has investigated other major MEAs such as the Basel, Stockholm, and Rotterdam Conventions and the Montreal Protocol. Though accounting and reporting provisions are an important part of each MEA, MEA research has generally been conducted from two perspectives: firstly, the impact of MEAs on pollution disclosures and policy decisions, and secondly, the factors influencing the success of the MEAs. The key themes relevant to the current study are that MEAs can have an impact in practice but that success depends on many factors, in particular access to financial and other resources.

In the first instance, several studies identified the impact of MEAs on corporate reporting and policy decisions. For example, some of the studies explored the impact of a country's ratification of the Kyoto Protocol on corporate carbon disclosures depending on firms' size (Freedman & Jaggi, 2005, 2011; Momin et al., 2017; Prado-Lorenzo et al., 2009; Saka & Oshika, 2014). Again the studies on the Kyoto Protocol show that involvement in carbon management (Aziz et al., 2018), environmental committees, institutional shareholdings, and board independence (Jaggi et al., 2018) are found to be influencing factors on corporate carbon disclosures. Hassan and Romilly (2018) identified the impact of corporate economic performance, environmental disclosure, and greenhouse gas (GHG) emissions on the policy implications for business strategy at organisational, national government, and international levels.

Some studies identified the impact of the Basel Convention on the movement of hazardous wastes and waste supply-chain networks (SCNs). For example, from the international law perspective, Khan (2016) argued that the weaknesses of the Basel Convention allow movement of hazardous electrical wastes in a condition that pollutes the environment and significantly impacts on the vulnerable people of the developing countries, and therefore the the Basel Convention is to some extent ineffective in controlling the movement of hazardous wastes. Ghosh et al. (2016) evaluated the waste electrical and electronic equipment management system and compliance with the Basel Convention in Brazil, Russia, India, China and South Africa (the BRICS nations). They found that the BRICS countries are facing similar challenges in waste electrical and electronic equipment management, specifically in the SCN including health hazards to the workers, water, soil, and other environmental pollution. They proposed that BRICS countries need to develop their SCNs following the SCN model that is used in the developed nations including the USA and the E.U. countries.

In the second instance, several studies have identified the success factors that influence the implementation of MEAs. Among those papers, some papers compared different MEAs and identified the success factors that might be replicated with other MEAs. For example, Liu et al. (2016) compared three conventions: the Basel Convention, the Rotterdam Convention, and the Montreal Protocol. They identified that lack of resources, lack of coordination, lack of specialised knowledge and expertise about environmentally sensitive commodities, and lack of focus on environmental issues by the developing countries all constrain the prevention of the illegal trade of hazardous waste and harmful chemicals. Sunstein (2007) compared the Montreal and Kyoto Protocols from the perspective of the US, which ratified the Montreal

Protocol but rejected the Kyoto Protocol. The paper argued that the US would ratify a protocol if the domestic benefit to the US was higher than its costs. Yoder (2003) identified that enacting practical provisions and encouraging more participation in the Stockholm Convention are among the success factors that may be replicated in the design and implementation of other similar MEAs. Similarly, Peloso (2010) compared two protocols – the Kyoto Protocol and the Montreal Protocol – and suggested modifying the Kyoto Protocol to make it widely acceptable by all the nations by mirroring the Montreal Protocol, which brought the whole world together to solve a common global environmental crisis.

Apart from the lessons from other MEAs, other factors also influence the implementation of the MEAs. For example, Zhao and Ortolano (2003) identified the roles of monetary motivation, local government participation, and administrative capability in implementing the Montreal Protocol. Ivanova (2007) investigated how corruption and illegal trade constrain compliance with the Montreal Protocol. In a study on the Rotterdam Convention, Daudu (2008) found that African countries are not capable of complying with the Convention and, therefore, needed significant national capacity-building supports. On the other hand, Al-Awad et al. (2018) examined how Jordan's Halon management capacity fulfils the internal needs of Halon and its commitment to the Montreal Protocol. Chambers (2008, p. 290) also highlighted the implications of complying with different agreements, particularly for the developing countries. He stated that "Developing countries are unable to cope with the extensive reporting and participation requirements of the current multilateral environmental structure, which has depleted expertise and resources for implementation." A study by Onyerikam (2007) on the Basel Convention found problems associated with compliance, and argued for an improved compliance strategy by adopting hard (enforcement) and soft (managerial) measures, including funding, external and internal monitoring and verification, and sanctions.

Several studies identify the issues that influence compliance with and implementation of the environmental agreements. For example, in relation to the Basel Convention, Ghosh et al. (2016) examine the waste electrical and electronic equipment management system and compliance with the Basel Convention in Brazil, Russia, India, China and South Africa (BRICS nations) and compared with the US and the EU's waste management systems to suggest the prospective ways of improvements. Among the studies on the Montreal Protocol, Zhao and Ortolano (2003) identify that monetary motivation, local government participation, and administrative capability play dominant roles in executing the Montreal Protocol, while the study of Ivanova (2007) correlates the relationship between corruption, law enforcement,

environmental policy, smuggling, and compliance with the Montreal Protocol. The findings show that knowledge of a country's level of corruption and its rule of law may help to determine the actual level of compliance with the Montreal Protocol.

Finally, some studies on MEAs also consider the issue of reporting, and find that reporting is often a problematic area of compliance, particularly for developing countries. For example, the studies of Loibl (2005) and Kurz and Apps (2006) highlight the significance of the development of accounting, reporting and information systems for compliance with and implementation of the international agreements. Loibl (2005) acknowledges that reporting and information systems have been an important means of encouraging implementation of, and compliance with, international environmental agreements. As parties to various agreements face difficulties in meeting the requirements including the different deadlines, he suggested that harmonisation and streamlining of reporting requirements under various environmental agreements might help to overcome some of the difficulties. Kurz and Apps (2006) examined Canada's development of the National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS) in support of its international obligations to report GHG sources and sinks. They found that the design of Canada's NFCMARS anticipated that new data, better scientific understanding, and refined ecosystem process models would become available in the coming years to meet international obligations.

This section has provided an overview of the research literature that informs this thesis as a whole. The following section discusses additional literature that is specifically pertinent to each of the four papers of the thesis.

2.3. Specific Gaps in the Literature on Mercury

2.3.1. Paper 1: Mercury reporting – the global perspective

The first paper primarily draws on the literature discussed in the preceding sections. In summary, environmental pollution is recognised as a global threat to sustainable development. To meet this challenge, numerous MEAs have been initiated including the Minamata Convention on mercury. However, researchers identify that implementation and compliance with the provisions of the MEAs are a challenge, particularly for the developing countries because of their limitations in resources, administrative, and legal structures. Moreover, the provisions of the convention (including reporting provisions) also have some inherent limitations. Although SEA research has concentrated on various aspects of the different pollutants, their impacts, mitigating strategies, effectiveness, reporting and disclosures, and

compliance with reporting provisions, no study has concentrated on whether the reporting provisions of the Minamata Convention will ensure the accountability of the parties to the Convention. The first paper of the thesis therefore endeavours to fill this research gap by answering the following two research questions:

- (a) To what extent will the reporting provisions of the Minamata Convention ensure the accountability of the countries for mercury emissions?*
- (b) How can the reporting provisions be improved to ensuring their accountability?*

2.3.2. Paper 2: Mercury reporting – a developed country perspective

As a signatory of the Minamata Convention, Australia will collect and submit information on mercury to the Secretariat. An important question is therefore whether Australian data on mercury would be sufficient to meet Australia's commitment under the Minamata Convention, and the second paper of the thesis identifies and endeavours to address this question. An overview of the relevant literature, which is distinct from the literature discussed previously in this chapter, is presented below. This comprises two main elements: previous research on the database that will be the source of reporting, and previous research on Australian mercury emissions.

Along with other 93 pollutants, the Australian National Pollutant Inventory (NPI) records mercury emissions. The NPI is an example of a mechanism more generally known as a Pollutant Release and Transfer Register (PRTR). PRTRs play a significant role in collecting data on from the emitters and disseminating this information to the stakeholders for their use in making policy decisions.

Only a handful of studies have been conducted on pollutant databases. For example, the study by Fung and O'Rourke (2000) exposed how the replacement of "populist maxi-min regulation" in place of the conventional "command-and-control" could achieve a dramatic triumph for the Toxics Release Inventory. The paper depicted the role of environmental information in making different social groups aware and in influencing the worst environmental performers. Gerde and Logsdon (2001) also evaluated four comparatively comprehensive databases available in the US, namely the USA Environmental Protection Agency's Toxics Release Inventory; the Kinder, Lydenberg, Domini SOCRATES database; the Council on Economic Priorities Corporate Responsibility Reporter database, and the Investor Responsibility Research Center database. Fung et al. (2004) evaluated the role of information disclosures of six U.S. government systems including the TRI for exploring the dynamics of transparency. This paper

found that some programs have enriched the use, scope, and quality of information, but some programs only add more cost for disclosure without creating any benefits to the users.

Though some studies have identified the successes of PRTRs, a few researchers have also exposed the limitations of those databases. For example, Atlas (2007) scrutinised the role of the TRI's information in improving the knowledge of the public living in the vicinity of the industries that use toxic elements, and described the TRI program as ineffective. Mee (2011) evaluated the global comparability of the national PRTRs and observed the barriers in comparing those among different jurisdictions. Similarly, Burritt and Saka (2006) examined six PRTRs based on the qualitative characteristics of accounting information as stated in the conceptual framework of accounting and exposed the quality limitations of the environmental information.

In the Australian context, the NPI also did not get much attention from an SEA perspective. Only a few studies focused on the awareness of the NPI, the use of the NPI database or website, and the impact of the NPI's decision on corporate behaviour. As Howes (2001a, p. 534) observed, "Very little analysis of the NPI has been undertaken in either the popular or the academic spheres." Thorning (2009b) found that only 23 per cent of the 609 general population surveyed were sufficiently aware of how to collect and use information from the NPI website. On the other hand, in evaluating the issues of communication of the NPI, Riley-Smith and Binder (2003) found that only six per cent of 582 respondents and Lock and Gleeson (2006) observed that only 13 per cent of people had heard the name of the NPI (truly aware less than 5%). Howes (2000) compared the NPI and the TRI and found that the NPI database is easier to use than the TRI, but the TRI provides more interpretation of the data than the NPI does. Cunningham and Gadenne (2003) found that the Australian NPI's decision to give the public access to the corporate emission data significantly influenced the corporate environmental information disclosure in annual reports. Only Cooper et al. (2017) and Lloyd-Smith (2008a) focused on the role of the NPI in providing information to the community.

A few studies observed that the NPI provides an inaccurate, inconsistent, and partial environmental pollution picture to the community. For example, Cooper et al. (2017) objected that the NPI fails to fulfil its legislative goals as it provides inaccurate and inconsistent information on lead. Lloyd-Smith (2008a) showed that the NPI provides very limited information compared to the TRI and the NPRI. Whereas the TRI provides data on more than 600 substances and the NPRI 176, the NPI provides information on only 93, and hence the NPI

data cannot provide a fully accurate picture of the environment (Lloyd-Smith, 2008a). Although the NPI has been changing its industry reporting requirements, many of the concerns of the affected parties and social communities were still not entertained, including “pesticides, chemical storage and emergency response plans” in its reporting process (Lloyd-Smith, 2008a, p. 7).

Along with the overall limitations of the PRTRs and specifically of the Australian NPI’s reporting processes and disclosures, several studies have identified quality issues regarding mercury disclosures. For example, numerous previous scientific studies including UNEP (2013a), AMAP/UNEP (2013a), Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010), and Walcek et al. (2003) have identified several quality limitations of current mercury reporting and disclosures, though reporting was the primary focus of these studies. Specifically, Nelson et al. (2009), Telmer and Veiga (2009), and Strezov et al. (2010), identified the weaknesses in understandability, Mohapatra et al. (2007) and UNEP (2013a) expressed concerns about accuracy and reliability, AMAP/UNEP (2013) pointed out the limitations in comparability, Nelson (2007) reported issues with verifiability, and Walcek et al. (2003) questioned the consistency of mercury information.

Considering the above weaknesses of mercury reporting in Australia, the question may arise as to whether the NPI’s mercury reporting quality would meet the reporting provisions under the Minamata Convention. As a signatory of the Minamata Convention, Australia will have mercury reporting obligations under the Minamata Convention and will utilise the NPI to undertake this reporting. In view of this, the second paper endeavours to fill this research gap. The present study thus expects to answer the research question: *Is the Australian National Pollutant Inventory’s mercury accounting and reporting adequate to meet the reporting obligations under the Minamata Convention?*

2.3.3. Paper 3: Mercury reporting – a developing country perspective

The third paper examines reporting under the Minamata Convention from the perspective of a developing country. Since the developing countries have financial, administrative, and regulatory weaknesses, they are the worst sufferers from environmental disasters. In some cases, developing countries bear the consequences of the technological development of the developed world. Different environmental agreements, including the Minamata Convention on mercury, include special considerations for the developing countries in relation to funding and compliance with the provisions of the agreements. However, previous literature demonstrates

that developing countries struggle to comply with the provisions of the MEAs. Eliminating mercury, as a transboundary element, is impossible without the active participation of the developing countries. An important question, therefore, is whether developing countries will be able to meet the reporting requirements of the Minamata Convention, and to what extent the limitations of the developing countries have been acknowledged in the Convention and in other relevant discussions. This paper also draws on the literature discussed in Sections 2.1 and 2.2, but specifically considers previous work that has focused on the developing world. This literature is reviewed below.

Though developing countries exist in vulnerable conditions and are the worst sufferers from the impact of the global pollutions, they have not attracted much attention in SEA research. More than 92 per cent of pollution-related deaths are in developing countries, and 25 per cent of the deaths in those countries are attributable to pollution (ITT, 2017). Despite this, there is a dearth of social and environmental accounting research that considers developing countries (Belal & Roberts, 2010; Sobhani et al., 2012). Most of the SEA studies have been conducted from the perspective of developed countries (Belal & Cooper, 2011; Belal & Roberts, 2010). More specifically, the contribution of SEA research to the corporate and public sectors of the developing countries is very limited (Goddard, 2010; Kabir & Akinnusi, 2012), and therefore there are appeals for more concentration in SEA research from a developing countries perspective to improve the socio-environmental situations and regulatory structures (Belal & Roberts, 2010; Sobhani et al., 2012).

Active participation of the developing countries is a must for achievement of the expected outcomes of MEAs. Though developing countries were lagging behind before the 1990s, they are now gradually more active in the negotiations of MEAs (Najam, 2005). Such greater participation is the prerequisite for the success of MEAs (O'Brien & Gowan, 2012), particularly in the case of the MEAs aiming to control the toxic elements, which are transboundary in nature. If a developing country does not cooperate and comply with the provisions, then the efforts of the whole world may be in vain. To achieve the expected outcomes from an MEA, the whole world should work together in targeting a common goal (Susskind, 2008). It is for this reason that MEAs bring the countries to a single platform for cooperating with each other in mitigating environmental challenges (United Nations Development Programme, 2003). However, differences in capabilities of the developed and developing countries create tension and slow the process of implementation of MEAs (Susskind, 2008).

Lack of resources and other capabilities hinders developing countries from implementing the MEAs. Only a few studies including those of Trasande et al. (2016), Ambalam (2014), and Daudu (2008) identified the limitations of the developing countries in complying with the provisions of the MEAs. However, these studies did not focus on the Minamata Convention on mercury, nor do they consider mercury reporting issues. Daudu (2008) examined the capabilities of the African countries in implementing and complying with the Rotterdam Convention and observed that African countries lack the capacity to effectively fulfil their obligations. He thus suggested taking initiatives to strengthen the capabilities of those countries. Ambalam (2014) also observed that the level of compliance with the MEAs is still one of the major challenges for the developing countries. Based on these capabilities, developing countries such as China and India have been allowed one more decade to achieve the same target of the Montreal Protocol as that of most of the developed countries (Susskind, 2008).

Other factors including policies and plans, skilled human resources, the democratic environment, and the willingness and commitment of the political leaders also influence developing countries to comply with the MEAs. Although most of the research identified financial resources, other factors including administrative weaknesses (Kannan, 2012; Zaelke et al., 2005), lack of policies and appropriate plans (Kannan, 2012; Zoeteman & Harkink, 2005), lack of necessary equipment and skilled human resources (Raustiala, 1997; Selin et al., 2018), and lack of financial, technical, and scientific resources (Chayes & Antonia, 1995; Economic Commission for Africa, 2007; Kannan, 2012; Selin et al., 2018) stymie developing countries from incorporating the environmental issues in their national agenda and complying with the MEAs. Moreover, local political leaders, the democratic environment, and the willingness and commitment of the government also influence the implementation of the MEAs (German Advisory Council on Global Change, 2001; O'Brien & Gowan, 2012).

Though mercury emissions have been significantly increasing in Asian countries including Bangladesh, they have not received much research attention from a developing countries perspective, particularly from an SEA point of view. For example, Huang et al. (2017, p. 230) examined anthropogenic mercury emissions in China from 1980 to 2012 and reported a more than 480 per cent increase, with coal combustion contributing the most to these emissions. Focusing on the economic benefits of reducing mercury emissions, Zhang et al. (2017) demonstrated that, among the four possible policy options, the most stringent mercury reduction in a coal-fired power plant in China will benefit China by \$432 billion (96%) and

neighbouring countries by 4 per cent. From the perspective of Bangladesh, Shahariar et al. (2012) examined the overall mercury emissions, Hossain (2012) identified the sources of mercury, Holsbeek et al. (1997), Joiris et al. (2000) tested the total mercury concentrations in marine fish, Akter et al. (2008) and Siddiquee et al. (2009) evaluated the impact of mercury on the environment, and finally, the effects of mercury and other heavy metals on human health in Bangladesh was examined by Jarup (2003) and Begum et al. (2009). All of these studies revealed that the use of mercury and mercury-containing products is increasing rapidly in the industrial process and in a wide variety of application in Bangladesh. These increases in mercury use have a significant adverse impact on the environment and human health, yet no study has so far examined mercury reporting aspects under the MEAs from the developing countries point of view.

In summary, while there has been much previous research on mercury, only a handful of studies have focused on reporting. In addition, though there is ample research on SEA from a developed countries perspective, there is a pressing need for more SEA research from a developing countries point of view. Moreover, due to administrative weaknesses, developing countries cannot initiate and implement environmental acts and policies, and they also struggle in complying with the provisions of MEAs. In addition, developing countries are increasingly emitting mercury because of increased production and development activities (AllAfrica, 2013). The question thus arises as to whether the developing countries would be able to comply with the reporting provisions under the Minamata Convention. The third paper identifies this research gap and poses the following research questions in an attempt to fill it:

- (a) What are the constraints of the developing countries, particularly Bangladesh, in complying with mercury reporting provisions under the Minamata Convention?*
- (b) To what extent are these constraints acknowledged in the Convention, and a strategy put in place for overcoming them?*

2.3.4. Paper 4: Corporate mercury disclosures

The fourth and final paper focuses on corporate mercury disclosures. Though corporations are primarily responsible for mercury emissions and mercury disasters, to date the literature has not focused on corporate mercury reporting and disclosures. SEA studies have focused on various environmental challenges including carbon, lead, arsenic, water, human rights, and biodiversity, yet no study has concentrated on corporate mercury reporting. Again most of the SEA corporate reporting and disclosure studies use self-reported and unverified corporate data (each from a single source) which are not comparable with any independent databases.

Corporations submit structured reports on mercury data to PRTRs, but it is not enough to understand the real exposure level. Moreover, corporations do not report in most of the countries of the world where there is no PRTR. In addition, there is no corporate reporting guideline and standard for mercury emissions. The fourth paper of the thesis proposes a “best-practice corporate mercury disclosure framework” and examines to what extent the current disclosure practices of the highest mercury-emitting companies meet the best-practice disclosure structure. As with the previous papers, this paper draws on the literature noted above, but it also considers specific previous literature in relation to corporate environmental reporting, which is discussed below.

Corporations are responsible for most of the global mercury emissions, and also for the most notorious mercury disasters. For example, a mere three chlorine plants are responsible for one-third of the mercury emissions of the UK (Winalski et al., 2005), and the top 60 plants emitted 97% of North Carolina’s total atmospheric mercury emissions in 2010 (Star News, 2012). Among the global mercury disasters, Dow Chemical’s plant at Sarnia (Ontario) rocked the USA and Canada in 1970–1972 (Müller, 2018). Chisso Petrochemical’s (Minamata) 81 tons of mercury emissions shook the world in 1968 (Bergquist, 2017), by killing an estimated 1,000 Japanese citizens (Bergquist, 2017) and injuring more than 2,200 people (Minamata Disease Research Group, 1968; Yorifuji et al., 2012). It is for this reason that the global initiative for mercury control has been named “The Minamata Convention”.

While previous studies have considered mercury disclosure from a national point of view, corporate mercury emissions have not been previously researched. For example, Evers et al. (2016) propose the fundamental reporting requirements for evaluating the success of the Minamata Convention from a national point of view. Another study by Strzelecka-Jastrzab (2018) evaluates the availability of the required data in Poland for meeting the reporting requirements of the Minamata Convention. Strzelecka-Jastrzab (2018) identified the data limitations of Poland and observed that Poland does not have all the necessary data to comply with the Minamata’s reporting obligations. Moreover, none of these studies justifies their findings using any theoretical framework.

Over time, an enormous volume of studies have been conducted covering various environmental issues from a corporate perspective; for example, carbon (Haslam et al., 2014; Nurunnabi, 2016), water (Hazelton, 2015; Tello et al., 2016), human rights (Cooper et al., 2011; Hazelton, 2013a), and biodiversity (Adler et al., 2018; Boiral & Heras-Saizarbitoria, 2017).

One of the common findings of these corporate environmental disclosure studies is that the level and quality of disclosures are very poor. For example, Nurunnabi (2016) found that Bangladeshi companies are reporting climate-change information at an average of 2.23 per cent. Similarly, Adler et al. (2018) observed that only less than 10 per cent of the sample top 150 Fortune Global companies disclose information on biodiversity and threatened species, and that the disclosed information is inconsistent. Corporate disclosure studies also concentrate on sulphur dioxide (Zhu & Zhang, 2012), arsenic (Soumya, 2011), and lead (Bae, 2012).

It is beyond doubt that disclosure studies have covered most of the important environmental challenges and contributed to different policy-making and to solving those crises. However, most of the disclosure studies suffer from a common weakness, in that they used a single source of data either from an annual report, a sustainability report, or an environmental report, all of which are self-reported and unverified. For example, Saka and Oshika (2014) studied the carbon management disclosures of Japanese manufacturing corporations, and Nurunnabi (2016) examined the corporate climate-change disclosures in Bangladesh using a single set of data. The reported data were not compared with the independently verified emission data provided in the databases. As a result, the data used are unreliable, resulting in complexities in ascertaining whether the low level of emission disclosures equates to a low level of environmental risks and a low level of emissions. Despite this, independent databases may report that these corporations are the highest-emitting corporations. On the other hand, significant undisclosed information reflects significant environmental risks and the need for changes in the regulatory approaches.

Although corporations report mercury emissions through PRTRs, it is not enough, and it is not possible in most of the countries where there is no PRTR. It is therefore argued that mercury should also be included in direct corporate reporting. Berthelot et al. (2012, p. 355) found that investors use and “positively value” corporate reporting, yet the reports provided by corporations to their respective national PRTRs contain only limited aspects of mercury information. Moreover, individual PRTRs accumulate data from a specific region and, therefore, do not produce aggregate reports. PRTR data also has limitations regarding consistency and reliability (Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010).

Governmental reporting regulations and reporting standards influence corporate environmental reporting practices, and *vice versa*. Environmental disclosures influence organisational, governmental and international policies (Hassan & Romilly, 2018) and, on the other hand,

governmental supports and strict regulations influence corporate environmental disclosures (Momin et al., 2017). As a result, a country's ratification or approval of the MEA influences corporate environmental practices and reporting (Freedman & Jaggi, 2005). Similarly to reporting regulations, reporting standards and guidelines also have a significant influence on corporate disclosures. For example, Rankin et al. (2011) and Fonseca et al. (2014) recognised the contribution of GRI guidelines, but they suggest the need for its continuous improvement, otherwise site-level application may camouflage unsustainable practices resulting in meaningless and inaccurate disclosures. More specifically, a reporting framework could assist corporations in reporting information in all the required areas. Drawing on the importance of a unique reporting framework, Herold and Lee (2018) and Boiral and Heras-Saizarbitoria (2017) argue that differences in measurement and reporting structures hinder policy decisions.

Commensurate with the lack of research on corporate mercury reporting is an absence of corporate mercury reporting standards. To facilitate the sustainability reporting of businesses, governments, and other enterprises, the Global Reporting Initiatives (GRI) establishes various standards in relation to the impacts of their activities on the economy, the environment, and society. Although the standards of the GRI cover a wide range of economic, social, and economic issues, including emissions, its standard on emissions was developed specifically for GHGs and does not cover other emissions, the nature of which varies widely. Moreover, the reporting requirements for substances are not exactly the same under different MEAs. In addition to recognising the significance of GRI standards in sustainability reporting, Rankin et al. (2011), Fonseca et al. (2014), and Morhardt (2009) identified the failings of GRI guidelines and argued for a rewriting of the guidelines drawing on the contextual perspectives for improving reporting quality.

In summary, the research literature depicts that mercury is one of the most toxic substances, stakeholders have the right to be informed about its impacts on human health and the environment, most of the disclosure studies used a single set of data, mercury is not explicitly considered in major corporate reporting guidelines such as the GRI, there is no stand-alone corporate mercury-reporting template, and the quality of the corporate mercury disclosures was not justified. To address this research gap, the study aims to answer the following questions:

- (a) What is a probable best-practice corporate mercury disclosure framework?*
- (b) To what extent do the current disclosure practices of the highest mercury-emitting companies meet the best-practice disclosure structure?*

2.4 Conclusion

This chapter has reviewed the previous literature relevant to this thesis. By considering the reporting of mercury pollution in the global, developed country, developing country, and corporate contexts, the thesis responds to calls for SEA research that engages with core environmental issues and issues relevant to the SDGs, considers non-corporate actors, and has a developing country focus. Furthermore, the thesis addresses gaps in the existing literature in relation to the quality of the Minamata Convention reporting regime, the ability of developed and developing countries to comply with this regime, and the extent to which large mercury-emitting corporations disclose their mercury-related activities. The theoretical perspective of the thesis employed to address these issues is presented in the following chapter.

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Chapter 3

Theoretical Frameworks

Theoretical Frameworks

3.0. Introduction

This chapter provides an overview of the key theoretical ideas underpinning the thesis. Primarily, this thesis applies theories of accountability to explore various dimensions of mercury disclosure. In particular, traditional concepts of accountability are reviewed and extended in the context of MEAs. Given that reporting quality is an important determinant of the degree to which reporting will discharge accountability, the qualitative characteristics of reporting are also used as a theoretical frame. For SEA reporting, one of the most contentious characteristics is that of completeness, which must be determined with reference to materiality. These core theoretical concepts – accountability, the qualitative characteristics of reporting, and materiality – are discussed in turn below.

3.1. Accountability

Accountability is a multi-faceted term that cannot be limited to a single definition (Sinclair, 1995). Steccolini (2004, p. 332-333) identified an extensive list of facets of accountability from the literature including accountability for probity and legality, process accountability, performance accountability, programme accountability, policy accountability, financial accountability, managerial accountability, professional accountability, public accountability, political accountability, personal accountability, administrative accountability, hierarchical accountability, partnership accountability, governance accountability, and fiduciary accountability.

In SEA, accountability has been variously defined as the responsibility to justify past actions, to recognise social and environmental rights of the current and future stakeholders, and to provide required information for facilitating actions and decision making in relation to the reporting entity. For example, Benston (1982) identified three views of corporate accountability as follows: In the narrowest view, corporations are seen as accountable to shareholders, in the intermediate view to stakeholders, and in the broadest view to society in general. Gray et al. (1996) defined accountability as “the duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible.” As Ramanna (2013, p. 410) explains, accountability exists when organisations account for all actions impacting stakeholders:

[Externalities] can be “positive” (*e.g.*, local community-building initiatives) or “negative” (*e.g.*, environmental pollution, regulatory capture) relative to the state of the world where the corporation does not engage in the action; and the internalisation of externalities into firm decisions may or may not create value for extant shareholders.

Accountability, then, extends beyond capital providers to stakeholders including society at large for the monetary and non-monetary implications of operations (Cooper & Owen, 2007; Gray, 2002b). Even future generations are included in the list of wider stakeholders to whom organisations are expected to be accountable (Messner, 2009).

Accountability is important because it can protect the rights of current and future generations (Hall et al., 2017), especially by creating ethical and socially responsible organisations (Beu & Buckley, 2004; Cropanzano et al., 2004). Corporations may create and provide material welfare for society, but because their ultimate endeavour for profit maximisation may also damage social and environmental resources they must be held to account (Gray, 2006).

As part of society, organisations are accountable to society due to their “social contracts”, that is, the social relationship or responsibility that encourages not doing any harm to others (Unerman & O'Dwyer, 2006). However, the nature of these social contracts varies depending on the social power of the parties concerned (Morf et al., 2013; Unerman & Bennett, 2004; Unerman & O'Dwyer, 2006). Different levels of social power create different levels of social pressure that compel organisations to prioritise their discharge of accountability: *i.e.*, their actions. The actual level of corporate accountability may therefore change according to variations in effect and power stemming from different stakeholders (Morf et al., 2013).

An important normative foundation of accountability is stakeholders' rights of access to information. The public “right to know” social and environmental information is increasingly recognised, and might even constitute a human right (Elkington, 1999; Hazelton, 2013a; McPhail, 2013; McPhail & Islam, 2014). Early global agreements such as the Stockholm Declaration (1972) provided guidelines on global environmental management. However, it did not address the issue of environmental information (Hazelton, 2013a). In the US, the Emergency Planning and Community Right-to-Know Act (1986) (EPCRA) provided the unprecedented right to knowledge of information on pollution (Goldman, 1992). Among the major provisions of EPCRA, Sections 311 and 312 relate to “community right-to-know reporting requirements”, and Section 313 relates to a “toxic chemical release reporting emissions inventory” (Goldman, 1992, p. 315). In the case of corporations, society has the right

to know the volume of emissions, the emissions the emitters could reduce, and the emissions that could not be reduced, and why not (Adams, 2004). At the global level, the Rio Declaration (1992) provides “the most detailed” and “clear” guidance on access to environmental information, and hence a further normative foundation for accountability (Hazelton, 2013a, p. 279).

Transparency has been defined as the mechanism that facilitates the right of the public to get access to information (Navarro-Galera et al., 2017). A conventional view is therefore that transparency creates and facilitates accountability (Fox, 2007). Transparency of financial information with the qualitative characteristics of “access, timeliness, relevance, and quality” has been claimed as essential to ensure just capital markets (Vishwanath & Kaufmann, 2001, p. 41). Similarly, transparency of reported social and environmental information is claimed to increase the accountability of organisations’ impacts on society (GRI, 2018a). Reports serve the interest of the stakeholders as well as the interest of the entity itself. The organisations should “tell the truth, the whole truth, and nothing but. Anything less is pointless and costly self-deception” (Miller & Bahnson, 2003, p. 14).

Whilst transparency is important, Fox (2007) argues that transparency is a necessary but not sufficient condition for accountability. Fox (2007, p. 663) divided transparency and accountability each into two classes: “opaque transparency” and “clear transparency”, and “soft accountability” and “hard accountability. Opaque transparency provides unreliable information that actually does not reflect the organisation’s real situation, and hence does not result in accountability of the reporting entity. Clear transparency provides reliable information that reflects the behaviour of the reporting entity, but this transparency cannot guarantee hard accountability without the intervention of the regulators. In view of this, Fox (2007) did not refute that transparency could lead to accountability, but emphasised the power of the stakeholders – and specifically their ability to impose sanctions – in determining the degree of accountability created.

The conceptual model of accountability was further developed by O'Dwyer and Boomsma (2015) who drew on previous literature (Ebrahim, 2003, 2009) to distinguish three accountability mechanisms: imposed, felt, and adaptive accountability. Under this view, the traditional view of accountability as “the imposed accountability regimes” is considered as a “formal oversight and control imposed” on an individual or entity (O'Dwyer & Boomsma, 2015, p. 40). Accountability is discharged through “giving and demanding for reasons for

conduct” (Sinclair, 1995, p. 221). It is a state of accountability where individuals or organisations are compelled to discharge accountability based on rules and procedures (Chenhall et al., 2010; Ebrahim, 2009; O'Dwyer & Boomsma, 2015). Individuals or organisations comply with the previously set regulations, which avoid uncertainty and facilitate appropriate performance measurement (Ahrens & Chapman, 2004; Chenhall et al., 2010; Rao et al., 2012). However, compliance-based imposed accountability facilitates the achievement of only short-term specific outcomes (O'Dwyer & Boomsma, 2015).

“Felt accountability regimes” envisage accountability as a voluntary form of “felt responsibility” to certain principles or a mission (Ebrahim, 2009; Fry, 1995). Roberts (1991, p. 365) defined felt accountability as “a social acknowledgement and an insistence that one’s actions make a difference to both self and others”. This acknowledgement is the ethical motivation of responsibility, which is fundamentally absent in imposed accountability (Messner, 2009; Roberts, 1991). In this type of accountability, individuals themselves feel the responsibility of being answerable without any external pressure. Chieng et al. (2016) articulated felt accountability thus: “Accountability for environmental stewardship is expanded by society’s expectations, which can extend beyond the requirements of law”. Accountability, in this case, is embedded into the mission, values, and culture of the organisation (Lewis & Madon, 2004; O'Dwyer & Boomsma, 2015; Shearer, 2002; Sinclair, 1995). By being embedded, felt responsibility is maybe more relevant to everyday affairs in an organisation, though it is less transparent than formal accountability (Hilhorst, 2003).

Finally, a combination of the instrumental aspects of imposed accountability and the moral and ethical aspects of felt accountability forms “adaptive accountability regimes” (Ebrahim, 2009). O'Dwyer and Boomsma (2015) argued that “adaptive regimes are proactive in nature, strategy-driven, and focused on medium to long-term performance measurement and mission achievement”. In this type of accountability, imposed and felt accountability co-exist. As with felt accountability, adaptive accountability incorporates accountability embedded in the organisational mission, values and cultures (Ebrahim, 2009). However, performance measurement in adaptive accountability is more prominent and formalised than in felt accountability, and, of course, less formalised than imposed accountability (O'Dwyer & Boomsma, 2015).

As with as other mechanisms, accountability is not without its limitations. Recent corporate scandals, reporting qualities, and countries’ compliance rates with MEAs recognises the limits

and limitations of private- and public-sector accountability. Corporate scandals have triggered stricter corporate accountability (Aguilera, 2005), and several authors have argued for wider form of corporate accountability beyond financial accountability (Gray, 2002b; Unerman & Bennett, 2004). Messner (2009) and Butler (2005) suggested imposing limits on accountability, arguing that allowing unrestricted accountability may create ethical problems for the reporting entity. Butler (2005, p. 42) described unconditional accountability as an “ethical violation,” and Messner (2009, p. 918) also agreed that “forcing” the reporting entity into accountability for some issues that are “very difficult or impossible to justify” is a “violence”.

3.2 Public Sector Accountability

Whilst the preceding discussion has had a corporate focus, the concept of accountability applies to both the public (government) and the private (corporate) sector. Public and private sector accountability differ because of their different contexts, particularly the stakeholders to whom they are accountable, the structure and activities of the entities, and the acts, rules, and regulations they are governed by. In particular, public sector accountability is much broader and more complex than its private sector counterpart (Funnell, 1990; Parker & Gould, 1999; Sinclair, 1995). Funnell (1990) classified public sector accountability requirements into fiduciary and management, whereas Tan and Egan (2017) divided public sector accountability into seven categories: public, managerial, fiduciary, policy, professional, political, and personal/self-accountability. In the public sector, policy accountability is the final stage of accountability, which accounts for the success or failure of achievement of objectives.

Public sector accountability does not necessarily involve reporting. Mulgan (2000, p. 556) identified four categories of accountability frequently used in public administration where the formal feature of accountability, “to give an account”, is absent. These include (a) “professional and personal accountability”, which denotes the feeling of individual duty towards the society’s interest that is expected from government employees; (b) “accountability as control”, which recognises “various institutional checks and balances” controlling the activities of the government (though there are no dealings between the government and these institutions); (c) “accountability as responsiveness”, which states the self-induced wishes of the government in fulfilling the desires of the public without any pressure; and (d) “accountability as dialogue”, which denotes the dialogue between the people “on which democracies depend” even though there is no proposition from any parties involved in those interactions (Mulgan, 2000, p. 556). Accountability, particularly the public type, is influenced by cultural, ethical, and personal

values (Hall et al., 2017). Different cultural contexts lead to different transparency and accountability practices (Navarro-Galera et al., 2017).

Among other things, the ability to facilitate action, the awareness of the people (democratic environment), the capability (resources), and the commitment of the reporting entity, corporation or country, are all required in order for accountability to be ensured. Reporting alone, however, is not sufficient: Bailey et al. (2000) emphasised that the conception of accountability requires not only the provision of information, but also its value in terms of “facilitating action”. Another issue that influences accountability is the awareness of the people (the democratic environment) of the country or the stakeholders of the corporation. The people who are aware of the emissions or environmental hazards may put pressure on the reporting entity for reporting of emissions, reduction of emissions, and compliance with the international agreements (Neumayer, 2002). Neumayer (2002) found that countries practising democracy are more committed to international environmental agreements than non-democratic countries are, and also that developed countries are observed to be more accountable and committed to safeguarding social and environmental capital.

The capability (resources) and commitment of a country (or a corporation) are important prerequisites for accountability, but have received relatively little attention in SEA literature. Capability “represents the qualities, the skills or the resources intrinsic to the actor and which are required to perform one or several accountability(ies)” (Feltus, 2014, p. 95). More specifically for public sector accountability, the administrative capability of the government including “management, funds, knowledge, and information” is required for implementing convention (Zhao & Ortolano, 2003, p. 718). As a result, developed countries are more accountable and committed to environmental protection than the developing countries are; however, capable countries or corporations may be less accountable if they are not committed to social and environmental protection. Commitment refers to the devotion to dedicating the capabilities for discharging the assigned responsibilities. More commitment encourages the incurring of more expenses for the social and environmental cause. Moreover, awareness of the stakeholders or citizens about environmental problems “eventually require[s] policymakers to exhibit stronger environmental commitment to address these concerns and honour the demand for environmental protection measures” (Neumayer, 2002, p. 140). Signing and ratification of the MEAs are the signals of the commitment of the countries to environmental problems, and developed countries are observed to be more committed than the other countries.

Sanctions are also an important prerequisite for accountability in a corporate setting, which raises important questions for the operation of accountability in a context where few sanctions are available. Bovens (2007) and Mulgan (2000) identify sanctions as a key element of accountability, and Fox (2007) argues that transparency may not achieve hard accountability if sanctions are not imposed by regulators. Although sanctions generally indicate disciplinary actions for non-compliance of the provisions, some studies recognise that a sanction may be a motivation or a punishment: that is, positive or negative (Bovens, 2007; Mulgan, 2000). Sanctions thus work as reminders for complying with the required regulatory processes (Feltus, 2014) and hence promote accountability.

Though sanctions are considered to be determinants of accountability, a critical feature of MEAs is that they do not operate in a regulatory environment where sanctions are possible. Consequently, ineffective sanctions, together with a lack of transparency and disagreement between the developed and developing world in terms of responsibility for environmental damage, limits the accountability of parties to MEAs. Recent thought on this topic is provided by Gupta and Asselt (in press), who examine the issues of accountability and transparency regarding multilateral agreements on climate change (*i.e.* the Kyoto Protocol, the Cancun Agreement, and the Paris Agreement). Gupta and Asselt focus on how ineffective sanctions damage the concept of accountability and also create distance between the developed and developing countries. As they explain, (Gupta & Asselt, in press, p. 8, emphasis added)

The UNFCCC context is one of state-to-state accountability, so the key question here is who, that is, which states should be accountable. This question lies at the heart of the notion of differentiation in the UNFCCC context. Differential treatment of developed and developing countries has consistently been the make-or-break issue in multilateral climate politics ... Differentiation is a lightning rod for conflict because it underpins fundamental disagreements about historical and continuing responsibility and burden sharing for climate actions. *These conflicts over differentiating between developed and developing countries over who has to do what necessarily spill over into who has to be transparent about what.*

This analysis highlights the role of assistance for accountability in the context of MEAs. Since traditional imposed accountability is ineffective in the context of MEAs, providing assistance is likely to be far more successful in motivating the parties, more specifically the developing world, to participate in, implement, and comply with the reporting provisions of the MEAs.

Assistance in the form of technical, technological, and financial support from the Secretariat would improve the capacities of the developing countries and motivate them to implement the reporting provisions. Moreover, UNEP may tie the relationship between trade benefits and loan facilities with low rates, waive loan liability, and provide development assistance with ratification, implementation and compliance with the provisions of the MEAs making agreements with the World Bank, IMO, and other similar organisations (Susskind, 2008). In other words, the provision of assistance may both create goodwill (or felt accountability), and also enable reporting (or imposed accountability, albeit with limited penalties for non-compliance).

The provision of assistance adds another dimension to conceptualising accountability relationships. In case of developed countries, accountability and transparency under a global agreement flow in (at least) two ways: firstly, from developed country parties to the respective secretariat for the compliance with the MEAs; and secondly from the developed to the developing world for the commitment of funding in order to support compliance. Similarly, from the insights of the Gupta and Asselt, the transparency and accountability of the developing countries should flow in two directions: that is, the compliance with the reporting provisions by the developing countries on the MEA, and also the funding they are receiving to materialise and report on the MEA.

This discussion shows that there are important differences in how accountability might be conceived in the context of MEAs, but reporting remains an important mechanism for discharging accountability. It is therefore important to explore how the quality of reporting might be evaluated. This issue is discussed in the following section.

3.3. Accountability and Qualitative Characteristics of Accounting

The preceding discussion has explored conceptions of accountability in a private and public context and the relationship between accountability, transparency, and reporting. It was identified that reporting is a necessary but not sufficient element of accountability. Importantly, reporting should be of the necessary quality to satisfy user needs. In other words, accountability requires provision not simply of information, but of information that consists of qualitative characteristics (Coy et al., 2001; Steccolini, 2004).

The qualitative characteristics of accounting information guide what to report, particularly the materiality principle and how to report. The qualitative characteristics ensure reporting transparency, and transparency confirms accountability (GRI, 2011, 2018a). Moreover, other

research has argued that transparency is necessary for accountability but cannot ensure accountability without the intervention of regulators such as the imposition of sanctions (Fox, 2007).

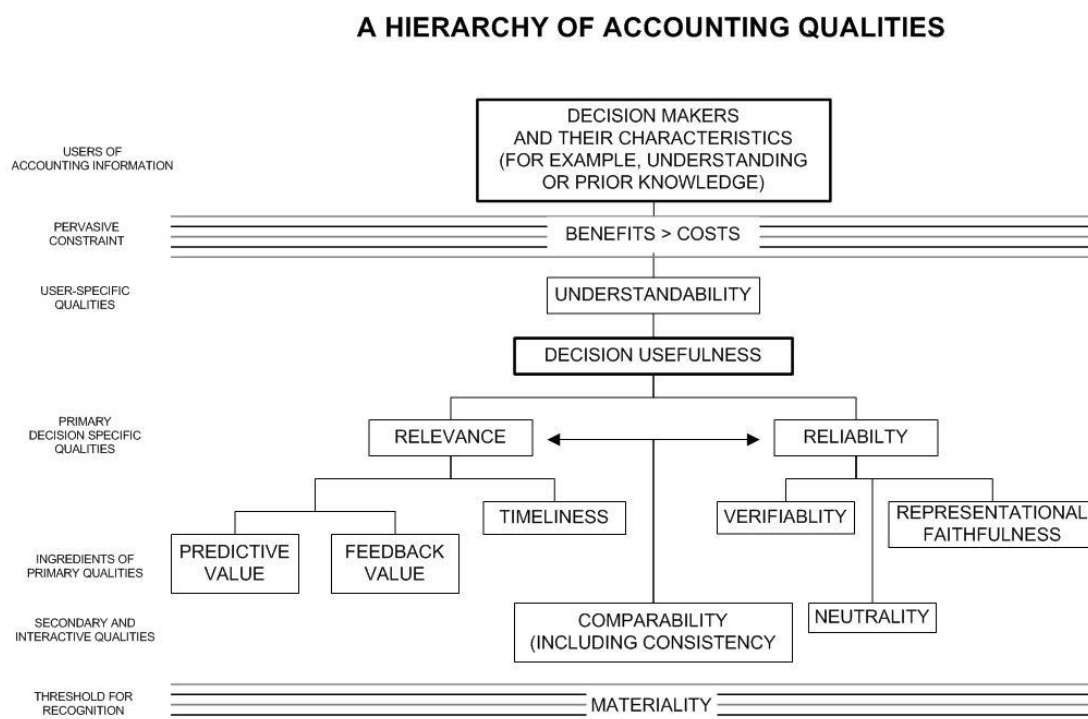
Although it is argued that quality information possessing qualitative characteristics would discharge accountability, accounting information does not always possess these qualities at the perfect level. The degree of the qualities differs in accounting information, resulting in a trade-off by the accountants, the auditors, and the users of that information. For example, accountants place more importance on reliability to satisfy audit requirements. Similarly, auditors place more emphasis on reliability because of legal obligation, although the majority of users of the information, particularly investors, place more importance on relevance as they want to know more about future earnings and financial prospects (Johnson, 2005). Depending on the context, although investors want to get timely information at the cost of accuracy and reliability, regulators may want to receive accurate information at the cost of timeliness. As a result, striking a practical balance among the qualitative characteristics in accounting information is complex and sometimes impossible, because they are neither attuned nor mutually exclusive (Schipper & Vincent, 2003). Consequently, determining optimum trade-offs among the qualities for effective reporting depends on the context of the reporters and the users of the reports for a particular accountability objective.

Although the qualitative characteristics (see Figure 1 and Table 3.2) are mostly used for evaluating financial accounting information (Cheung et al., 2010; Shahwan, 2008), different researchers (see Table 3.1) including Comyns and Figge (2015), O'Dwyer et al. (2005), Stanwick and Stanwick (2006), and Burritt and Saka (2006) applied these qualitative characteristics in evaluating social and environmental accounting information. Moreover, different national and international organisations including the GRI (2011), OECD (2008), and NPRI (2017) also recommend using these characteristics for examining the quality of the social and environmental information of both public and corporate entities. According to the “quality of information guideline” of the Government of Canada, and in line with the “six dimensions of quality” of Statistics Canada, the Canadian National Pollutant and Release Inventory (NPRI) uses seven qualitative characteristics of accounting information for ensuring the quality of reports (NPRI, 2017).

Table 3.1. Previous studies using qualitative characteristics in the context of environmental reporting

	Sources	Qualitative characteristics used
1	NPRI (2017)	Relevance, accuracy, reliability, completeness, understandability, accessibility, and timeliness
2	Comyns and Figge (2015)	Accuracy, completeness, consistency, credibility, relevance, timeliness, and transparency (transparency, reliability, and clarity)
3	Ane (2012)	Relevance, reliance, comparability, and clarity
4	GRI (2011)	Materiality, stakeholder inclusiveness, sustainability context, completeness, balance, clarity, accuracy, timeliness, comparability, and reliability
5	OECD (2008)	Accuracy, comparability, completeness, consistency, and transparency
6	Stanwick and Stanwick (2006)	Auditability, completeness, relevance, accuracy, neutrality, comparability, timeliness, transparency, inclusiveness, clarity, and context
7	Burritt and Saka (2006)	Understandability, relevance, materiality, reliability (faithful representation, substance over form, neutrality, prudence, completeness), comparability, timeliness, and balance between benefit and cost
8	O'Dwyer et al. (2005)	Adequacy, verifiability, credibility, comparability, consistency, and usefulness

Figure 1: A hierarchy of the qualitative characteristics of accounting information



Source: Financial Accounting Standards Board (1980)

Table 3.2. Definitions of the qualitative characteristics

Qualitative characteristics of accounting information: The Financial Accounting Standards Board (FASB), in its SFAC No. 2, examined some of the key characteristics of accounting information for users. These characteristics are listed below (FASB, 1980):

Understandability: The quality that allows users of accounting information to recognise the content and importance of the delivered report

Relevance: The quality of information that enables users to differentiate among the alternatives available

Predictive Value: The quality that permits users to predict the impacts of the actions of the actors (persons/organisations)

Feedback Value: The quality that assists users in ensuring or rectifying past predictions.

Timeliness: The quality that makes the information available to its users to assist them in making timely decisions

Reliability: The quality that ensures the users of information that the reports are accurate and free from all types of errors

Verifiability: The quality that enables users of information to justify the realities represented by the reports

Neutrality: The quality that allows users of information to be neutral or eliminate biases in making decisions

Representational Faithfulness: The quality that maintains the coherence between the reports and the realities

Comparability: The quality that enables the users of information to identify uniformities and uniqueness of two categories of phenomena

Consistency: The quality that maintains the similarity of accounting policies and approaches, resulting in consistent reports.

A particular challenge for SEA is the qualitative characteristic of completeness. Organisations deal with thousands of issues, and their activities encompass and impact on hundreds of aspects of society, but reporting and accountability encompass the significant issues only. Questions therefore arise as to what extent the organisation should inform society and what they should be accountable for. It is true that the firm should evaluate the impacts of their actions and identify the probable effects of their future actions on the community (Bebbington et al., 2014; Dillard, 2007). However, they will not report everything, and it is not possible to disclose all the issues in the reports. Nevertheless, the report should not exclude the important information, and hence reporting accountability recognises that the entity will report the information that is

significant for understanding the entity and also that has a significant impact on the decisions of the stakeholders. The concept of “materiality” is fundamental to addressing this issue, which is discussed in the following section.

3.4. Materiality

In financial accounting, an item of information is material if its misstatement or omission would affect the financial decisions of its users or the discharge of accountability of the management (AASB, 2010, paragraph 9). Misstatements below the level of materiality do not change the perception of the stakeholders about the financial position of the organisation (Tuttle et al., 2002). Information that is material to the investors is therefore included in the financial statements, and the trivial information is omitted. However, determining the “decision-usefulness” of a piece of information is critical because it may have a significant influence on one decision but have little or no impact on another (Lo, 2010). For example, information on future growth prospects may be material to investors whereas it may not be appealing to the creditors. Hence different factors including the size, nature, and base items determine whether an item is material or not. Usually, both the size and the nature of items are considered when ascertaining materiality; however, in some cases, the size or nature of the items alone determines materiality. In the event of correction of errors after the reporting period, the size of the items alone is enough to determine their materiality; whereas in the event of related party transactions or transactions relating to directors or executives, the nature of the transaction alone is sufficient to determine materiality (AASB, 2010, paragraph 12; Moyes et al., 2005). Determination of materiality depends on “professional judgement”; a specific rule may not work in all circumstances (Edgley, 2014, p. 255). In a particular situation, determination of materiality may depend not on the size, nature or base of the items but rather on specific factors that are opposite to the usual trends of the organisation, or on directly related items.

As with other accounting concepts, materiality has also changed over time and constitutes multiple connotations and roles (Edgley, 2014). Based on “metaphorical discourses”, Edgley (2014, p. 255) identified the roles of materiality as “a moral responsibility; a solution to the problem of over-auditing; a solid epistemic foundation for financial reporting; a scientific technique; a quantitative rule of thumb; a risk management concept; and a mysterious shield.” Brennan and Gray (2005, p. 1) described the concept of materiality as “accounting’s best kept secret” as it permits a degree of flexibility. Although materiality is apposite to both accounting

and auditing, it has a different significance for each, since accountants and auditors determine the materiality from their own perspectives (Edgley, 2014).

In the context of Social and Environmental Reporting (SER), materiality applies to the social and environmental impacts of organisations in order to identify disclosures that satisfy the diversified information needs of users (Edgley et al., 2015, p. 15). Reporting that focuses only on material issues results in “more relevant, more credible and more user-friendly” reports to the stakeholders as well as enabling more targeted management attention (GRI, 2015, p. 4). AccountAbility (2006b, p. 5) portrays materiality as “a framework that helps to align strategy, reporting, and performance. Businesses need to work out what is material and articulate this in credible ways in order to drive learning and innovation”. According to the GRI (2015, p. 7) the materiality threshold selected should “reflect the organisation’s significant economic, environmental and social impacts; or substantively influence the assessments and decisions of stakeholders.” Material disclosures in SER may include water and energy usage, greenhouse gas emissions, hazardous substances, biodiversity, waste management, stakeholder engagement, working environment, human rights and workers’ rights, and health and safety (AccountAbility, 2006a, 2006b; Edgley et al., 2015).

The concept of materiality within SEA has been described as being a dynamic concept with a stakeholder-focused ethical lens that changes from “firm to firm, and context to context” (Edgley et al., 2015, p. 14). Moreover, SEA materiality considers not only current matters but also those that may impact the organisation or stakeholders, or society in the future (Edgley et al., 2015, p. 8). However, materiality is measured based not only on quantitative but also on qualitative factors (Gray & Manson, 2008; IFAC, 2010). Accountability Principles Standard (AA1000) provides that the process of identifying “material issues will change over time as issues mature and understanding improves (AccountAbility, 2008, p. 13). AccountAbility (2008, p. 12) emphasised that an organisation needs to develop a thorough understanding of the sustainability perspective on the material as well as non-material issues because, in the latter case, they “still require a response, and a balanced and robust understanding of who they are material to and why.”

The concept of materiality in SER, then, significantly differs from that of financial reporting in a number of ways. Firstly, materiality in financial reporting prioritises capital providers, whereas in SER it contemplates a broader range of stakeholders including employees, customers, and wider society (Adams, 2013; Edgley et al., 2015; EY, 2014; Whitehead, 2017).

O'Dwyer et al. (2005, p. 762) assert that sustainability reporting is worthless if it does not recognise the “rights”, fulfil the “needs”, and “empower” the stakeholders in decision making. Secondly, materiality in financial reporting deals with financial data only, whereas materiality in SER encompasses much broader social and environmental issues (Unerman & Zappettini, 2014) and hence excluding material information from SER is a concern (Edgley et al., 2015). Thirdly, materiality in financial reporting is primarily determined quantitatively, whereas in SER, because of the complex qualitative nature of the data, materiality is not reducible to a quantitative test. Fourthly, materiality in financial reporting focuses on omissions or errors, whereas materiality in SER concentrates on what issues should be reported (AccountAbility, 2008; GRI, 2013; Puroila, 2015). Finally, because of the wider variability of the users of SER, the implications of materiality on “decision-usefulness” are significantly different from those in financial accounting, where the impact of data on stock trading is the major concern. In other words, materiality in SER is concerned with a wider array of decisions (Adams, 2013). More specifically, Kamala (2016) identified some of the decisions that the users of environmental reports make including purchase of products, investment in shares, taking on partners or involving them in business, and supporting or taking actions against companies.

Materiality assessment is more challenging in SER because of the complex nature, volume, and measurement issues of the sustainability data. Organisations including the GRI, AccountAbility, SASB, IIRC and KPMG provide materiality assessment frameworks focusing on different issues. Some of these frameworks concentrate on company-specific issues and some of them on industry-specific factors, some focus on the impact on the stakeholders, and some of them combine all issues. However, a common theme is the importance of stakeholder expectations in determining materiality. For example, the GRI (2016a, p. 10) states that material information is “reflecting the organisation’s economic, environmental, and social impacts, or influencing the decisions of stakeholders”.

The GRI provides a four-step materiality operationalisation process for identifying and reporting material issues in the corporate reports. The GRI’s materiality framework is more flexible and inclusive than those of other organisations. The four steps are “identification”, “prioritisation”, “validation”, and “review” (GRI, 2016a). The first step, identification, entails the corporation making a comprehensive list of sustainability issues raised by GRI, industry-specific frameworks, and also any other issues having significant social and environmental impacts on the organisation or the stakeholders (GRI, 2016a). The second step, prioritisation, is the process of prioritising issues from the broad list based on a threshold and criteria

suggested by GRI. Among others, the issues include company-specific issues, risks and opportunities, industry-specific issues, expert views, national and international rules, regulations and agreements, and stakeholder consultation. The GRI (2016a) suggests that companies should report the threshold and the base criteria in their reports and may be depicted as a materiality matrix. The third step, validation, comprises authorisation from senior management or from stakeholders for ensuring that the prioritised issues are reasonably material. The final step is “review”, which entails evaluating and updating material issues reported in the preceding period as required.

Other organisations including AccountAbility, the International Integrated Reporting Council (IIRC), and KPMG adopt similar, but not identical, approaches to materiality assessments. AccountAbility recommends a three-step approach to materiality assessment, IIRC suggests a six-step process, and KPMG suggests a robust seven-step approach for materiality assessment and stakeholder engagement and feedback. AccountAbility (2013) suggest a materiality assessment process consisting of three broad but similar steps – identifying, prioritising, and reviewing – for ascertaining material issues for reporting. The materiality assessment process of the Sustainability Accounting Standards Board (SASB) focuses on industry-specific issues for facilitating comparison among the reporting companies (Eccles et al., 2012). SASB’s investor-focused materiality process consists of three steps: evidence of interest, evidence of financial impact, and forward-looking adjustment. By way of contrast, the International Federation of Accountants (IFAC) and the IIRC’s materiality process consists of six steps: establishing process parameters, identifying relevant matters, evaluating importance, prioritising importance, setting reporting boundaries, and determining disclosures (IFAC & IIRC, 2015). Finally, KPMG (2014, p. 4) suggest a seven-phase robust materiality assessment process where each phase identifies some activities as minimum requirements and some steps for organisations having a more advanced sustainability strategy. These steps are as follows: Phase 1, define purpose and scope; Phase 2, identify potential topics; Phase 3, categorise; Phase 4, gather information about the impact and importance of topics; Phase 5, prioritise; Phase 6, engage management; and Phase 7, seek stakeholder feedback.

An important limitation of current practice is the implementation of stakeholder consultation. In many cases, stakeholders are not addressed at all. A study by Ceres (2018) of more than 600 companies from the US found that only 14 per cent engage stakeholders in materiality assessment process. There is also a related concern that stakeholder concerns may not be

addressed. For example, Adams (2004, p. 738) identified the concern of the stakeholders regarding pollution as follows:

Whilst the responsible care indicators are concerned with levels of emissions or discharges, stakeholders are at least as concerned with what is being done to reduce emissions and discharges of toxic substances, what the corporate targets are and why they have not been met.

A further concern – and the one most relevant to this thesis – is that even when stakeholder consultation is implemented in good faith it may not be sufficient. In some instances, stakeholders may be overly myopic and prioritise issues “they hear and talk about frequently without objective checks” (Norris et al., 2014, p. 112). Both Mullerat (2005) and the GRI (2016a) materiality assessment framework recommend incorporating additional sustainability issues and considering international agreements in prioritising material items for sustainability reporting. In view of this, Mullerat (2005, p. 535) suggested identifying “broad-based societal concerns” to ascertain other important issues to be reported in the corporate sustainability report, stating that “Such broad-based concerns may derive, for example, from national policy and international conventions” (Mullerat, 2005, p. 535).

The efforts of the GRI to link organisational materiality assessment with global sustainability concerns as identified in the Sustainable Development Goals (SDGs) is an example of incorporation of such broad-based concerns into materiality assessment. The GRI suggests that corporations have a role in meeting SDGs as well as reporting SDG-related impacts through SER (GRI, 2014). To facilitate this reporting, the GRI, in conjunction with the U.N. Global Compact and the World Business Council for Sustainable Development (WBCSD), developed the SDG Compass in 2015 (GRI, 2018). The SDG Compass provides guidance for introducing sustainability into core business strategies as well as measuring the organisational contribution to achieving the SDGs. In addition, it assists with selecting the relevant GRI Standards for a particular area of SDGs (GRI, 2018).

Sustainability reporting is ever-changing and is expected to take in new issues in the future. Under the “Sustainability and Reporting 2025” project, the GRI identified three significant types of changes that would define the future of sustainability reporting: digital (new format and multiple information sources); responsible (new content and new focus); and interactive (information empowers the new role of stakeholders) (GRI, 2016b, 2016c). Corporations would produce a digital report more frequently to facilitate stakeholders’ real-time decision

making. The GRI (2016c) predicts that stakeholders would get access to well-suited sustainability data from multiple sources enabling them to analyse issues from different dimensions including justifying the corporations' commitment to addressing the actual social and environmental challenges that the community is trying to solve. The prediction is that "materiality will be an even more dynamic concept, defined by these interactive and well-informed stakeholders" (GRI, 2016c, p. 22). Importantly, companies will lose their control over their performance data as their extended peers in the supply chain would know and share those data to reveal clear "contribution to climate change, to eliminate contamination (solid, liquid, and gas), to protect ecosystems ... to the quality of life – access to food and water, education, health services and civil rights" (GRI, 2016c, p. 21).

Conceptual and practical questions in relation to materiality are pertinent to this thesis as although mercury is one of the world's most toxic substances it may not have a high profile in the eyes of stakeholders. GRI (2013) conducted a study to identify the material items that the stakeholders think relevant and suggest should be monitored or reported in a corporate sustainability report. Based on 194 stakeholder organisations consisting of five categories of stakeholders (business associations, labour representatives, civil society organisations, information users, and experts), the GRI identified 2,812 topics in relation to 52 categories of businesses, of which 1,612 are unique topics. According to the GRI (2013), stakeholders from five different categories of business (electrical equipment and machinery (p. 51); automobiles and components (p. 56); textiles, apparel, footwear and luxury goods (p. 61); technology and semiconductors (p. 107); and electric utilities and independent power producers and energy traders (p. 126)) suggested that mercury be monitored or reported in the corporate sustainability report. On the other hand, Maag et al. (2007) and AMAP/UNEP (2013a) identified that stakeholders are not always aware of the mercury exposures. The study by the GRI (2013) also reflected that stakeholders in another 47 categories of business including mining, the highest mercury-emitting sector, did not recognise mercury as a material topic for reporting. However, the mining section suggested monitoring and reporting of heavy metals, which also includes mercury. All of the stakeholders of the major mercury-emitting corporations may thus not be sufficiently aware of the mercury pollution to recognise it as a material issue for reporting. For controlling mercury as one of the most toxic substances, this broad-based societal concern must therefore be derived from the relevant pollution-related sections of the SDGs and the Minamata Convention.

3.5. Summary and Conclusion

This chapter has provided an overview of the key theoretical ideas underpinning the thesis: accountability and the related concepts of quality reporting and materiality. Accountability is a multi-faceted term that cannot be confined within a brief definition (Sinclair, 1995). In SEA, accountability has been variously defined as the responsibility to justify past actions, to recognise the social and environmental rights of the current and future stakeholders, and to provide required information for facilitating actions and decision making in relation to the reporting entity. Accountability is not limited to the capital providers, but is extended to stakeholders including society at large for the monetary and non-monetary implications of operations (Cooper & Owen, 2007; Gray, 2002b). Moreover, future generations are also included in the group of wider stakeholders to whom organisations are expected to be accountable (Messner, 2009). However, the accountability of organisations to the stakeholders differs depending on the power of those stakeholders (Unerman & O'Dwyer, 2006).

An important normative foundation of accountability is stakeholders' rights of access to information. Transparency has been defined as the mechanism that facilitates the rights of the public to get access to information (Navarro-Galera et al., 2017). Whilst transparency is important, Fox (2007) argues that transparency is a necessary but not sufficient condition for accountability; sanctions and the ability of accountees to influence decision making are also required. The conceptual model of accountability was further developed by O'Dwyer and Boomsma (2015) who drew on previous literature (Ebrahim, 2003, 2009) to distinguish three accountability mechanisms: imposed, felt, and adaptive accountability. This typology is relevant to this study as while legal structures (imposed accountability) may ensure accountability in the private sector *via* sanctions, in the context of multilateral environmental agreements the imposition of sanctions is not available, and felt accountability is therefore critical.

The concept of accountability applies to both the public (government) and the private (corporate) sector. Accountability differs between these two sectors because of their different contexts, particularly the stakeholders to whom they are accountable, the structure and activities of the entities, and the acts, rules, and regulations they are governed by. Among others, the ability to facilitate action, the awareness of the people (democratic environment), the capability (resources), and the commitment of the reporting entity, corporation or country are required to ensure accountability. Bovens (2007) and Mulgan (2000) identify sanctions as

a key element of accountability, and Fox (2007) argues that transparency may not achieve hard accountability if sanctions are not imposed by regulators. In the context of MEAs, because of the sovereignty of the countries involved, sanctions are largely unavailable. Gupta and Asselt (in press) also note that the reverse – the provision of assistance to developing countries – becomes much more important in a global setting and is intertwined with the notion of accountability.

Despite this theoretical complexity of accountability, quality reporting remains important. The qualitative characteristics of accounting provide a useful foundation for determining report quality (GRI, 2011, 2018a). In SEA, completeness is a key challenge, and the concept of materiality determines whether an item should be included in the report or not. Although there are some quantitative standards of materiality in financial accounting, the determination of materiality is much more difficult in cases of social and environmental accounting and reporting because of the qualitative nature of the data. Determination of materiality in SER largely depends on the magnitude of the item to the reporting entity and the influence of the item on the decision-making process of the stakeholders. Consequently, recommended approaches emphasise the expectations of the stakeholders in determining the material issue, but a potential issue is that immediate stakeholders may not be fully aware of wider social and environmental issues. Such societal concerns must therefore be identified from the national and international social and environmental agreements (Mullerat, 2005), and the efforts of the GRI to link organisational materiality assessment with global sustainability concerns as identified in the SDGs is an example.

This chapter has provided an overview of the key theoretical concepts of accountability and the related concepts of quality reporting and materiality. The following four chapters comprise the four papers that detail the empirical work undertaken.

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Chapter 4

To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?

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To What Extent Will the Reporting Provisions of the Minamata Convention Improve Global Accountability for Mercury Emissions?

Abstract

Purpose: The Minamata Convention is a global approach to reducing mercury pollution being developed by the United Nations Environment Programme. Governments who are signatories agree to undertake reporting as per the provisions set out in the Convention. This paper evaluates the extent to which these reporting provisions will improve global accountability for mercury emissions given the concerns raised by previous literature regarding the quality of mercury reporting.

Design/methodology/approach: This paper reviews the reporting framework based on accountability theory. It adopts a qualitative approach and uses documentary analysis of UNEP technical reports, relevant research papers, the proceedings of all of the seven Intergovernmental Negotiating Committee (INC) meetings and discussions at the first Conference of the Parties (COP1), as well as the Convention reporting provisions. The qualitative characteristics of accounting information are used to identify the quality challenges posed by mercury reporting.

Findings: The paper argues that there is considerable scope for improvement across many dimensions of mercury reporting quality. In particular, formal accountability could be improved by incorporating provisions for verification of data to be submitted by the parties, covering additional emissions and omitting exclusions from the Convention for improving the completeness of mercury information, ensuring support for reporting, including financial support for developing countries, and providing incentives for compliance. It is thus currently the level of “felt accountability” that is crucial to achieving the expected objectives of the Convention.

Originality/Value: Few previous studies have focused on reporting under the Minamata Convention and none have evaluated the quality of country-level reporting to the Secretariat. This paper gives practical recommendations for improving accountability under the Convention as well as contributing to the understanding of reporting in the context of Multilateral Environmental Agreements, the primary tool for addressing the world’s most important environmental issues.

Keywords: Mercury, Reporting, Disclosure, Accountability, Minamata Convention

1. Introduction

This paper responds to the calls for research of relevance to the UN SDGs (Bebbington & Unerman, 2018b) by examining national mercury reporting under the newly ratified Minamata Convention. The UN Sustainable Development Goals (SDGs) strongly emphasise pollution reduction since air, water, and soil pollutants pose a critical challenge to human health (Futurism, 2018) and hence to sustainable development (ITT, 2017; The Lancet, 2017; UN, 2015). Pollution causes at least 9 million deaths globally every year (The Lancet, 2017). Pollution-related diseases caused more than 16 per cent of human deaths in 2015, which is three times more deaths than from AIDS, tuberculosis, and malaria combined, and 15 times more than from all wars and other forms of violence (ITT, 2017).

Among others, SDGs 2, 3, 7, 9, 11, 12, 14, and 15 specifically set targets to reduce environmental pollutants. For example, SDG 3.9 seeks to “by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination” (UN, 2015). Similarly, SDG 12.4 seeks to

by 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment (UN, 2015).

Mercury is one of the world’s most toxic pollutants. Scientists gained an understanding of the severe poisonous impacts of mercury after the Minamata incident in the 1950s (Minamata Disease Research Group, 1968). In cooperation with the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry (ATSDR) identified mercury as the world’s third most hazardous substance after arsenic and lead (ATSDR, 2001). Similarly, mercury pollution from artisanal gold mining was ranked as the world’s top pollution problem in 2013 (Worstpolluted, 2014). As an element, mercury cannot be damaged or condensed into new substances that are not harmful to people or the environment (United Nations Environment Programme, UNEP, 2011). All categories of mercury are dangerous to the human nervous system. A significant level of mercury exposure damages kidneys, hearing, and memory, as well as having a significant adverse effect on the development of fetuses (NPI, 2014).

Mercury pollution is a global issue, as post-emission mercury contamination spreads widely. In the 1990s scientists identified its transboundary nature, which led to the initiation of international strategies and agreements for reducing its impacts (Selin & Selin, 2006). Sources of mercury emissions include coal combustion, CFL lamps, switches, medical equipment, batteries, dental

amalgam, and cement. These sources of mercury emissions are present in most countries (AMAP/UNEP, 2013a; USEPA, 2014).

A global approach to reducing mercury pollution, the Minamata Convention, is currently being enacted. Global efforts for mitigating the mercury impacts have been observed since the 1970s (Selin & Selin, 2006), and collaborative voluntary efforts under the UNEP to eliminate mercury emissions have been evident since the 2000s (Sun, 2017). Observing the limitations of the national and regional efforts, the Barron Declaration and the Executive Body of the Convention on Long-Range Transboundary Air Pollution (CLRTAP) called upon UNEP to initiate a global assessment of mercury in 2000. In response to scientific and political interest and also to the growing demand for an assessment of mercury emissions, the UNEP Governing Council in February 2001 agreed to initiate a global assessment, which they reported on in December 2002. The report provided evidence for initiating a global agreement on mercury. However, considering the time and resources required, several countries argued for a voluntary approach, or for regulating mercury under the Stockholm Convention on POPs (Selin & Selin, 2006). Finally, after discussing the matter in several meetings, in February 2009 the UNEP Governing Council agreed to initiate a multilateral environmental convention on mercury.

As with other multilateral environmental conventions, reporting is an essential element of the Minamata Convention (UNEP, 2013b). The draft reporting format consisting of four parts was finalised in INC 7 in March 2016 (IISD, 2016). Part A calls for general information on the reporting country; Part B calls for information on (i) the measures taken by the reporting party to implement the relevant provisions of the Minamata Convention, and (ii) the effectiveness of such measures in meeting the objectives of the Convention. This main part of the report consists of 44 questions and 13 sub-questions, most of which are Yes/No type questions that require the parties to provide explanations of their position. Part C requires for the identification of possible challenges in meeting the objectives of the Convention. Part D seeks comment on the reporting format and possible improvements. In September 2017, the first Conference of the Parties (COP1) approved the final format of the report, which includes the same number of questions. However, in a few instances the questions and options have been simplified, and some minor details requested in the draft format under Article 3 (mercury supply sources and trades), and Article 8 (emissions), have been omitted.

Reporting under the Minamata Convention is somewhere in between voluntary and mandatory reporting. Although the parties are asked to report, there are no sanctions for non-reporting or poor disclosure. Moreover, there has been no incidence of penalties being imposed under Multilateral Environmental Agreements (MEAs) for reporting because of the sovereignty of the

participating countries (Kiss, 2006). Although sanctions act as a nudge towards meeting regulatory requirements (Feltus, 2014) and there is an appeal for imposition of sanctions for increasing compliance under the Basel Convention (Onyerikam, 2007), the Minamata Convention did not include any provision for sanctions for non-reporting. The question therefore arises whether the reporting provisions of the Minamata Convention will actually improve global accountability for mercury emissions.

The Minamata convention has received surprisingly little academic attention, especially regarding reporting. Although several scientific studies, (e. g., UNEP (2013a), AMAP/UNEP (2013a), Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010) and Walcek et al. (2003)) mention mercury reporting and information quality, these issues are not their primary focus. These studies identify mercury disclosures as lacking in different parameters of quality including understandability, accuracy, verifiability, reliability, completeness, and comparability. Other authors have traced the history and likely impact of the Minamata Convention, but few have considered the issue of reporting. There are two main exceptions. In the first, Evers et al. (2016) discuss the provisions of the Minamata Convention and make suggestions as to what the main reporting requirements should be for assessing the overall success of the Convention, assumed to be conducted every 6 years. Whilst important, this study does not consider the ongoing national reporting required by the Convention. The second study, by Strzelecka-Jastrz b (2018), examines the Minamata Convention’s reporting requirements and the capability of Poland to comply with them. Whilst this study explicitly focuses on country reporting, it makes no assessment as to the quality of the Convention’s overall reporting requirements. Furthermore, neither of these studies attempt to evaluate the reporting requirements using a theoretical framework. Within social and environmental accounting (SEA) literature, historically the focus has been on corporate reporting more generally (eg. Deegan & Rankin, 1997; Guthrie & Parker, 1990; Mathews, 1997), and though there has been increasing focus on specific environmental issues such as water, biodiversity, and carbon, no studies to date have specifically examined mercury reporting.

By addressing the research gap for mercury reporting under the Minamata Convention, this paper seeks to make several contributions. Firstly, by providing suggestions to improve mercury reporting, the paper responds to calls by Guthrie and Parker (2016, p. 2) for “enabling accounting that can benefit society more widely”, as well as to calls to align SEA research with priorities signalled by the UN SDGs (Bebbington & Unerman, 2018a). Secondly, SEA research is mostly about corporate reporting, but this paper explores sustainability reporting at country level, which is at the forefront of reporting for sustainability (Bebbington & Unerman, 2018a). Whilst reporting by government agencies has been widely researched, reporting by governments

themselves has generally been neglected within the SEA, save for reporting by local government (Othman et al., 2017). Thirdly, this paper explores country-level reporting in the context of mandatory reporting to a global regulatory body. This investigation is important given earlier calls for mandatory reporting within the SEA literature (Adams, 2004; Gray & Milne, 2004), but there are conflicting findings regarding whether mandatory reporting actually improves reporting quality (Chelli et al., 2016; Costa & Agostini, 2016; Fallan, 2016). Fourthly, the findings of this study may be relevant to the reporting of other specific pollutants, because country-level reporting under different conventions (such as the Stockholm Convention, the Rotterdam Convention, and Basel Convention) for different contaminants is similar to that in the Minamata Convention.

The remaining sections of the study are as follows: Section 2 reviews relevant literature, Section 3 delineates the theoretical framework, Section 4 discusses the method of the study, Section 5 provides the findings, and Section 6 concludes and outlines implications and further research directions.

2. Literature Review

To date, while Social and Environmental Accounting (SEA) research has considered various social and environmental challenges, mercury has received negligible attention. During the previous three decades, SEA research has advanced significantly and engaged with many pressing environmental issues (Deegan, 2017; Gray & Laughlin, 2012) including carbon (Penz & Polsa, 2018; Perkiss & Moerman, 2018), water (Hazelton, 2015; Tello et al., 2016), human rights (O'Brien & Dhanarajan, 2016; Siddiqui & Uddin, 2016), and biodiversity (Adler et al., 2018; Boiral & Heras-Saizarbitoria, 2017). In addition, SEA has focused on toxic substances disclosure in general (Centner, 2013), and specifically on arsenic (Soumya, 2011), sulphur dioxide (Zhu & Zhang, 2012), and lead (Bae, 2012). However, mercury, one of the most toxic substances and despite having the most diversified impacts on human health and the environment, has not been studied by SEA researchers.

Outside of SEA, several studies have examined the factors influencing the implementation of MEAs. For example, Zhao and Ortolano (2003) identified that monetary motivation, local government participation, and administrative capability play a significant role in implementing the Montreal Protocol; Ivanova (2007) explored how corruption and illegal trade impede compliance with the Montreal Protocol; and Yoder (2003) examined the Stockholm Convention and identified the lessons, specifically articulating practical provisions and encouraging wider participation, which may help in the design and implementation of other similar MEAs. The studies of Trasande et al. (2016), Ambalam (2014), and Daudu (2008) focused on developing

countries and identified their constraints in complying with the provisions of the MEAs. Daudu (2008) specifically examined the capabilities of the African countries of implementing and complying with the Rotterdam Convention and suggested initiatives for eliminating the weaknesses of those countries.

Several studies have also recognised the significance of reporting provisions for achieving the objectives of MEAs. For example, Loibl (2005) and Kurz and Apps (2006) recognise the importance of developing accounting, reporting and information systems for compliance with and implementation of the international agreements. Loibl (2005) acknowledges that reporting and information systems had been an important means of encouraging implementation of, and compliance with, international environmental agreements. As parties to different Conventions face difficulties in meeting the requirements, he suggests that harmonisation and streamlining of reporting requirements under various environmental agreements might help to overcome those difficulties. Kurz and Apps (2006) examine Canada's development of National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS) in support of its international obligations to report greenhouse gas sources and sinks. They find that the design of Canada's NFCMARS anticipated that new data, better scientific understanding, and refined ecosystem process models would become available in the coming years to meet international obligations.

Several studies have specifically considered the Minamata Convention, but with the exception of Evers et al. (2016) and Strzelecka-Jastrzab (2018) – discussed further below – no studies have focused on reporting issues associated with the Convention. Previous work falls into three main camps: predominantly descriptive studies that examine the history and/or potential of the Convention overall, more analytical studies that provide a more theoretically or empirically grounded evaluation of the Convention, and studies that consider the impact of the Convention on a particular region or industry.

2.1 Background to the Minamata Convention

In the first camp, an overview of the origins, negotiations and ultimate outcome of the Convention is provided by Templeton and Kohler (2014), Eriksen and Perrez (2014) and Selin (2014). These papers give similar accounts of the history of the Convention: early interest by the US being supported by European nations; a period of research culminating in a proposal for a legally binding treaty that the US and some other developed nations did not support; a change in the US presidency to Barak Obama, which reignited US interest; the development of a relatively rapid consensus; and the signing of the Convention facilitated by the United Nations Environment Programme (UNEP), resulting in the first new international environmental treaty in over a decade.

Whilst each of the authors comments favourably on the speed and outcome of the Convention, all also acknowledge the challenge that establishing a compliance and reporting regime presented. An important consideration for the development of the Minamata compliance regime was the experience with previous multilateral agreements, and a review of previous agreements was conducted by UNEP (Selin, 2014, p. 3). In particular, the experience of the Rotterdam and Stockholm Conventions was important, as despite a clear mandate in both of those Conventions for the establishment of a compliance mechanism, many years after implementation no such mechanism had been established (Eriksen & Perrez, 2014, p. 208). For this reason, UNEP considered it essential that the compliance mechanism be established as part of the Convention rather than being left for future negotiation.

Eriksen and Perrez (2014, pp. 201-203) report that in order to establish the compliance framework a particularly contentious element of negotiations is the extent to which parties should have “common but differentiated responsibilities”, as set out in Principle 7 of the Rio Declaration. Essentially, developing countries were concerned that they would be held to meeting certain standards without having access to adequate resources, and hence emphasised that “differentiated” responsibilities would be appropriate. On the other hand, developed countries were worried that this concept would be later used to suggest that the Convention did not have the same legal force as it did in the developed world. Moreover, they argued that a “North–South” divide did not reflect the more complex reality of a spectrum of levels of national development. Ultimately, the compromise was that the overall Convention does not distinguish between developing and developed countries. However, there is provision for allowing specific countries to ask for country exemptions or extensions to particular elements of the Convention.

Given this backdrop, it is perhaps not surprising that the compliance elements of the Convention were negotiated in parallel with the funding mechanisms. Developing countries argued that financial and technical assistance should be a “condition for” implementation, whilst developed countries argued that such assistance should rather be considered merely “essential to” implementation (Selin, 2014, p. 14). Developing countries advocated treaty-specific funding from donors (modelled on the Montreal Protocol), whereas developed countries advocated a funding model based on the Stockholm Convention, whereby applications can be made to the Global Environmental Facility, a body established in 1992 that funds a wide range of environmental initiatives. The latter approach was ultimately adopted *via* Article 12, but this resulted in a watering down of compliance provisions. Most notably, National Implementation Plans are not mandatory, but rather “may” be developed by countries that wish to do so (Article 20).

Overall, the approach to compliance is facilitative rather than punitive. Selin (2014, p. 16) reports that developing countries wanted greater certainty on funding as a condition of agreeing to compliance mechanisms, but in the end agreed to establish a Compliance Committee *via* Article 12. This Committee, however, is explicitly tasked with being “facilitative”, must strive for consensus and can only pass a recommendation as a “last resort”, and even then only with a three-quarters majority vote. Furthermore, the Compliance Committee “shall pay particular attention to the respective national capabilities and circumstances” of the parties to the Convention. Despite these restrictions, given the abject failure to establish compliance mechanisms for the Rotterdam and Stockholm Conventions, Eriksen and Perrez (2014, p. 208) suggest that “the [compliance] agreement achieved for the Minamata Convention can be seen as ground-breaking and very progressive.”

Whilst the mechanism for compliance was agreed as part of the Convention, the details for reporting were not. Article 21 sets out the requirements for reporting but consists of only three clauses. The first clause is that each party must report the measures taken to implement the Convention, the effectiveness of these measures, and the possible challenges in meeting the objectives of the Convention. The second clause states that each party shall include the information called for in Articles 3 (supply and trade), 5 (manufacturing), 7 (gold mining), 8 (emissions), and 9 (releases), but no reporting details are specified in any of the Articles. Instead, the third clause of Article 21 states that the reporting format and timing shall be decided at the first Conference of the Parties. This meeting was conducted in September 2017, and the reporting requirements are discussed in the following section.

In considering the Minamata Convention approach to reporting, an important distinction is between the country-level reporting required in Article 21 – which is intended to communicate the effectiveness of implementing the Convention for a given nation – and reporting that enables an evaluation of the effectiveness of the Convention as a whole, which is called for in Article 22. Whilst obviously there is a strong relationship between the two, it may be that country-level success does not equal global success for a number of reasons, such as inaccurate reporting or limitations of the Conventions itself (*e.g.*, making exceptions for military and other specific uses of mercury). Article 22 of the Convention states that an evaluation of effectiveness should be made within 6 years and periodically thereafter, but provides few details as to how that evaluation should be undertaken and what measures should be used. Evers et al. (2016) provide a proposed reporting guide for use in 6 yearly increments, which covers all the major articles of the Convention. This proposal includes items such as the level of mercury production, the number of new mercury mines, the level of mercury trading, *etc.* Whilst this proposal undoubtedly has

merit, the key point is that no decision has been made as to exactly how the evaluation of the success of the Convention will be undertaken.

2.2 Evaluation of the Minamata Convention

In addition to research describing the key features and history of the Minamata Convention, some studies have given a more analytical perspective. Perhaps most notable is the work of You (2015) who investigates the possible reasons for the overall approach to mercury abatement adopted by the Convention. As You (2015) points out, the Convention differs from multilateral agreements such as the Kyoto Protocol in that it does not impose quotas for national mercury consumption or emissions and nor does it quantify reduction requirements. There is also no capacity for mercury emissions trading. In contrast, You (2015, p. 1) describes the Convention as “source-specific” in that the phasing-out and phasing-down requirements are directed “to specific categories of pollution sources through the regulation of specific sectors of the economy and social life”. Two possible explanations for this approach are provided (and empirically supported). The first explanation is that mercury is a “non-threshold” pollutant in that there is no safe level of emissions. The second (and related) explanation is that there is no feasible way to determine a total allowable quantity for mercury emissions. Whilst there is undoubtedly merit in this analysis, the absence of national targets and quotas nevertheless introduces the risk that overall progress (or lack thereof) might only become known when the overall assessment of the Convention’s success is carried out 6 years after implementation.

Research has also been conducted that considers the impact of the Convention on a particular region or industry. Examples of this research include examining the extent to which the Convention will address ecological economics and small-scale gold mining in Indonesia (Spiegel et al., 2018); illegal gold mining in Peru (Buccella, 2014); the likely impact on gold mining in Sub-Saharan Africa (Hilson et al., 2018; Spiegel et al., 2014); the likely impact on the US (Rotondi & Smaczniak, 2014); the impact on the EU (Jarvis, 2015); the impact on Coal-fired power generation in Asia (Giang et al., 2015); the impact on coal-fired power stations in China (Ancora et al., 2016); the impact on dental amalgam (Meyer et al., 2016), and so on. Whilst less immediately relevant to the present study, an important theme of many of these studies is to emphasise the interrelated nature of the mercury problem and the role that more developed countries can play in both direct and indirect assistance. For example, in relation to Peruvian gold mining, Buccella (2014, p. 186) suggests that Peru is “caught between avoiding harm to the environment and public health or jeopardizing the rural economy and social stability”, given that illegal gold mining produces significant emissions but is one of the few viable sources of wealth for the poor. Buccella (2014, p. 186) notes that the Convention does not provide financial support

to assist illegal miners to leave the industry and suggests that an important element of the solution is to reduce demand: “The United States alone could affect the demand for gold simply by recycling the 85 per cent of electronics that are thrown away there each year.” This example underscores the interrelated nature of compliance and financial assistance that was so evident in the Convention negotiations.

Two studies have specifically considered reporting under the Convention. The study by Evers et al. (2016) specifically considers reporting, but as noted above this study is concerned with the periodic monitoring of the success of the Convention overall as opposed to the more frequent reporting of the parties to the Convention. The second is that of Czaplicka et al. (2018), who explore the extent to which Poland has the informational infrastructure to enable compliance with the proposed reporting regime. This (brief) study describes the main reporting requirements and key Polish data sources that might be utilised to meet these requirements, but it does not attempt to evaluate the quality of the reporting regime of the Convention itself. Selin et al. (2018) argued that though the Minamata Convention has been built based “upon an extensive body of scientific knowledge on mercury” (p. 198); however, “when examining science and policy linkages, it is necessary to pay attention both to the content of the scientific information and to the processes by which that information is produced and communicated” (p. 199). The paper identified that “credible, policy relevant”, “fair”, and “unbiased” information is significant for policy making (Selin et al., 2018, p. 199).

The above discussion reveals that whilst the Minamata Convention has attracted significant academic interest, to date there have been few studies that have focused on reporting, and none that have examined the quality of the proposed reporting regime. However, a range of literature has identified various quality challenges in relation to mercury information. For example, Mohapatra et al. (2007) and UNEP (2013a) posed questions about accuracy and reliability; AMAP/UNEP (2013) were concerned about comparability; Nelson (2007) was anxious about verifiability; Walcek et al. (2003) questioned consistency; and Nelson et al. (2009), Telmer and Veiga (2009), and Strezov et al. (2010) questioned the understandability of mercury information. Furthermore, no study concentrates on evaluating whether the reporting provisions, funding mechanisms, and capabilities of the parties to the Minamata Convention would hinder the achievement of the objectives of the Convention. It is therefore possible that current reporting may be inadequate for ensuring accountability of the parties to the Minamata Convention.

Given the concerns in relation to the adequacy of the Convention’s reporting requirements, this paper aims to answer two research questions. Firstly, *To what extent will the reporting provisions*

of the Minamata Convention ensure the accountability of the countries for mercury emissions? and secondly, *How can these reporting provisions be improved?*

The following section presents the theoretical framework used for the study.

3. Theoretical Framework: Accountability

This study draws upon related notions of accountability to examine the reporting provisions under the Minamata Convention. This perspective is used as it directly responds to the objectives of reporting under the Convention and the concerns raised by commentators in relation to the adequacy of this reporting. In terms of accountability, as noted above the Convention is legally binding, and hence parties are formally accountable to the Secretariat. Furthermore, the Convention is the result of extensive research demonstrating the toxicity of mercury to human and non-human life, meaning that parties have a moral accountability to the global community. In terms of the qualitative characteristics of reporting, the previous section has identified concerns in relation to accuracy and reliability (Mohapatra et al., 2007; UNEP, 2013a), comparability (AMAP/UNEP, 2013a), verifiability (Nelson, 2007), consistency (Walcek et al., 2003), and understandability (Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009).

Accountability may be defined as the ability to explain and to answer any question relating to past actions, and hence accountability involves the right to obtain appropriate information and the corresponding obligation to release all necessary details. Accountability consists of different aspects, and cannot be limited by a straightforward definition (Sinclair, 1995). It has been defined as “the duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible” (Gray et al., 1996, p. 38). Arrington and Francis (1993) define accountability as fulfilling the responsibility of an economic entity: that is, one obliged to demonstrate the rationality of its activities to others by providing its accounts. Benston (1982) expressed three views of corporate accountability. In the narrowest view, corporations are seen as being accountable to shareholders, in the intermediate view to stakeholders, and in the broadest view to society in general. On the other hand, Stewart (1984) described accountability as the power of the accountee (the receiver of the account or information) to hold to account the person who gives the account. A broader definition provided by Bailey et al. (2000, p. 203) emphasises that the concept of accountability requires not only the provision of information but also its value in terms of “facilitating action”.

Public-sector accountability is broader and more complicated than its private-sector counterpart (Funnell, 1990; Parker & Gould, 1999; Sinclair, 1995). Funnell (1990) identified two classifications of public sector accountability, fiduciary and management, whereas Tan and Egan (2017) divided public sector accountability into seven categories: public, managerial, fiduciary, policy, professional,

political, and personal/self-accountability. In the public sector, policy accountability is the final stage of accountability that accounts for achieving or failing to achieve objectives, and “Policy effectiveness is the ultimate level of accountability because it is concerned with whether the goals of the government have been achieved. It requires the comparison of achievements with expectations and questioning the merits of existing policy” (Funnell, 1990, p. 13).

Based on the approach of discharging accountability, O'Dwyer and Boomsma (2015) described three categories of accountability as “imposed, felt, and adaptive accountability”. Firstly, the traditional view of accountability – “the imposed accountability regimes” – is considered as a “formal oversight and control imposed” on an individual or entity (O'Dwyer & Boomsma, 2015, p. 40). In this context, accountability is discharged through “giving and demanding for reasons for conduct” (Sinclair, 1995, p. 221). It is a state of accountability where an individual or organisations are compelled to discharge accountability based on rules and procedures (Chenhall et al., 2010; Ebrahim, 2009; O'Dwyer & Boomsma, 2015). Individuals or organisations comply with previously set regulations that avoid uncertainty and facilitate appropriate performance measurement. Adherence to the detailed regulations is required both to regulate actions and to ensure punishment for non-compliance (Ahrens & Chapman, 2004; Chenhall et al., 2010). However, compliance-based imposed accountability facilitates the achievement of a short-term specific outcome (O'Dwyer & Boomsma, 2015).

Secondly, “felt accountability regimes” envisage accountability as a voluntary form of “felt responsibility” to certain principles or a mission (Ebrahim, 2009; Fry, 1995). Roberts (1991, p. 365) defined felt accountability as “a social acknowledgement and an insistence that one’s actions make a difference to both self and others”. This acknowledgement is the ethical motivation of responsibility that is fundamentally absent in imposed accountability (Messner, 2009; Roberts, 1991). According to felt accountability principles, individuals themselves feel the responsibility of being answerable without any external pressure. Chieng et al. (2016) articulated the concept of felt accountability as “expanded by society’s expectations, which can extend beyond the requirements of law”. Accountability in this case is embedded into the mission, values, and culture of the organisation (Lewis & Madon, 2004; O'Dwyer & Boomsma, 2015; Shearer, 2002; Sinclair, 1995). Felt responsibility is more incorporated into the everyday life of an organisation, but it is less transparent (Hilhorst, 2003).

Thirdly, a combination of the instrumental facets of imposed accountability and the moral and ethical facets of felt accountability form adaptive accountability regimes (Ebrahim, 2009). O'Dwyer and Boomsma (2015, p. 42) argue that “adaptive regimes are proactive in nature, strategy-driven, and focused on medium to long-term performance measurement and mission achievement”. In this type of accountability, imposed and felt accountability co-exist, their relative dominances being balanced

out. Similarly, adaptive accountability is embedded in the organisational mission, values, and cultures (Ebrahim, 2009). Although performance measurement in adaptive accountability is more prominent and formalised than with felt accountability, it is less formalised than it is with imposed accountability (O'Dwyer & Boomsma, 2015).

According to the reporting provisions of the Minamata Convention, especially in relation to verification and sanction, felt accountability is the primary mechanism likely to improve the accountability of the parties to the Convention. Sanctions work as a reminder and require the instigation of felt accountability for complying with the required regulatory processes (Feltus, 2014). Moreover, sanctions not only mean negative sanctions of giving punishment for non-compliance or poor reporting, but also positive sanctions of rewarding for satisfactory performance (Bovens, 2007; Mulgan, 2000). This study responds to the call of O'Dwyer and Boomsma (2015) for further studies that explore the creation of felt accountability in other institutional environments and cultural contexts.

Among the different facets of accountability, one of the recognised ways is the provision of relevant and understandable information. The accountable organisation should beware of its expectations based on the evaluation of the impacts of its previous actions and the probable effects of its actions on the community (Dillard, 2007).

Accountability is used here to examine the adequacy of the discharge of responsibility to provide quality information on mercury to the stakeholders. The accountability framework also recognises the human rights aspect of the provision of mercury information as used by Hazelton (2013a) in the case of water information. Merely providing information is not sufficient to ensure the rights to information. However, providing quality information that fulfils the qualitative characteristics outlined in an established framework can safeguard the rights to that information; hence the concept of the qualitative characteristics of reporting is used as a tool to evaluate the quality of reporting. This is discussed further, together with the other elements of the method of the study, in the following section.

4. Method

4.1. Explanatory Case Study

This paper is a qualitative case study that evaluates the quality of the mercury reporting process and of mercury disclosures. It follows the qualitative case study method suggested by Baxter and Jack (2008), Hancock and Algozzine (2006), Miles and Huberman (1994), Stake (1995) and Yin (2003). Baxter and Jack (2008, p. 544) state that “qualitative case study methodology provides

tools for researchers to study complex phenomena within their contexts”. Providing broader contextual information, Yin (2003) defined a case study as

an empirical inquiry that (a) investigates a contemporary phenomenon within its real-life context, especially when (b) the boundaries between phenomenon and context are not clearly evident (p. 13). The case study inquiry (a) copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result; (b) relies on multiple sources of evidence, with data needing to coverage in a triangulating fashion, and as another result; (c) benefits from the prior development of theoretical propositions to guide data collection and analysis.

A qualitative case study approach is used for this paper because it fulfils almost all the criteria set by Yin (2003, p. 21) including the following:

(a) the focus of the study is to answer “how” and “why” questions; (b) you cannot manipulate the behaviour of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context.

Among the different typologies of case studies, this paper is an “explanatory case study” that will answer “questions that [seek] to explain the presumed causal links in real-life interventions that are too complex for the survey or experimental strategies. In the evaluation language, the explanations would link program implementation with program effects” (Baxter & Jack, 2008, p. 547).

4.2. Data

This study used published documents to answer the research questions as Hancock and Algozzine (2006, p. 51) identified that “case study researchers often review existing documents”, and these documents may be “extracted from the Internet, private and public records, physical evidence, and instruments created by the researcher”. Yin (2003, p. 86) ascertained “documentation” as the first source among six sources of information for case study research. He identified some strengths in the use of documents including “(a) stable – can repeatedly be reviewed, (b) unobtrusive – not created as a result of the case study, (c) exact – contains exact names, references, and details of an event, (d) broad coverage – long span of time, many events, and many settings” (Yin, 2003, p. 86).

Three key data sets have been considered in this study. Firstly, to identify key challenges for mercury accounting this paper analyses the published documents of the United Nations on mercury including the technical background report for the global mercury assessment (271 pages) (AMAP/UNEP, 2013a), the global mercury assessment of 2013 (44 pages) (UNEP, 2013a), the Minamata Convention on Mercury (69 pages) (UNEP, 2013b), and relevant academic research papers.

Secondly, the study examines the detailed reports on the day-to-day discussions of the Minamata Convention planning meetings INC 1 to INC 7 and COP1 to identify the extent to which quality challenges are emphasised in their discussions. The Earth Negotiations Bulletin, published by the International Institute for Sustainable Development (IISD)⁴, provides 174 pages of discussions which were analysed for references to reporting issues. The Earth Negotiations Bulletin has reported the details of the discussions, comments and suggestions of each country, regional body and NGO representative made in those meetings. For example:

Canada said the reporting cycle should balance transparency and administrative burden, and be separate from other MEAs. Iran said the amount of reporting called for is “excessive” compared to other MEAs and urged considering the different levels of financial and technical capacity among parties. Peru said reporting requirements should be clear, simple and specifically related to national priorities. The US said that there is no need to submit additional data that could be demonstrated through a description of a party’s experience, with China and Thailand stressing that reporting requirements should not overburden parties. Pakistan said reporting should be used to understand the effectiveness of the Convention and not to “name and shame.” (IISD, 2016, p. 9)

These discussions revealed the extent to which representatives of the countries had provided importance on reporting issues, to what extent the quality limitations are identified, and how far these could be expected to comply with the reporting provisions of the Convention provisions.

Thirdly, INC 7 had approved a draft reporting format, and COP1 provided a final reporting format that is the outcome of the discussions of the reporting issues. We analyse this draft reporting format and update on the final reporting format to examine whether the quality challenges, as identified in the literature and in the discussions of the INC meetings, are reflected.

4.3. Data Analysis

⁴ All INC meeting (1-7) detailed reports are available on the website of International Institute of Sustainable Development: <http://www.iisd.ca/mercury/inc>

In terms of “determining the case/unit of analysis”, Miles and Huberman (1994, p. 25) asserted that the case is “in effect, your unit of analysis”. The unit of analysis of this study is the reporting provisions of the Minamata Convention only. In terms of “binding the case” this paper limits its objectives and discussions by “activity” (Stake, 1995) (*i.e.*, the reporting activity), and by “context” (*i.e.*, the Minamata Convention. In terms of “propositions”, this paper has some specific propositions under the qualitative characteristics of accounting information as laid down in the conceptual framework of accounting. The specific propositions of the case study research increase the probability that the paper will be limited to a specific latitude (Baxter & Jack, 2008).

The study follows the steps suggested by Baxter and Jack (2008, p. 555) as the “strategies for achieving trustworthiness in case study research”, including the following:

(a) [provision of] enough details to prove the “validity or credibility” of the research to its readers; (b) clearly written research question, provided propositions; (c) case study design suitable for answering the research question; (d) systematic data collection; and (e) appropriate data analysis.

The study also adopted additional strategies suggested by Baxter and Jack (2008) and Krefting (1991) for improving the reliability of the work, including having multiple researchers, peer examination of the collected data, the adopted methods, and the analysis of the findings of the study. One of the researchers collected the data described above, searched the relevant information from the collected documents based on the keywords such as quality criteria, and the other two researchers checked the relevance and reliability of the information identified for further analysis.

With regard to data analysis, although different approaches have been suggested by Yin (2003) and Stake (1995), this paper adopted the “categorical aggregation” approach as suggested by Stake (1995). That is, in analysing the data, the study used the qualitative characteristics as the categories of mercury information lacks, as identified in the literature review, in relation to accuracy and reliability (Mohapatra et al., 2007; UNEP, 2013a), comparability (AMAP/UNEP, 2013a), verifiability (Nelson, 2007), consistency (Walcek et al., 2003), and understandability (Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009).

Although these qualitative characteristics are mostly used to evaluate financial accounting information (Cheung et al., 2010; Shahwan, 2008), Comyns and Figge (2015) examined the quality of GHG disclosures in the sustainability reports of oil and gas companies based on seven quality criteria (accuracy, completeness, consistency, credibility, relevance, timeliness, and transparency) and found that GHG information fulfilled the requirements of timeliness and relevance, but has been lacking in terms of completeness, accuracy, and transparency. Burritt and Saka (2006) used some of these criteria, including understandability, relevance, materiality,

reliability, comparability, and timeliness, for examining physical management accounting information provided by the Pollutant Release and Transfer Registers (PRTRs), and revealed that problems that require attention still exist in most of these areas. O'Dwyer et al. (2005) used six qualitative characteristics (adequacy, verifiability, credibility, comparability, consistency, and usefulness) for evaluating Irish corporate sustainability reporting based on a survey of stakeholders (social and environmental NGOs) and found that NGOs are mostly in disagreement on the sufficiency, credibility, and usefulness of the corporate social disclosures, and demanded external verification by external social and environmental auditors. Moreover, according to the “quality of information” guideline of the Government of Canada, and in line with the “six dimensions of quality” of Statistics Canada, the Canadian National Pollutant and Release Inventory (NPRI) uses seven qualitative characteristics of accounting information for ensuring the quality of reports (NPRI, 2017a). In addition, the GRI (2011) and OECD (2008) also suggested these characteristics for ensuring the quality of PRTR data.

Finally, considering the decisions of INC meetings, COP1, and the reporting process of other MEAs, suggestions have been made for improving mercury reporting quality and ultimately achieving the accountability of the parties to the Convention.

The findings of this analysis are presented in the following section.

5. Findings

The COP1 finalised the reporting format of the parties to the Minamata Convention. The four parts of the reporting format are as follows: (a) information about the reporting party and its contacts, (b) information about mercury emissions, (c) information on challenges to meeting the objectives of the Convention, and (d) comments on reporting format and possible improvements. Part (b) is the main body of the report, which requires parties to report on the following: mercury supply sources and trade including primary mines; mercury stocks; imports, and exports (Article 3); mercury-added products detailing their manufacture, import, and exports; measures taken to reduce the level of reductions achieved (Article 4); mercury-using manufacturing processes including facilities that use mercury or mercury compounds and measures taken to prohibit mercury use in manufacturing processes (Article 5); artisanal and small-scale gold mining (ASGM) specifically the uses of significant mercury in the ASGM, measures taken to reduce and eliminate mercury use and national action plan regarding ASGM (Article 7); mercury emissions detailing the new and existing sources of mercury emissions; use of best available techniques or best environmental practices (BAT/BEP); measures implemented to control inventory of the emissions, identification of the relevant sources, and national plans (Article 8); and releases including relevant sources of releases and inventory of releases (Article 9).

The parties are also required to report on the following: the measures taken to ensure interim storage of non-waste mercury in an environmentally friendly manner (Article 10); measures in place and their effectiveness in using mercury waste and the facilities for managing waste mercury (Article 11); financial sources and mechanisms detailing the uses of the resources, based on its capabilities, to implement the policies, priorities, plans and programmes, and the contribution of the party to the funding mechanism of the Secretariat and also to the developing countries through other channels (Article 13); the party's role in providing, promoting and receiving capacity-building, technical assistance, and technology transfer (Article 14); details of measures taken to provide information to the public and to protect human health from mercury exposure (Article 16); details of activities related to information exchange (Article 17); information on activities related to promoting public awareness and education on mercury emissions and exposures (Article 18); and finally, details of research, development, and monitoring of mercury emissions (Article 19).

Considering the above-mentioned reporting requirements, this section identifies the key quality challenges to the provision of information on mercury based on the qualitative characteristics of accounting information. An account of the summary of the status of the qualitative characteristics is provided in Table 1, which shows that all of the qualitative characteristics need improvement in order to accomplish the objectives of the Convention.

Table 1. Summary of the status of accountability of the qualitative characteristics

	Qualitative Characteristics	Quality Concerns	Proposals under the Minamata Convention	Suggestions
5.1	Completeness	Greater uncertainties, lack of information, faults in reporting systems and verification of assumptions impede the creation of adequate information	Non-burdensome and simplified reporting approach	Inclusion of all the emissions in the reporting framework and ensuring all countries become parties
5.2	Verifiability	Uncertainties in estimation; no verification process	No specific verification approach proposed	Introducing a verification provision like the Kyoto Protocol
5.3	Comparability	Parties use different measurement and reporting methods.	The COP shall, as soon as practicable, adopt guidance on the methodology for preparing inventories of emissions.	Specify a measurement method and a comparable reporting approach
5.4	Timeliness	Four-year cycle for a full report and a 2-year cycle for reporting key issues	Competing proposals are a 4-year, annual or biannual reporting cycle	Annual reporting timeframe like the Basel Convention, Montreal Convention, and Kyoto Protocol
5.5	Understandability	Poorly understood (hinder prevention and remediation)	A simple and well-understood reporting process	Separate reporting for experts and general users
5.6	Accuracy	Uncertainty, lack of documentation and transparency in the estimation	Public disclosure of mercury information for confirming transparency and reliability of the process.	Prescribing methods, reducing uncertainties, and ensuring standard reporting

The detailed analysis and the findings in terms of each qualitative characteristic are presented in the following subsections.

5.1 Completeness

Completeness refers to the reporting of all the expected information that “reasonably” fulfils all the qualitative reporting requirements. [According to FASB (1980), “completeness implies that nothing material is left out of the information that may be necessary to ensure that it validly represents the underlying events and conditions.”

Greater uncertainty, lack of information, faults in reporting systems, and verification of assumptions impede the gathering of adequate information on mercury. AMAP/UNEP (2013a)

is concerned that information regarding global releases of mercury into aquatic systems is still incomplete, with data not available for some categories that might be important contributors (e.g., landfills, cement production, waste incineration, coal-fired power plants). Similarly, Telmer and Veiga (2009) highlight how the mercury data reported is incomplete in cases where these may be underestimated or overestimated. Furthermore, Nelson (2007) was concerned about the completeness of mercury reporting, highlighting concerns about the completeness of the data reported, and large uncertainties in global estimates of mercury emissions to the air. These uncertainties stem from various sources, including the availability of information on activity levels, but mainly from the lack of information concerning the mercury content of some raw materials and the validity of assumptions regarding processes and technologies employed to reduce mercury emissions, including their rates of application and effectiveness (UNEP, 2013a). UNEP also stated that few data are available for reporting mercury releases into aquatic systems.

Completeness of mercury reporting under the Convention has been emphasised in all of the INC meetings. In the second INC, the USA supported complete reporting requirements and asked the parties to consider the reporting requirements under each article of the Convention. While some discussants, such as the Zero Mercury Working Group, asked for the inclusion of additional requirements, most discussions were around simplifications of the reporting format resulting in non-burdensome reporting requirements. The discussions in the seventh INC are reported as follows:

Many countries supported a simple, efficient, non-burdensome, facilitative reporting scheme ... China and Thailand said the reporting requirements should not overburden parties. India called for simplification of the format to ensure better implementation and called for capacity building to support reporting (INC 7, 10–15 March 2016).

Several countries such as Pakistan and India supported additional requirements, but only after developing the capacity of the parties. In response to the proposal by one of the developed countries for allowing the submission of an incomplete report, Pakistan and India said that

PAKISTAN, supported by INDIA, favoured keeping the reporting format simple and in strict accordance with Article 21, with the option to further elaborate reporting requirements as countries build capacity (INC 6, 4 November 2014).

The reporting format also provides opportunities for submitting inaccurate information to the Secretariat. For example, in 10 per cent of the questions in the reporting format, parties are given an option such as “Do not know (*please explain*)”. These options may be considered as loopholes through which inaccurate information can be provided, and a means of avoiding responsibility

for emissions. Selin et al. (2018, p. 199) were also disappointed that though the Minamata Convention is a legally binding instrument, “some provisions require action (using the word ‘shall’) while some are hortatory (using words such as ‘should’ or ‘may’)”. Similarly, Lin et al. (2017, p. 1070) were concerned at the use of “very soft wording” such as “parties may” and “parties are encouraged to” in different operational articles of the Convention.

The draft reporting format also emphasised the completeness or scope of information on mercury by asking for additional information and explanation in almost every question. However, not all mercury-emitting sources are included in the reporting requirements. The major exclusions are military use, crematoria, steelmaking, aluminium, and small-scale emissions such as cement clinker and waste. Importantly, so far only 128 countries are signatories, and 94 countries became parties to the Convention. As a result, if all the countries do not become parties to the Convention, then its success in controlling a transboundary element like mercury would be beyond the realm. These exclusions raise questions as to the completeness of mercury reports, evidence disclosed, and the accountability of the parties to the Minamata Convention.

5.2 Verifiability

Verifiability implies the justification of information by independent measurers using the same measurement technique. FASB (1980) stated that “verifiability is a quality that may be demonstrated by securing a high degree of consensus among independent measurers using the same measurement methods.” Williams and Griffin (1969, p. 143) more broadly defined verifiability as “the correctness of mathematics and logical arguments, the trustworthiness of reports, the authenticity of documents, the accuracy of historical and statistical accounts, the reliability and exactness of observations”.

Uncertainties in estimation may limit verifiability, but it is not impossible. AMAP/UNEP (2013a) stated that although inventory estimates have often been made using different approaches, the level of agreement between the 2010 global inventory and nationally reported estimates are, with a few exceptions, surprisingly good, and this level of agreement is an encouraging verification for the methodology employed to prepare the 2010 inventory estimates. They also outlined that the reporting is subject to validation, and that associated uncertainties are quantified, and hence an evaluation and quantification of uncertainties should be a routine component of emission-reporting systems (AMAP/UNEP, 2013a). On the other hand, Nelson (2007) said that, inevitably, the data from a centralised reporting system such as the NPI is subject to uncertainty at a number of levels, and reporting is performed on the basis of workbooks based on world’s best practice in emissions estimation and negotiated between government and industry. There is thus limited

validation of the NPI mercury reporting system, which creates concerns regarding the completeness of the data reported.

While data verification is a way of producing quality data, none of the INC meetings except for INC 1 emphasised this issue. Two countries and an NGO (Canada, Norway, and IPEN) highlighted the importance of review, assessment, evaluation, and verification mechanisms for justifying the national reports for ensuring transparency and compliance. Canada highlighted the importance of national reporting as the “*backbone of any compliance mechanism*” and argued for the initiation of provisions for evaluating the compliance of the parties. IPEN and Norway asserted the following:

IPEN emphasized that effective monitoring, reporting, and review mechanisms are essential to promote transparency and ensure compliance. (INC 1, 7–11 June, 2010)

Norway highlighted necessary elements of a compliance mechanism, including: reporting by the parties; verification of the information provided; and effective evaluation, including monitoring (INC 1, 7–11 June 2010).

The draft reporting format suggests that UNEP is going to ask for verifiable data, and these data are subject to verification. However, the Minamata Convention introduces no such mechanism for verification. For example, the amount of mercury in inventory and the existence of relevant sources of mercury in the territory need verification. Lack of verification and review may provide the opportunity for parties to provide misleading data to the Secretariat. However, for effective monitoring, the Secretariat planned “creation of a draft framework for a global monitoring approach to integrate comparable results of future monitoring that countries and stakeholders may choose to undertake” (UNEP Official Report, Annex VIII, INC 7, 10–15 March 2016).

As with other conventions, the Minamata Convention may include a verification provision for providing reliable information on mercury. Article 8(3) of Kyoto Protocol calls for

a thorough and comprehensive assessment of all aspects of a state’s national systems including its emission inventory and inventories are to be reviewed against the standard of being “transparent, documented, consistent over time, complete, comparable, assessed for uncertainties, [and] subject to quality control and quality assurance” (IPCC, 2000 cited in Zahar et al., 2013).

As for the Kyoto Protocol, an Expert Review Team (ERT) can be developed for justification of the mercury report provided by the parties to the Convention, including site visits for observing impacts and changes in emissions of mercury, and correction of the reports where necessary.

5.3 Comparability

Comparability enables the users of information to identify uniformities and uniqueness according to two categories of phenomena. The FASB (1980) defines comparability as “the quality or state of having certain characteristics in common, and the comparison is normally a quantitative assessment of the common characteristic” (FASB, 1980). The Australian Accounting Standards Board AASB (2009) defines comparability in para. 39 of its framework as follows:

Users must be able to compare the financial reports of an entity through time in order to identify trends in its financial position and performance and users must also be able to compare the financial reports of different entities in order to evaluate their relative financial position, financial performance and cash flows.

Comparison of mercury information between countries and between periods of time in the same country was made complicated and sometimes impossible because of the use of different reporting systems. A straightforward comparison of the outcomes of global inventories emitted over the past 25 years is not possible (UNEP, 2013a) because of changes in reporting methods, inventory estimates, and consideration of (new) emission sources (AMAP/UNEP, 2013a). Comparing estimates for individual countries and sectors is complicated by differences in reporting methods, in particular the differences in specification and categorisation of sectors (UNEP, 2013a), approaches and underlying assumptions, release estimates, and different databases/registers covering different industry sectors and economic activities used in different national and international reporting systems (AMAP/UNEP, 2013a). Steady (UNEP, 2013a). Harmonised approaches (AMAP/UNEP, 2013a) to both measurement and reporting of mercury releases from anthropogenic point sources (*i. e.*, pollution originating from human activity) are needed to ensure comparability of data on the global scale. AMAP/UNEP (2013a) asked for future work to allow emissions estimates compiled and reported under different reporting systems (including national release inventories) to be reliably compared, or at least to identify the main areas that currently prevent such comparisons. They highlighted that this work would be essential if future (UNEP) reporting systems are to make use of existing national and other reporting systems.

Discussions in INC meetings did not emphasise the issue of comparability of the mercury reporting process and reported information. Although UNEP planned to create a framework for developing comparable regional monitoring data for effectiveness evaluation, the discussions did not pay sufficient attention to the comparability of national reports. The COP1 decided two reporting cycles: full reporting every 4 years, and short reporting focusing including supply sources and trade and wastes every 2 years. Although a reporting format was provided for a full

report, no structure was designed for the short report. The 2-year and 4-year reports would therefore be incomparable (Earth Negotiations Bulletin, 2017).

According to the draft reporting format, some questions encourage comparability of information, but some responses of the parties would not be comparable. For example, countries are asked to indicate the amount of mercury and the year of measurement within the last 5 years. With regard to this question, the responses of the countries will be different in terms of the year of measurement, and thus comparability will be lost. Regarding methods of measuring mercury, the different countries use different methods, and even within countries different methods are used in different periods, resulting in the reporting of different volumes of mercury. The Convention outlined its expectation that the Conference of the Parties (COP) will guide, as soon as practicable, the methodology for preparing inventories of emissions. However, the draft reporting format did not ask about the method used by respective parties and did not ask for the use of any specific measurement method, and therefore the results will be lacking in comparability.

5.4. Timeliness

Timeliness refers to providing information promptly to decision makers so that they can make timely decisions. The AASB (2009) expressed that “if there is undue delay in the reporting of information it may lose its relevance and hence management may need to balance the relative merits of timely reporting and the provision of reliable information” (para. 43). According to FASB, para. 56, “to be relevant, information must be timely, which means that it must be available to decision makers before it loses its capacity to influence decisions” (FASB, 1980). Similarly, Shahwan (2008) argued that if the information is not available at the time when a decision needs to be made, it lacks relevance.

The Minamata Convention specified no timing of the reporting to be followed by the parties. Article 21 (para. 3) of the Minamata Convention states that the COP shall, at its first meeting, decide on the timing and format of the reporting to be followed by the parties, taking into account the desirability of coordinating the reporting with other relevant chemical and waste conventions (UNEP, 2013b).

Consensus on the reporting cycle was achieved in the first conference of the parties, COP1, during 24–29 September 2017. Before that the INC meetings thoroughly discussed the mercury reporting cycle. The seventh INC formed a contact group to further discuss the frequency and format of reporting (INC 7, 10–15 March 2016). Interestingly, some countries, including some developed countries, want a 4-year reporting cycle under the Minamata Convention. The opinion of this group is as follows:

On the frequency of reporting, GRULAC, the EU, Norway and Argentina preferred a four-year reporting cycle and an electronic format, and called for the reporting forms to be translated into all six UN languages. The US, Iran, Switzerland, Japan and China also supported a four-year reporting cycle, with Japan preferring a flexible cycle, allowing countries to report at any time within this 4-year period (INC 7, 10–15 March 2016).

On the other hand, African groups want more frequent reporting (annual or biennial):

The African Group called for the reporting scheme to be aligned with reporting under the BRS Conventions, and preferred annual or biennial reporting on trade (INC 7, 10–15 March 2016).

Although many MEAs require annual or biennial reporting, most of the countries proposed quadrennial reporting under the Minamata Convention. While the African group opted for annual or biennial reporting, the US, Iran, Switzerland, China, GRULAC, the EU, Norway, and Argentina proposed a 4-year reporting cycle. The comparison of frequency of reporting and rates of submissions under different MEAs shows that rates of reporting submissions are much higher for other conventions, such as the Convention on Long-Range Transboundary Air Pollution, the United Nations Framework Convention on Climate Change, and the Kyoto Protocol. Although there are instances of higher rates of submissions in cases of quadrennial submission, examining the overall scenario of reporting submission rates does not suggest that quadrennial submission requirements will increase the submission rates of the Minamata Convention.

INC discussions revealed that an NGO, ZMWG and some African countries want more frequent reporting whereas some other countries, including some dominant ones, prefer quadrennial reporting. Financial support and resource constraints of the parties are a significant concern for the frequency of reporting. Finally, COP1 decided on a 4-year cycle for the full report (first report due by 31 December 2021) and a 2-year cycle for short report consisting of the key issues including supply sources and trade and wastes (first report due by 31 December 2019) (Earth Negotiations Bulletin, 2017). However, the parties should consider the desirability of using the submitted data when determining the frequency of reporting. Reporting every 4 years, processing those reports for policy making, and determining strategies based on those submissions may hinder the achievement of the ultimate objectives of the Convention.

The draft reporting format does not collect relevant and updated information. For example, in a question in the draft reporting format, UNEP asks “[h]as the Party prepared an inventory of emissions from relevant sources within five years of entry into force of the Convention for it?”

If the answer is yes, a country may respond by providing information for the preceding 5 years and some after 5 years, and different countries will answer in relation to different years. Importantly, there may be a large variation in information between the periods. On the other hand, if the answer is no then accountability is lacking, and the question remains as to how UNEP will ensure accountability of the parties. Moreover, the mercury emission inventories of different years will constrain comparability. In view of this, an annual reporting cycle seems a better option for the Convention.

5.5. Understandability

Understandability relates to the quality of information that allows reasonably informed users to perceive its significance, and to understand the content and significance of financial statements and reports. FASB (1980) defined understandability as the comprehensibility of information provided in the reports. According to the AASB (2009, para. 25), “Understandability aims for an essential quality of the information provided in financial reports that it is readily understandable by users.”

Mercury information provided under the Convention is difficult to understand, which ultimately hinders the prevention and remediation of mercury emissions. Different studies (Nelson, 2007; Strezov et al., 2010) suggested that the emissions data are widely based on estimates and reporting protocols, which for some sources are still not well understood, and it is clear that current knowledge of emissions is subject to significant uncertainties. Similarly, regarding artisanal small-scale gold mining (ASGM), Telmer and Veiga (2009, P. 132) stated that “the current lack of understanding about mercury in ASGM puts a limitation on the development of innovative solutions towards prevention and remediation”. Nelson et al. (2009, p. 12), in their study in Australia, emphasised the need for quality data, arguing that the “area and diffuse commercial and domestic sources of mercury are similarly poorly understood, and the available data are inconsistent and/or inaccurate”. UNEP (2013a) also emphasised the need for improved understanding of long-range transport and source-receptor relationships, which can be facilitated by having better data on mercury distribution in the troposphere.

Understandability of mercury information has been emphasised in INC meetings, where there were large-scale discussions on mercury reporting. A simple and well-understood reporting process can produce clear and more understandable mercury information. Many countries, including India, Pakistan, and Peru, stressed the need for simplification of reporting requirements and formats. One country suggested a simple reporting format for all countries, or alternatively, two different formats for the developed and developing countries (INC 7, 10–15 March 2016). Moreover, Norway, Switzerland and the EU called for a user-friendly electronic reporting

system. At the seventh INC, many countries, including one speaking on behalf of a group of countries, asked for reporting forms to be made available in all six official languages of the Convention. The Reporting Contact Group argued that

... Reporting Contact Group opting for a simple “Yes” or “No” format for national reports, emphasizing that flexibility is fundamental to successful implementation of the Convention. (INC 6, 4 November 2014)

The draft reporting format to some extent reflects the INC discussions. However, all the issues raised and the proposed responses regarding understandability have not yet materialised in the reporting format. The draft reporting format is simple as it is articulated based on the articles of the Convention, and most of the questions are Yes/No type questions (although requiring more data). However, the reporting format was not made available in all six international languages. In a question on ASGM, UNEP asked whether a party is required to determine the level of its activity and notify the Convention if its activities are “more than insignificant”, although there is no explanation as to what is meant by “more than insignificant”. A scale is required that outlines a specific quantity for determining the level of significant emissions.

5.6. Accuracy

The qualitative characteristic “accuracy” refers to the correct provision of information in the report. Accuracy and reliability are almost synonymous – the reliability of information can be judged based on its accuracy. In para. 31 of its framework, AASB (2009) stated that

to be useful, information must also be reliable. Information has the quality of reliability when it is free from material error and bias and can be depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to represent.

FASB (1980) defined reliability as the quality of information that assures that it is reasonably free from error and bias and faithfully represents what it purports to represent. Miller and Bahnson (2007) also denoted reliability as the correspondence or agreement between a measure and the phenomena it purports to represent.

Uncertainty, lack of documentation, and transparency in estimation are relevant to the accuracy and reliability of information on mercury. Regarding ASGM, UNEP (2013a) stated that reliable official data were still difficult to obtain as ASGM is unregulated or even illegal. AMAP/UNEP (2013a) argued that estimation procedures expose apparent inconsistencies between emissions assigned to point sources in some national/regional pollution discharge inventories, and hence there is a requirement for more dependable mercury data from offshore investigation and

exploitation activities. An audit of inventories identified that original estimations might be significantly lower than actual inventories (Mohapatra et al., 2007), since much of the existing inventory information is either not derived from direct measurement or not bound by mass-balance accounting (Trip et al., 2004). Recognition of uncertainties is therefore an important consideration, otherwise “presenting single national estimates can convey a misleading picture of what is known and, more importantly, not known about emissions” (AMAP/UNEP, 2013a). Moreover,

industry reporting to national government may be limited to sources with emissions above a certain threshold level so that emissions from smaller sources, below the threshold, are not reported and hence, where smaller sources form a major part of the source category, disclosed inventories may, therefore, significantly underestimate total Mercury emissions (AMAP/UNEP, 2013a).

The best estimate of total emissions of mercury to the atmosphere in 2006 was around 15 tonnes, and “using a very different methodology the most recent global emission estimate (in 2008) reports total anthropogenic emissions from Australia at ~34 tonnes/year” (Nelson et al., 2009, p. 31). Pacyna and Pacyna (2002) reported approximately 100 tonnes of mercury emissions from waste incineration in 1995, but “this is stated to be largely underestimated and may be five times larger, since only a few countries report quantities of waste incinerated, and even fewer measure mercury emissions from waste incinerators” (Hylander & Meili, 2003, p. 24). Nelson et al. (2009) emphasised that as the available data is inaccurate, higher quality data should be collected. Walcek et al. (2003) expected that inventory errors and discrepancies would continue until there is a central repository of hazardous air pollutants (HAP) data with clearly defined requirements on reporting parameters.

While accuracy and reliability of mercury information is a challenge and all the actions regarding mercury emissions depend on the accurate measurement of mercury, this issue did not attract much attention in the INC discussions. One NGO asked about improving the credibility of mercury information in the INC 1:

The Zero Mercury Working Group suggested making data publicly available to ensure the transparency and credibility of the process (INC 1, 8 June 2010).

The draft reporting format did not ask any question regarding the accuracy and reliability of the mercury information. Although the UNEP technical report on mercury (AMAP/UNEP, 2013a) raised concerns about accuracy and reliability, the Convention did not specify disclosures relating to data accuracy. No mechanism was provided by the Convention for verification to ensure and improve the accuracy of the information to be submitted by the parties. An important limitation on imposed accountability is that the Minamata Convention is silent on sanctions for poor- or

non-reporting. Although the reporting provisions are imposed and legally binding by the Convention, in reality it is a kind of voluntary reporting.

Discussions at the INC meetings reflected instances of felt accountability from countries including the USA, Canada, and Nigeria (on behalf of the African group). In addition, non-governmental development organisations, including the Zero Mercury Working Group and IPEN, sought to elevate the urgency of mercury reporting and emphasised more rigorous reporting architecture, including reporting frequency, additional information in the reporting requirements, and monitoring, assessment and verification of the reported information.

Developing felt accountability is expected to compensate for the inherent weaknesses in the imposed accountability of the mercury reporting architecture. Moreover, due to the limitations of our data, this study could not demonstrate to what extent the enhancement of felt accountability would counter the weaknesses in the proposed reporting process. Though imposed accountability by regulation of standardised mercury accounting and assurance may be expected to solve the problems of data quality and bring consistency of the disclosures, due to the sovereignty of the parties no negative sanction could be imposed on the parties to the convention (Kiss, 2006). Positive sanction, which is providing different incentives to the countries for complying with the provisions, may work effectively, though. Future studies using more extensive data, including interviews with the UNEP experts, parties to the Convention, SEA researchers, national environmental policymakers, and sustainability accountants and reporters may explore the issue further.

6. Accountability

This paper seeks to answer the questions: *How far will the reporting provisions of the Minamata Convention ensure the accountability of the countries for mercury emissions*, and *How can the reporting provisions be improved?* The preceding section evaluated the reporting regime using the conceptual framework of reporting quality. This section interprets these findings from the broader perspective of accountability.

As discussed in the theoretical framework section, O'Dwyer and Boomsma (2015) provide a typology of accountability comprising imposed, felt, and adaptive accountability. Imposed accountability refers to the responsibility created due to the provisions of rules and regulations that organisations observe in discharging their duties of accurate reporting. Felt accountability is a form of discretionary ethical responsibility that organisations abide by due to self-motivation in achieving a mission, despite having no regulatory requirements. Adaptive accountability integrates both imposed and felt accountability.

The formal reporting requirements of the Minamata Convention are an example of imposed accountability on the parties regarding mercury emissions. The previous section shows that there are significant weaknesses in this reporting regime across virtually all of the elements of reporting quality. An important question is, therefore, how to respond to these weaknesses.

In addressing this question, it is important to note that accountability is also provided *via* felt accountability. With felt accountability, parties voluntarily place importance on achieving the desired outcome from the Convention and will not seek to exploit weaknesses in imposed accountability.

Given that felt accountability is intrinsic, it is inherently difficult to observe and measure. In this particular case, however, there are a number of elements that point to the existence of a high degree of felt accountability among the parties to the Convention.

The first and most obvious element is that the parties have voluntarily entered into a legally binding agreement, and they did so with surprising speed. There is no indication that participation was coerced or incentives provided to induce participation. Instead, countries willingly agreed to comply with a set of shared rules. This is not to say that national interests were entirely set aside, and clearly there were negotiated outcomes in relation to aspects such as exclusions and phase-out speeds of certain activities. Nevertheless, the election to participate in the Convention is a sign of felt accountability.

Secondly, it is evident that addressing mercury pollution is in each party's individual interest. As noted earlier in this paper, the toxicity of mercury has been clearly demonstrated through a plethora of scientific studies, and the adverse outcomes of mercury pollution were noted throughout the Convention negotiations and are foregrounded in the various preambles within the final Convention. It is therefore not only plausible but expected that at least some degree of felt accountability would be present for each of the parties to their communities.

Thirdly, the transboundary nature of mercury means that there is likely to be a felt accountability not just to local communities but also to global communities, which are represented by the other parties to the Convention. As with the toxicity of mercury, the global proliferation of mercury pollution has been echoed throughout the Convention negotiations and is foregrounded in the various preambles.

Given this evidence of felt accountability, an interesting issue is whether imposing additional formal accountability would enhance or reduce the overall level of accountability of parties to the Convention. For example, in his analysis of the Kyoto Protocol, Sugiyama (2001) distinguishes between philosophies of "enforcement" and "management". Enforcement is

analogous to formal accountability and emphasises rules and sanctions. Management is analogous to felt accountability and emphasises consultation and intrinsic commitment. Sugiyama (2001) argues for the management approach on many grounds, not least because at the international level meaningful sanctions are extraordinarily difficult to enforce. Of particular interest is his claim that the imposition of rules is not only unworkable but acts to undermine the goodwill of the parties to the agreement and therefore threatens to completely “destroy the regime” (Sugiyama, 2001, p. 16).

The concerns of Sugiyama (2001) might explain the conflicting results provided to date as to whether mandatory reporting actually improves reporting quality (Chelli et al., 2016; Costa & Agostini, 2016; Fallan, 2016). According to this view, there might be an optimum trade-off between imposed and felt accountability, and in some circumstances, any additional gains *via* increased imposed accountability might be more than lost by corresponding reductions in felt accountability.

In relation to the Minamata Convention, the highly contested negotiations in relation to compliance (Eriksen & Perrez, 2014; Selin, 2014; Templeton & Kohler, 2014) suggest that any increases in imposed accountability would have to be approached with caution. In particular, the negotiations in relation to compliance were inextricably intertwined with negotiations regarding funding. This economic dimension of accountability, together with the concluding remarks, is addressed in the following section.

7. Conclusion

Responding to calls to conduct research that can benefit wider society (Guthrie & Parker, 2016) and which aligns with the UN SDGs (Bebbington & Unerman, 2018a), this paper explores the extent to which the reporting provisions of the Minamata Convention will improve global accountability for mercury emissions. Although both mercury emissions and the Minamata Convention have been the subject of considerable academic attention, no previous study has specifically explored the extent to which country-level reporting under the Minamata Convention will promote accountability.

Previous literature on mercury emissions has identified that mercury information is lacking in different parameters of quality including understandability, accuracy, verifiability, completeness, comparability, and timeliness, suggesting that current mercury reporting may be deficient. This paper used qualitative characteristics of accounting information for data analysis following the work of NPRI (2017a), Comyns and Figge (2015), GRI (2011), the OECD (2008), Stanwick and Stanwick (2006), Burritt and Saka (2006), O'Dwyer et al. (2005), and the concepts of imposed, felt and adaptive accountability as outlined by O'Dwyer and Boomsma (2015).

Specific issues were identified that could improve the quality of reporting. The first issue was the incorporation of provisions for verification of data to be submitted by the parties. As with Article 8(3) of the Kyoto Protocol, the Minamata Convention needs to develop an “Expert Review Team” for thorough and comprehensive verification of the reported information (IPCC, 2000 cited in Zahar et al., 2013). Importantly, the ultimate level of accountability expects justification of the effectiveness of the policies initiated by the outcomes that obviate “the comparison of achievements with expectations and questioning the merits of existing policy” (Funnell, 1990, p. 13).

The second issue identified was additional coverage of emissions and omission of exclusions from the Convention for improving the completeness of mercury information. Exclusions of mercury emissions from military use, crematoria, steelmaking, aluminium and small-scale emissions such as cement clinker and waste may mislead mercury-controlling policy decisions.

The third issue was the introduction of an annual, or in the most flexible case, a biennial reporting cycle. The final decision of the COP1 to have two reporting cycles including a 4-year full reporting cycle and a 2-year partial reporting cycle raises questions: Are the countries required to submit a partial report in 2021 when they are submitting the full report? If not, then the partial report would also turn into the 4-year cycle, as the first short report is due on 31 December 2019 and then again in 2023. If yes, then countries would be required to submit the full and partial report in 2021, duplicating their work since the full report would be expected to include the information in the short report. Another question that arises concerns the format of the partial report that countries are submitting in 2019. Furthermore, different reporting cycles would impact the comparability of mercury information from different sources, and a 4-year reporting cycle would entail deferment of policy decisions and their implications.

The fourth issue arising concerns ensuring support for reporting, including financial support for developing countries and those with economies in transition. However, to what extent the Minamata Secretariat would be able to give such support is now in question because COP1 has failed to sign the MoU with GEF, the major financing mechanism of the Convention.

In relation to the typology of accountability proposed by O'Dwyer and Boomsma (2015), it is clear that the reporting regime – an instance of imposed accountability – is deficient. In reviewing the creation of the Convention, however, we also find support for the existence of felt accountability. Furthermore, previous work on international agreements (Sugiyama, 2001) and ambivalent results in relation to the efficacy of mandatory corporate sustainability reporting (Chelli et al., 2016; Costa & Agostini, 2016; Fallan, 2016) suggest that greater levels of imposed accountability might undermine felt accountability. The consequence is that any efforts to

enhance imposed accountability within the Minamata Convention must be approached with caution.

In particular, the creation of a compliance function within the Minamata Convention was intertwined with discussions regarding the sharing of both technical and financial resources between countries. As noted in the literature review, an especially contentious negotiating point was how significant Rio Principle 7 of “common but differentiated responsibilities” would become, and what funding mechanism would be adopted by the Convention. These discussions underscore the importance not just of the stick but also of the carrot in accountability (Bovens, 2007; Mulgan, 2000), and the importance of creating some form of immediate short-term benefit for parties in order to meet long-term environmental objectives (Susskind, 2008). The importance of providing resources and incentives in order to promote accountability is an area that warrants further attention within social and environmental accounting, particularly given calls for a greater focus on the developing world (Susskind, 2008).

Going forward, future research might extend this study in a number of directions. An important limitation of the study is that it used secondary data. Future studies may further explore the issue of global mercury reporting under the Minamata Convention using interviews with UNEP experts, parties to the Convention, researchers, national environmental policy makers, and other stakeholders. Future research might also consider the adequacy of reporting for particular countries, such as has been done for Poland by Czaplicka et al. (2018). In addition, research might examine the adequacy of corporate mercury reporting in light of the global imperative to reduce emissions. Perhaps most obviously, further work might examine the quality of national Minamata reports as they begin to appear.

In addition to the specific issue of mercury emissions, the findings of this study may be relevant to other pollutants. For example, further studies might draw on this work to evaluate reporting policies and practices for greenhouse gases under the Paris Agreement, ozone-depleting substances under the Montreal Protocol, persistent organic pollutants under the Stockholm Convention, and transboundary wastes under the Basel Convention.

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Chapter – 5

Is the Quality of Mercury Accounting via the National Pollutant Inventory Sufficient to meet Australia’s Minamata Convention Reporting Commitments?

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3 **Is the Quality of Mercury Accounting via the National Pollutant Inventory**
4 **Sufficient to meet Australia’s Minamata Convention Reporting**
5 **Commitments?**
6

7 **Abstract**
8
9

10 **Purpose** – This paper evaluates Australian mercury reporting under the National Pollutant Inventory
11 (NPI), which includes mandatory corporate mercury reporting. In particular, as Australia is a
12 signatory to the Minamata Convention (a global approach to reducing mercury pollution currently
13 being developed by the United Nations Environment Programme) the study explores whether
14 Australian mercury reporting is of sufficient quality to meet Australia’s reporting obligations under
15 the Convention.
16

17 **Design/methodology/approach** – From a theoretical perspective, this paper examines the quality of
18 NPI mercury accounting using the concepts of imposed, felt and adaptive accountability based on
19 O'Dwyer and Boomsma (2015) and the qualitative characteristics of accounting information. Data
20 comprises semi-structured interviews with regulators and reporters as well as documentary analysis.
21

22 **Findings** – While Australian mercury accounting under the NPI is well developed and interviewees
23 generally believe it is sufficient to meet Australia’s reporting obligations, we also find a number of
24 reporting deficiencies. A persistent theme is that of regulatory budgetary pressures undermining the
25 quality of governmental mercury data capture and reporting. Thus while we found evidence of ‘felt
26 responsibility’, in areas of the regime where reporting was not mandatory this responsibility did not
27 result in high quality reporting. Further, while mandatory reporting was effective in creating a
28 balanced reporting environment, the utility was highly influenced by the level of comparability,
29 oversight, sanctions and focus on performance improvement.

30 **Practical Implications** – The Australian NPI mercury reporting process could be considerably
31 improved, particularly in relation to the measurement and reporting of emissions from diffuse sources.
32 These improvements will not only improve accountability to the Australian community but also
33 globally via reporting under the Minamata Convention.
34

35 **Originality / Value** – Despite mercury being a key environmental challenge, mercury accounting has
36 not yet received any attention from social and environmental accounting researchers and this paper
37 provides initial insights into mercury reporting. More generally, as this paper considers mandatory
38 corporate reporting of mercury, the findings are relevant to the many SEA researchers calling for
39 mandatory reporting and those jurisdictions which impose mandatory reporting.
40

41 **Keywords:** Mercury, National Pollutant Inventory, Minamata Convention.
42
43
44

45 **1. Introduction**
46

47 Mercury is one of the most toxic elements known to humanity. Mercury can harm the human
48 nervous system and damage the kidneys, lungs, hearing, memory, and babies in the womb
49 (NPI, 2014). Mercury is considered the third most hazardous substance in the world, after
50 arsenic and lead (ATSDR, 2001) and it cannot be converted to a non-toxic substance (UNEP,
51 2011). Mercury emissions stem from a wide range of sources including coal combustion
52 (Selin & Selin, 2006), gold mining, lamps, switches, medical equipment, wastages, batteries,
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fossil fuel, dental amalgam and cement (AMAP/UNEP, 2013; USEPA, 2014). Mercury emissions from one country may spread to others via air or water (Rahman, 2011), which means that reducing mercury pollution requires a globally coordinated approach.

The Minamata Convention, developed by the United Nations Environment Programme, aims to reduce global mercury emissions. The Convention aims to reduce mercury production, use, emissions, storage and disposal as well as encourage the remediation of contaminated sites (UNEP, 2016). National reporting will also be required in relation to these objectives. The Convention has been signed by 128 countries (including Australia), ratified by 84 countries, and now in force starting from 16th of August 2017 (UNEP, 2017).

Given that Australia is a signatory to the Minamata Convention, a key question is whether current Australian mercury reporting is sufficient to meet the proposed reporting obligations under the Convention. Mercury reporting in Australia has been compulsory since 1998 through the National Pollutant Inventory (NPI), and NPI data will underpin Australia's Minamata Convention reporting. Mercury emissions comprise those from a particular immobile source – identified as 'point sources' – and from mobile and unspecified sources – identified as 'diffuse sources.' Examples of point sources include domestic, municipal and industrial facilities, and examples of diffuse sources include cars, wildfires and fuel reduction burning. Both point and diffuse sources are captured by the NPI.

Previous studies have raised concerns over mercury reporting quality in terms of understandability, accuracy, verifiability, reliability, completeness, and comparability. For example, Nelson et al. (2009), Telmer and Veiga (2009) and Strezov et al. (2010) have questioned the understandability and accuracy of mercury data. Nelson et al. (2009) argued that mercury data are inaccurate and inconsistent, while AMAP/UNEP (2013), Mohapatra et al. (2007), Walcek et al. (2003) and Hylander and Meili (2003), have also pointed to the inaccuracy and unreliability of mercury information. Despite these criticisms, mercury reporting has received little focused attention in the scientific literature and none in the social and environmental accounting literature.

In order to address this research gap, we evaluate the quality of Australian mercury accounting and reporting under the NPI. We use accountability as a theoretical lens, drawing on the notions of imposed, felt and adaptive accountability proposed by O'Dwyer and Boomsma (2015) and building on the work of Ebrahim (2003; 2009). We also provide a more

detailed analysis utilising the qualitative characteristics of accounting information as utilised by a number of prior researchers and organisations in relation to environmental accounting (Ane, 2012; Burritt and Saka, 2006; Comyns and Figge, 2015; GRI 2011; NPRI, 2017; OECD, 2008; O'Dwyer et al., 2005; Stanwick and Stanwick, 2006).

We seek to make three contributions to the social and environmental accounting literature. First, we provide an initial exploration of national mercury reporting, an important environmental issue. Our findings are relevant both to academics seeking to better understand mercury reporting and regulators seeking to improve it. Second, while most social and environmental accounting research investigates voluntary corporate reporting, this paper explores mandatory corporate mercury reporting to a governmental regulatory body, namely the Australian NPI. Given previous calls for mandatory reporting within the social and environmental accounting literature (e.g. Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004) we seek to provide some insight into the extent to which a mandatory reporting regime can enhance accountability. As the NPI encompasses not only mercury but 92 other substances, our results may be relevant for researchers seeking to explore reporting of other pollutants. In addition, as the Australian NPI approach is similar to that of other pollutant databases around the world, our study will be relevant to researchers exploring the operation of pollutant inventories in other jurisdictions. Third, we seek to make a theoretical contribution by showing how the accountability theory proposed by O'Dwyer and Boomsma (2015) in the context of NGOs can be applied in a governmental setting to better understand and evaluate complex processes of accountability. We also show how the conceptual framework of accounting can provide a useful tool for assessing the quality of environmental accounting and reporting.

The paper is structured as follows. Section 2 provides the background and context of the study. Section 3 reviews relevant literature and Section 4 delineates the theoretical framework of the study. Section 5 outlines the methods of the study, Section 6 provides findings and Section 7 offers conclusions, implications and further research directions.

2. Background and Context

Scientists began to understand the severe toxic effect of mercury in the 1950s after the Minamata incident, in which more than 2,200 people suffered mercury poisoning (Yorifuji et al., 2012). Methylmercury is especially neurotoxic (Bjornberg et al., 2003) but all types of mercury are harmful to the nervous system, and high-level exposure can cause damage to the

kidney, brain, and foetus (NPI, 2014; Valera et al., 2011). The impact of mercury on the brain can negatively affect vision, hearing, and memory and cause tremors and irritability (NPI, 2014). The children of mothers exposed to mercury may have negative impacts on their reasoning and intellect, language and academic achievement (Crump et al., 1998). Mercury exposure may occur through air or water borne particles; eating fish or other affected food; and from contaminated soil (Axelrad et al., 2007). Methylmercury is the most poisonous form of mercury not only because of its toxicity but also due to its capacity to be incorporated and bio-magnified in organisms in the food chain (NRC, 2000; UNEP, 2011) and is highly related to diets consisting of particular freshwater fish and seafood (USEPA, 1997; Weihe et al., 2005).

Given the transboundary nature of mercury pollution, national and even regional agreements have been largely unsuccessful in curbing emissions (Selin & Selin, 2006). UNEP has therefore taken a global approach, and the Minamata Convention represents the culmination of these efforts (Selin, 2013). The Convention includes measures to reduce mercury production (such as banning new mercury mines and phasing out current mining), use (by reducing mercury usage in processes and products), and emissions (by introducing control measures for air, land and water releases), as well as mercury storage, disposal and the remediation of contaminated sites (UNEP, 2016). Governments were first invited to sign the Convention in 2013, and it came in to force on 16 August 2017 (UNEP, 2017). The Convention has now been signed by 128 countries (including Australia) and ratified by 84 countries.

In addition to mercury reduction measures, the Minamata Convention has extensive reporting requirements. Each party must report to the Conference through the Secretariat on the actions it has adopted and the effectiveness of those steps in accomplishing the ultimate goal of the Convention [Article 21]. Parties are expected to provide information, where relevant, on (a) mercury supply [Article 3]; (b) mercury import and export [Article 3]; (c) production, supply in commerce and trade of mercury-added goods [Annex A]; (d) steps taken to phase out mercury-added products and amount already reduced; (e) evidence of development in reducing and eradicating, atmospheric emissions and releases [Articles 8 and 9]; (f) financial and technical supports [Articles 13 and 14]; (g) evaluations of the improvements of implementation plan [Article 15]; (h) progress report on implementation plan; and (i) other data or reports as required by the Convention (UNEP, 2013b).

Australia signed the Minamata Convention on 10 October 2013 and is a significant mercury emitter on a per capita basis (Ippolito et al., 2012). In absolute terms, Australia is one of the top ten anthropogenic mercury emitting countries, although countries placed eight to ten (which includes Australia) emitted less than 5% of global emission, while the top three emitted nearly 60% (AMAP/UNEP, 2008). Half of the Australian mercury emissions are from industrial point sources (particularly power generation, mining, aluminum, and refineries) with the remaining from diffuse sources (NPI, 2008 cited in Dutt et al., 2009).

Australian mercury information is collected through the NPI, which was established in 1998 to capture and publicly report emissions of 93 pollutants. The Australian NPI is broadly equivalent to other pollutant release and transfer registers such as the Pollutant Inventory of the United Kingdom, National Pollutant Release Inventory of Canada, Toxic Release Inventory of the US and European Pollutant Release and Transfer Register.¹ Pollutant data is collected by state and territory governments, with funding provided by the Australian Government, and entered into the NPI database.

The NPI database contains emission data from both point sources (i.e., facilities such as power plants, mines or smelters) and diffuse sources (i.e., aggregate discharges from lamps, switches, thermometers, and batteries). Point source emissions are estimated by facilities using Emission Estimation Technique (EET) manuals that provide industry-specific guidelines for emission estimation based on production volumes and other variables. Facilities must submit their reports by 30 September for the preceding year ended either 30 June or 31 December. State and territory environment agencies evaluate the reports and then forward this data to the Australian Government by 28 February, and the Australian Government publishes the data on 31 March. Aggregated emissions data from diffuse sources are measured and reported by respective state and territory governments. The scope and timing of this measurement are at the discretion of the state and territory governments and is usually less frequently than the point sources emission. Diffuse emissions estimation technique manuals are used to determine consistent emission data among states and territories. Once this data is obtained, it is sent to the Australian government for formatting and is then included in the NPI at the next publication date

3. Literature Review

We are not aware of any previous studies which specifically focus on mercury accounting. Previous scientific studies on mercury have commented on the issues of mercury accounting and reporting, however, and have identified numerous issues regarding the quality of mercury information. This literature therefore raises concerns as to whether the Australian NPI mercury reporting process is adequate for meeting its international obligations.

While there have been many generalist reviews of environmental accounting (Mathews, 1997), authors such as Deegan and Rankin (1997) and Guthrie and Parker (1990) have called for narrower social and environmental accounting research. More recently, there have been calls for studies that contribute to the key challenges of sustainability and sustainable development (Bebbington and Unerman, 2018; Unerman and Chapman, 2014). In response, researchers have increasingly focused on specific environmental challenges such as carbon (Bebbington and Larringa, 2014; Haslam et al., 2014), water (Hazelton, 2015; Tello et al., 2016) and biodiversity (Samkin et al., 2014; Tregidga, 2013).

To date, however, mercury reporting has surprisingly received no attention from social and environmental accounting researchers. Even more surprisingly, the mechanism for providing pollutant information – pollutant databases – has also received scant attention in the literature. This neglect is difficult to explain given the interest of SEA researchers in causing change via disclosure and the success of pollutant databases. Fung and O'Rourke (2000) showed the role of US Toxic Release Inventory (TRI) information in warning various social groups about the worst environmental performers, which could then be used to create pressure for change. Hess (2007) also examined US transparency programs, including the TRI, and claimed that information reporting to different social groups can play a role as an emerging governance form in ensuring stakeholder accountability. Similarly Garcia et al. (2007) examined the efficiency of the Indonesian Program for Pollution Control Evaluation and Rating (PROPER), the first leading public reporting database in the developing world, and found a positive response to PROPER through emission reduction, particularly for firms with weak environmental compliance histories. While other research finds less evidence for the effectiveness of pollution databases - for example, Atlas (2007) suggested that the TRI was ineffective in improving the knowledge of people exposed to polluting industries and Fung et al. (2004) found that while some databases were beneficial others merely added

disclosure costs – pollutant databases clearly represent an important opportunity for causing change.

Studies of databases have also revealed significant opportunities for improvement in reporting quality. For example, in one of the only social and environmental accounting studies to engage with pollutant database reporting, Burritt and Saka (2006) examined six pollutant databases of different countries, including Australia, Canada, Japan, the Netherlands, the UK, and the US based on qualitative characteristics of accounting information. The findings were that the databases suffered from are numerous quality problems. Similarly, Gerde and Logsdon (2001) evaluated four comprehensive databases available in the US, identified the strengths and weaknesses of the databases, and suggested a number of areas where the quality and quantity of environmental performance data could be improved. Fung et al. (2004) also identified potential improvements to TRI reporting.

Studies focusing on the Australian NPI have raised specific concerns regarding both completeness and understandability. Lloyd-Smith (2008) identified that the NPI provides relatively limited information because the US TRI includes 600 substances and the Canadian National Pollutant Release Inventory of Canada includes 176, while the NPI includes only 93. The NPI has also been criticised for ignoring appeals from a range of stakeholders for incorporating data relating to pesticides, chemical storage and emergency response plans (Lloyd-Smith, 2008). It is also difficult to assess the distribution of emissions over the year, given that only the total is reported by the NPI (Lloyd-Smith, 2008).

Whilst the above studies have considered pollutant reporting via databases in general, few studies have specifically examined mercury accounting and reporting. Scientific mercury studies that have commented on mercury reporting - UNEP (2013a), AMAP/UNEP (2013), Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010), Nelson et al. (2012) and Walcek et al. (2003) - suggest that most mercury information is deficient in terms of reliability, accuracy, comparability, consistency, verifiability, relevance and understandability. Globally, UNEP (2013a) and AMAP/UNEP (2013) observed that comparative analysis of global mercury emissions during the last 25 years is impossible due to changes in reporting, estimating approaches, additions of new sectors, differences in specification and classification of sectors. Moreover, changes in methods and units and lack of coordination among reports have produced inconsistent results

(Walcek et al., 2003). More specifically, reliable data collection is difficult from activities such as small scale gold mining, because it is unregulated and, in some cases, illegal (UNEP, 2013a). Research on global emissions also uncovered significant under-reporting of mercury discharges from waste furnaces (Hylander & Meili, 2003). In an Australian context, Nelson (2007) observed that the centralised reporting system of the NPI allows for a very limited scope of verifying mercury information. Furthermore, Nelson et al. (2009), Telmer and Veiga (2009) and Strezov et al. (2010) questioned the understandability of mercury data, because of inconsistencies in estimating and reporting. Observing the inaccuracy of mercury data, Nelson et al. (2009) argued that higher quality data should be collected. It should be emphasised, however, that while these studies mentioned reporting and information quality these issues were not their primary focus. Hence, none of these studies followed any specific framework or performed a systematic review of mercury reporting quality.

Given Australia's mercury reporting obligations as a signatory to the Minamata Convention, for which it will rely on the NPI to undertake reporting, these questions about reporting quality and the absence of prior studies, this study explores the following research question: *Is the Australian National Pollutant Inventory's mercury accounting and reporting adequate to meet the reporting obligations under the Minamata Convention?* We utilise accountability as a theoretical frame to address this question, using two related theoretical frameworks: the accountability theory of O'Dwyer and Boomsma (2015) and the conceptual framework of accounting, which are explained in turn below.

4. Theoretical Framework

4.1 Accountability theory

Accountability is a multidimensional construct (Sinclair, 1995) and has been broadly defined as "the duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible" (Gray et al., 1996, p. 38). An important element of accountability is reporting: Miller and Bahnson (2003, p. 14) state that organisations should "[t]ell the truth, the whole truth, and nothing but. Anything less is pointless and costly self-deception". Reporting alone, however, is not sufficient: Bailey et al. (2000) emphasise that accountability requires not only the provision of information, but also its value in terms of "facilitating action."

Building on Ebrahim (2003; 2009), O'Dwyer and Boomsma (2015) distinguish three accountability mechanisms: imposed, felt and adaptive. They argue that the traditional view of accountability involves "imposed accountability regimes" where "formal oversight and control [is] imposed" on an individual or entity (O'Dwyer & Boomsma, 2015, p. 40). In this context, accountability is discharged through "giving and demanding for reasons for conduct" (Sinclair, 1995, p. 221). It is a state of accountability where individuals or organisations are compelled to discharge accountability based on rules and procedures (Chenhall et al., 2010; Ebrahim, 2009). Individuals or organisations comply with the previously set regulations that avoid uncertainty and facilitate appropriate performance measurement (Ahrens & Chapman, 2004; Chenhall et al., 2010; Rao et al., 2012). However, compliance-based imposed accountability facilitates achieving only short-term specific outcomes (O'Dwyer & Boomsma, 2015).

Ebrahim, (2009, pp. 886-890) suggests that such 'imposed' oversight can be characterised in two ways. First a 'coercive or punitive' approach, which relies on mandatory disclosure and oversight with the underlying threat of sanctions for non-compliance. The focus of this disclosure is the stewardship of the resources of the organisation – i.e., what the organisation *does*. The second stream is 'professional or technocratic' accountability which focuses on (ostensibly objective) performance metrics - i.e., what the organisation *achieves*. Ebrahim (2009) makes the case that whilst these approaches to accountability might sound plausible in theory, their efficacy is an empirical question. In reviewing the literature to date, he finds little conclusive research to either support or refute each element.

SEA research has overwhelmingly focused on these 'imposed' accountability regimes, which are primarily manifested in the reporting of sustainability-related actions and performance. As has been shown many times (e.g. Cho and Patten, 2007; Cho et al., 2010; Cho et al., 2012a; Cho et al., 2012b) current reporting is insufficient because companies are often non-compliant with relevant sustainability standards and are biased towards reporting 'good news.' Hence many researchers have called for greater imposition of accountability via mandatory reporting (e.g. Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004). Yet the implication of work such as Ebrahim (2009) is that whilst mandatory reporting may indeed lead to greater accountability, the extent to which it does so remains a matter for empirical exploration.

O'Dwyer and Boomsma (2015) suggest that the second dimension of accountability (and one which receives far less attention in SEA research) is "felt accountability". This dimension encompasses a voluntary form of "felt responsibility" to certain principles or a mission (Ebrahim, 2009; Fry, 1995). If imposed accountability might be conceived as what the organisation *does* and *achieves*, felt accountability is what the organisation *believes*. Roberts (1991, p. 365) defined such an accountability as "a social acknowledgement and an insistence that one's actions make a difference to both self and others". This acknowledgement is the ethical motivation of responsibility, which is fundamentally absent in imposed accountability (Messner, 2009; Roberts, 1991). In this type of accountability, individuals themselves feel the responsibility of being answerable without any external pressure. Chieng et al. (2016) articulated felt accountability as "accountability for environmental stewardship is expanded by society's expectations, which can extend beyond the requirements of law". Accountability, in this case, is embedded into the mission, values, and culture of the organisation (Lewis & Madon, 2004; Shearer, 2002; Sinclair, 1995). By being embedded, felt accountability may be more relevant to everyday affairs in an organisation, though it is less transparent than formal accountability (Hilhorst, 2003).

A third and final dimension of accountability identified by O'Dwyer and Boomsma (2015) is the combination of the instrumental aspects of imposed accountability and the moral and ethical aspects of felt accountability. This third stream is "strategic and adaptive" (Ebrahim, 2009, p. 889) and focuses on the mission of the organisation and how it modifies operations in order to optimise the achievement of this mission – i.e., how the organisation *learns*. O'Dwyer and Boomsma (2015, p. 42) term this "adaptive accountability" and argue that "adaptive regimes are proactive in nature, strategy-driven, and focused on medium to long-term performance measurement and mission achievement". In this type of accountability, imposed and felt accountability dynamically co-exist. As with felt accountability, adaptive accountability incorporates accountability embedded in the organisational mission, values, and cultures (Ebrahim, 2009). However, performance measurement in adaptive accountability is more formal than felt accountability but less formalised than imposed accountability (O'Dwyer & Boomsma, 2015).

In addition to the accountability typology of O'Dwyer and Boomsma (2015), this study follows GRI (2011), OECD (2008), Comyns and Figge (2015), O'Dwyer et al. (2005), and Burritt and Saka (2006)'s previous study of pollutant databases by operationalising

accountability via the qualitative characteristics of accounting information. These characteristics are discussed below.

4.2 Conceptual framework of accounting

As noted in the previous section, reporting is a necessary (though not sufficient) element of accountability. An important question is therefore what constitutes ‘quality’ reporting. Whilst most of the commentary on the qualitative characteristics of information focuses on financial information, as researchers such as Comyns and Figge (2015), O'Dwyer et al. (2005), Burritt and Saka (2006) show, these characteristics can also provide a useful frame from which to evaluate the quality (or lack thereof) of non-financial information. Moreover, different national and international organisations including GRI (2011) and OECD (2008) also recommended using these characteristics for examining the quality of the social and environmental information of both public and corporate entities. For example, in relation to pollutant inventories, the Canadian National Pollutant and Release Inventory (NPRI) uses seven qualitative characteristics of accounting information for ensuring the quality of reports (NPRI, 2017). Table 1 provides a summary of the qualitative characteristics considered by prior work.

Table 1. – Prior work utilising qualitative characteristics in relation to environmental reporting

	Sources	Qualitative characteristics used
1	NPRI (2017)	Relevance, accuracy, reliability, completeness, understandability, accessibility, and timeliness
2	Comyns and Figge (2015)	Accuracy, completeness, consistency, credibility, relevance, timeliness, and transparency (transparency, reliability, and clarity)
3	Ane (2012)	Relevance, reliance, comparability, and clarity
4	GRI (2011)	Materiality, stakeholder inclusiveness, sustainability context, completeness, balance, clarity, accuracy, timeliness, comparability, and reliability
5	OECD (2008)	Accuracy, comparability, completeness, consistency, and transparency

6	Stanwick and Stanwick (2006)	Auditability, completeness, relevance, accuracy, neutrality, comparability, timeliness, transparency, inclusiveness, clarity, and context
7	Burritt and Saka (2006)	Understandability, relevance, materiality, reliability (faithful representation, substance over form, neutrality, prudence, completeness), comparability, timeliness, and balance between benefit and cost
8	O'Dwyer et al. (2005)	Adequacy, verifiability, credibility, comparability, consistency, and usefulness

Therefore in this study, we combine the accountability typology of O'Dwyer and Boomsma (2015) with qualitative characteristics of reporting to provide a more nuanced understanding of Australian mercury reporting under the NPI. From the above studies, as well as the *Characteristics of Accounting Information* issued by the FASB in 1980 and the Australian Accounting Standards Board (AASB) *Conceptual Framework* issued in 2009, we utilise the following set of qualitative characteristics to evaluate the quality of mercury reporting: accuracy, understandability, relevance, comparability, consistency, predictive value, feedback value, timeliness, verifiability, completeness and materiality.¹ Whilst these characteristics are widely understood, for the sake of completeness we briefly define each term below.

The qualitative characteristic of 'accuracy' means the information provided is correct; accuracy and reliability are almost synonymous as the reliability of information should be judged in terms of its accuracy. The AASB (2009, paragraph 31) states:

[T]o be useful, information must also be reliable. Information has the quality of reliability when it is free from material error and bias and can be depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to represent.

FASB (1980) define reliability as the quality that assures information is reasonably free from error and bias and faithfully represents what it purports to represent. Similarly, Miller and Bahnson (2007) denote reliability as the correspondence or agreement between a measure and the phenomena it purports to represent.

¹ The IASB currently has a project to update its conceptual framework but this does not involve material revisions to the set of qualitative characteristics.

Understandability is the quality of information that allows reasonably informed users to perceive its significance, that is, to understand the content and significance of financial statements and reports. FASB (1980) denote understandability as the comprehensibility of information provided in the reports. According to the AASB Conceptual Framework, “understandability aims for an essential quality of the information provided in financial reports that it is readily understandable by users” (AASB, 2009, paragraph 25).

Comparability enables information users to identify uniformities, that is, is the “quality or state of having certain characteristics in common, and comparison is normally a quantitative assessment of the common characteristic” (FASB, 1980, paragraph 115, p. 41). AASB (2009) defines comparability as making possible the following ability of users:

[T]o compare the financial reports of an entity through time in order to identify trends in its financial position and performance, and users must also be able to compare the financial reports of different entities in order to evaluate their relative financial position, financial performance, and cash flows.

Timeliness refers to providing information promptly to decision makers. AASB (2009) states that “if there is undue delay in the reporting of information it may lose its relevance and hence management may need to balance the relative merits of timely reporting and the provision of reliable information”. Wolk et al. (2013, p. 202) suggest that “to be relevant, information must be timely, which means that it must be available to decision makers before it loses its capacity to influence decisions”.

Verifiability implies the justification of information by independent measures using the same measurement technique. FASB (1980, p. 33) define verifiability as “a quality that may be demonstrated by securing a high degree of consensus among independent measurers using the same measurement methods”. Williams and Griffin (1969, p. 143) more broadly refer to verifiability as “the correctness of mathematics and logical arguments, the trustworthiness of reports, the authenticity of documents, the accuracy of historical and statistical accounts, the reliability and exactness of observations”.

Completeness refers to reporting all the expected information that ‘reasonably’ fulfills the qualitative reporting requirements. According to FASB (1980, p. 32), completeness “implies that nothing material is left out of the information that may be necessary to ensure that it

validly represents the underlying events and conditions”. Adequate information disclosure is a significant condition of a “true and fair view” (Gill, 1983).

The accountability typology of O'Dwyer and Boomsma (2015) and the conceptual framework of accounting provide the theoretical frame for evaluating Australian mercury reporting under the NPI. The following section details the method adopted for the study.

5. Method

The primary data sources of the study are documentary analysis and semi-structured interviews. Documentary analysis consists of reviewing key background literature, including Hylander and Meili (2003), Mohapatra et al. (2007), Nelson et al. (2009), Strezov et al. (2010), and Walcek et al. (2003), and UNEP documents, including UNEP (2013a), UNEP (2013b), as well as information provided on the NPI website.

In addition to the documentary analysis, eight semi-structured interviews with 11 interviewees were conducted, summarised in Table 2. Details of the interview questions are provided in Appendix A. Semi-structured interviews were selected as this approach allows the capture of both richer and more focused data than fully structured or unstructured interviews (Fontana & Frey, 2000). The duration of these in-depth interviews was from 40 to 93 minutes with an average of 67 minutes. Two interviews were undertaken in person and the others via telephone. As a means of collecting research data, the use of the telephone has been gradually increasing (Glogowska et al., 2011). In terms of data quality, the data collected through telephone interviews are considered comparable to that of face-to-face interviews and Glogowska et al. (2011, p. 21) argued that “there is already evidence to suggest that data obtained through telephone interviews are no less valid than those obtained in face-to-face interviews”. The telephone interview has advantages (Cook et al., 2003), including avoiding travel, eliminating the problems associated with personal contact and quicker data collection (Walliman, 2006). On the other hand, the limitations of the telephone interview include limiting the opportunity to observe the non-verbal behaviour of the interviewee, problems in raising more complex questions and difficulties in maintaining the pace of the interview and recording the data. To avoid these limitations and to improve the quality of the collected data, we followed the suggestion of Glogowska et al. (2011) and Saunders et al. (2009), such as providing details of the project and points of focus in advance and subsequently providing a summary of key issues discussed via email.

Table 2 - Overview of interviews

Interview	Date	Duration (mins)	Type	Interviewee (s)	Role
1	22/06/2015	93	Face to Face	Interviewee -1	Researcher
2	02/07/2015	71	Face to Face	Interviewee -2 Interviewee -3	UNEP Mercury Experts
3	21/10/2015	66	Telephone	Interviewee -4 Interviewee -5	Regulator Regulator
4	11/11/2015	75	Telephone	Interviewee -6 Interviewee -7	Regulator Regulator
5	15/11/2015	66	Telephone	Interviewee -8	Regulator
6	08/02/2016	47	Telephone	Interviewee -9	Corporate Reporter
7	27/04/2016	40	Telephone	Interviewee -10	Regulator
8	23/05/2016	81	Telephone	Interviewee -11	Regulator
Total = 539 Minutes, Average = 67 Minutes					

We interviewed people from different backgrounds and locations, including academic mercury researchers, UNEP mercury experts, regulators such as NPI regulators and administrators from various regions of Australia, mercury reporters from the major mercury emitting companies in Australia and Australian Government NPI representatives. Interviewers A and B conducted all of these interviews. All the interviews were recorded with the prior permission of the interviewees except for interview 2, where the interviewers took handwritten notes. Interviewees were also given the option to talk ‘off the record’ if and when they chose. These interviews explored different aspects of current Australian mercury reporting, particularly an evaluation of the mercury reporting processes and mercury information.

Although we conducted a relatively small number of interviews, our interviewees covered the major parties related to mercury emissions including academic researchers, UNEP mercury experts, state and territories regulators, Australian Government regulators, and a corporate mercury reporter. We also reached the “interview to saturation” (Trotter, 2012, p. 399) as additional interviewees provided almost the same opinions as those of the previous interviewees. Moreover, qualitative research is usually conducted based on a small number of samples (Gentles et al., 2015; Ritchie et al., 2003) because additional interviews provide very little new information and qualitative research works collect data that are “rich in details” (Ritchie et al., 2003, p. 83). Our sample was within the range recommended by Marshall et al. (2013) of between six and 50 interviews.

The interview responses were transcribed, then analysed based on the methods explained by Ryan and Bernard (2000), Silverman (2000), O'Dwyer (2004) and O'Dwyer et al. (2011). Initial codes were ascertained from the discussions of the background and theoretical frames. Initial codes were used in the first coding pass, and new codes were included when new dimensions were identified. Interview notes were also used for determining additional dimensions. All transcripts and notes were evaluated for the identified codes in the second pass, and a draft was prepared as a tool for arranging interview themes. As noted above, a summary of key themes was also provided to interviewees for clarification and comment.

6. Findings

The study identified major strengths of the NPI mercury reporting processes, particularly in relation to point source emissions. These include an appropriate reporting threshold level, public data availability, administration by state and territory governments with good relationships with industry, and a long history of data. Interviewees with the best knowledge of the reporting requirements of the Minamata Convention believed that this process would be sufficient to meet Australian reporting obligations, especially in comparison with the non-existent or unsophisticated reporting regimes of many developing countries. One of the UNEP experts observed that:

NPI not perfect but is robust, meets OECD standard, and know that NPI had 16 years of data a continuous baseline that is credible. (Interviewee 2, UNEP Mercury Experts)

Whilst this assessment was encouraging, the study also identified a number of weaknesses in the NPI mercury reports and reporting processes. The primary issue was the lack of data and reporting on diffuse source emissions, but other concerns included understandability, consistency, timeliness and relevance. A common theme was the reduction in funding for the NPI at both Australian Government and state and territory levels that has resulted in diminished data quality across a range of dimensions.

The findings are presented first based on the qualitative characteristics of the accounting information: understandability, accuracy, verifiability, comparability, timeliness, and completeness (we also discuss resourcing as this was a common theme brought up by interviewees and impacts all dimensions). We then analyse our findings more broadly using the O'Dwyer and Boomsma (2015) typology of accountability.

6.1 Understandability

Interviewees provided diverse views regarding the understandability, usage, and usefulness of mercury information. While interviewees generally agreed that the information was presented in an understandable manner, the primary concern was that interpretation is difficult:

We produce, or we publish the emission estimates of the 93 substances that the NPI covers. Facility X says they emit 40 kilograms of this and 20 kilograms of that, and another industry says we emit 10,000 kilograms of this and five kilograms of this. However, what's missing is the context in data . . . there's no broader context to the information. It is literally just a data summary. So it is easy to understand from a data perspective but from a context perspective, there's nothing. (Interviewee 5, Regulator)

[A]ctually understanding what the implications of those emissions are, I don't think it goes very far in that regard. (Interviewee 10, Regulator)

One interviewee reported that in their region, NPI data was used for load-base licensing, whereby licence fees are linked to pollutant emissions. This approach facilitates an understanding of the impact of pollution on wider environmental issues:

The substances that were chosen for the load-base licensing were also linked to real environmental issues . . . So for example with total nitrogen, total phosphorous, . . . It is a real issue with sea grasses. . . . Or for example total volatile organic compounds in the [capital] air-shed leading to smog, air quality issues and things like that. . . . So, therefore when you actually get your bill, you go oh okay, this is then linked to my licensing bill. (Interviewee 8, Regulator)

The broader issue, however, is that the community impact of a given emissions profile is not evident from NPI data. As one interviewee explained, factors such as stack height will influence emission impact, but this is not currently reported in the NPI:

Also there's a need to be a little bit more sophisticated in the way the information is presented – or there's an opportunity to do that. If you – things like stack heights, for example. So, if you have a lot of emissions coming out of – or potentially hazardous emissions coming out of a chimney stack, if it is a low stack – therefore they are closer to the ground – the emissions occur closer to the ground, and the community is more likely to be exposed to those emissions. That is a worst case scenario. If it is a very tall stack and the emissions are released at a much higher level, then there will be some overall atmospheric impact. But, actually, the impact on the local community is considerably reduced because the emissions are occurring at a higher level in the atmosphere. (Interviewee 10, Regulator)

Overall, interviewees suggested that data presentation of the NPI can be made more sophisticated for improving the usefulness and understandability of data to the community, non-government organisations and health organisations that want to understand the potential exposure to emissions. The inclusion of data on stack heights is one example, but a more ambitious proposed improvement is correlating the emissions data with atmospheric and

weather data. Moreover, these improvements to data presentation could be made without any additional reporting burden on industry.

6.2 Accuracy

Point source data was considered reasonably accurate in that industrial users followed the estimation manuals to determine emissions. However, there was a range of views regarding the quality of these manuals. While some believed that they were adequate others suggested that they needed to be updated. A middle view was to couch the debate in terms of costs versus benefits:

I think there would have to be a cost benefit analysis. But I think things like more frequent – or specification around the frequency of testing and some tighter rules around methodologies for sampling and so on. (Interviewee 10, Regulator)

Some interviewees suggested that the flexibility of different types of reporting and the inability to capture voluntary transfers result in a lack of reliability in the NPI generated mercury data. Reporting of mercury information based on ‘direct measurement’ and ‘emission factors measurement’ is inconsistent but the NPI is flexible in this case. One of the NPI Interviewees stated that:

[T]here may not be that absolute knowledge of how reliable that data might be or how specific it is, because there might be a bit of a variation then, depending on what type of methodology has been used to calculate those emissions. (Interviewee 8, Regulator)

In terms of diffuse source emissions, given that these are performed by states on an as-needed basis and without a mandated methodology it is difficult to determine an overall level of accuracy. However for diffuse emissions the key issue is data availability as opposed to accuracy, a point discussed further below.

6.3 Verifiability

There are different views amongst the interviewees on the adequacy of verification of mercury information. Prior literature and some interview responses suggest that the numbers are not appropriately audited. NPI staff from the state and territory level strongly emphasised that they do verify each report received via a ‘desk audit’. This verification includes comparing the emissions of the current year with those of the previous year, comparing emissions with information about fuel consumption and volume of production and identifying facilities reporting with significant variations in emission levels. Particular scrutiny is given to larger facilities, newly reporting facilities and consistently poor reporters. Additional

verification steps include asking for clarification and evaluating the feedback received as well as site visits and consulting with facilities to fix reporting problems and improve reporting capacities.

One interviewee outlined the secondary processes that are applied for verification as below:

If at the end of that we are still not satisfied that the data they've given us is representative or makes sense in the context of their historic operations then we will query them, and we will send feedback, very specific feedback saying we have noticed this ... Sometimes there're more systemic areas that we have to go and do a bit of work to help them fix ... we visit, and we inspect. We review their calculations in detail; you know fine comb, we get their spreadsheets. (Interviewee 5, Regulator)

Whilst NPI staff were satisfied that current verification processes are adequate, all the interviewees agreed that the recent reduction in resourcing threatens the ongoing verification of mercury data (particularly for remote sites) as NPI personnel are being reduced in many regions. This funding issue is discussed in more detail further below.

6.4 Comparability

The analysis of NPI reporting and interviewees showed that different mercury reporting facilities apply different approaches to measurement and reporting, which hinders comparability of the reported information between facilities. Even individual facilities use different approaches in different years, which also hinders comparability between periods.

I guess you've always got the aspect that you can't always compare one facility to another..... So we do try to do validation of different - like just say for example we tried to do the mining sector together, although it depends as well. Sometimes they're quite different as well between what they do. (Interviewee 8, Regulator)

“....if you're looking at national emissions it's a conglomerate of hundreds of facilities who are reporting who might all be using different - they couldn't all be using them, but I mean they may be reporting under difference bases. So some of them might have done some measurements, others might have been using mercury in coal values, others might've been doing something else, using US default values.” (Interviewee 1, Academic Researcher)

Differences in state and territory legislation effect have the potential to impact data quality. As noted above, the NPI reporting processes are a joint program between the Australian Government and state and territory governments. However, implementation of the programs differs based on the particular state and territory law in that jurisdiction. While the substances and the thresholds are the same, there are differences in fines applied and the way compliance is undertaken. Such differences are less important than the options given for reporting,

however, as while there are differences in state and territory legislation, the same regulatory practices are used. Interviewee 5 summarised this sentiment:

As a broad process there's a lot of consistency. So we all do the same things... We all do the same validation processes of the data. Broadly speaking the state and territories are consistent, it's more slight nuances. So, different territories might not do as much follow-up work. Different areas might not do as much sort of pre-work to engage with industry and that will impact data quality outcomes. So, there is some sort of day to day procedures that the states and territories do differently from each other. (Interviewee 5, Regulator)

6.5 Timeliness

Though most of the facilities and state and territory staff from the NPI submit their point source reports on a timely basis, significant delays were reported in processing diffuse data at the national level.

As noted in section 2, for point source data, facilities submit their reports to respective NPI state and territory environment agencies by 30 September for the preceding year from 1 July to 30 June. State and territory environment agencies evaluate the reports for accuracy and then forward to the Australian Government by 28 February and the Australian Government publishes the facility data for public use on 31 March. Facilities have the option of submitting reports either based on the calendar year or financial year. The calendar year reporters create a big time lag as their data is not reported until the following 31 March, that is, calendar 2016 data would not be released until March 2018.

For diffuse sources, state and territory governments usually procure measurement studies by external scientists or government agencies. States and territories submit the data to the Australian Government for entry into the NPI as the Australian Government ensures that the data is correctly formatted. However, interviewees reported that there is a lag of some years in data being entered into the system. Consequently, faced with funding cuts, states and territories are reducing efforts to collect diffuse source data as there seems little point in collecting data that will not be processed on a timely basis.

Australian Government interviewees stated that funding has been approved for an update to the IT system for late 2016 that will once again enable timely processing of diffuse emissions. Funding constraints, however, limit their ability to do what is really desired, namely a comprehensive system update:

[I]t's difficult in a resource constrained environment for the department to allocate resources to – enhancing an IT system that is a fairly old, bespoke IT system. When, really, what we would rather do is rebuild something or build a new system, but we don't have the capital resources to do that. So it's a bit of a piecemeal process, and that takes a little bit of time to get the approvals to undertake those projects.
(Interviewee 10, Regulator)

6.6 Completeness

Mercury data completeness is more problematic than accuracy, especially for diffuse emissions. As noted in the previous section, the appetite for studies of diffuse emissions is waning given budget cuts and processing delays. Even notwithstanding these issues, interviewees suggested that diffuse coverage was patchy.

For point sources, concerns were raised that some organisations were not reporting because handbooks had not been produced:

So, it's quite possible that the data completeness thing would be affected because we don't supply emission factors. We don't have it – our view here in [our state], which isn't the same view which is held nationally, is that if there's no emission estimation technique available, then the substance doesn't need to be reported. (Interviewee 7, Regulator)

Nevertheless, there was general agreement that point source data was reasonably complete given the established process. The verification of reporting by the states and territories via both desk audits and site visits was noted as an important tool that ensured complete information was available in the NPI database.

6.7 Resource constraints

Though not originally part of the model, a recurring theme across interviewees is resource constraints, which are significantly hampering the capacity of the NPI in discharging its accountabilities. Almost all the interviewees expressed their concerns about the reduction of resources allocated to the NPI by the Australian Government, and staff cuts at the Australian Government and state and territory levels. Initially, there was significant support for the NPI:

.....When I started that was just - shortly after I started was 10 years of NPI reporting. The Commonwealth [Australian Government] was very well resourced at that time. They had their own director, communications team, scientific people, a few IT people, and their own - yeah, their own director. It was fantastic. They did a lot of work. There was just a lot happening. Then the updated legislation had come out with the transfers and things like that. So they were putting a lot of resources in it - to it. They had a conference celebrating the 10 years. There was really a lot happening.
(Interviewee 8, Regulator)

Over time, however, resourcing has diminished. Data accumulation, validation and reporting processes have become marginalised which ultimately deteriorate the reliability and usefulness of mercury data. In response to a question whether the funding is adequate for what is needed to do to deliver a good outcome from the NPI, both of the Australian Government representatives replied negatively.

It should be noted, however that the NPI funding model is unusual:

[the NPI] is a highly unusual program in that it's a program that's managed by eight different states and territories, and they're funded to do that by the Commonwealth [Australian Government] on a 50 per cent shared basis ... It's not normal for one particular government to fund the involvement of all of the others. It's probably an accident of history that funding was provided at the very commencement of the NPI, 15 years – or however long ago it was – 16 years ... It is a strange situation that the Commonwealth actually provides any funding at all to them. (Interviewee 10, Regulator)

Consequently, it was pointed out that although the Australian Government recently halved the funding allocation for the operation of the NPI, states and territories could have stepped in to maintain the previous level of funding. In any event, there was widespread agreement that funding cuts had reduced the quality of NPI data across the board, particularly in terms of diffuse emission data collection and the reliability of point source data, as verification activities were being diminished. In addition, in the current funding climate there seems limited opportunity for improvement, save for the funded Australian Government project intended to improve diffuse source reporting.

6.8 Imposed, felt and adaptive accountability

In addition to evaluating findings from the perspective of the qualitative characteristics of financial reporting, findings were also analysed using the O'Dwyer and Boomsma (2015) typology of accountability. As noted in section 4, imposed accountability refers to the accountability that arises due to the set rules and regulations which the individual or organisations comply with and discharge their responsibilities of accurate reporting what they did. On the other hand, felt accountability is a form of voluntary ethical responsibility that individual or organisation discharges due to the self-motivation of achieving a mission, without any external or regulatory requirements. Finally, the adaptive accountability combines both imposed accountability and felt accountability via learning in ways that optimise the achievement of organisational objectives.

The current mercury reporting processes under the NPI and types of accountability are depicted in Figure 1. For point sources, the relationship between corporations and State and Territories is primarily one of imposed accountability. Reporting of point source mercury emissions is mandatory and controlled by the state and territory governments. In addition to mandatory reporting, other elements of imposed accountability include sanctions and audits. Yet as the previous process reveals, there are some limitations in the efficacy of this process, primarily around consistency. Further, the NPI reporting process does not require pollution reduction targets to be set or activities to be undertaken by firms. Whilst heightened pollution levels may attract regulatory attention from other areas, this is not built into the NPI system. Hence there is the risk that the observation by Ebrahim (2009) that performance data is not used to improve performance is apt here.

For diffuse sources, state and territory governments sponsor the mercury measurement that is often done by external scientists or other government agencies. There is no specific ‘accountee’ in such cases and hence no imposed accountability. It is rather the belief by states and territories that it is important to track this facet of mercury pollution which drives this reporting. As there is not a defined process for the collection or reporting of diffuse emissions, it is most accurately defined as felt accountability.

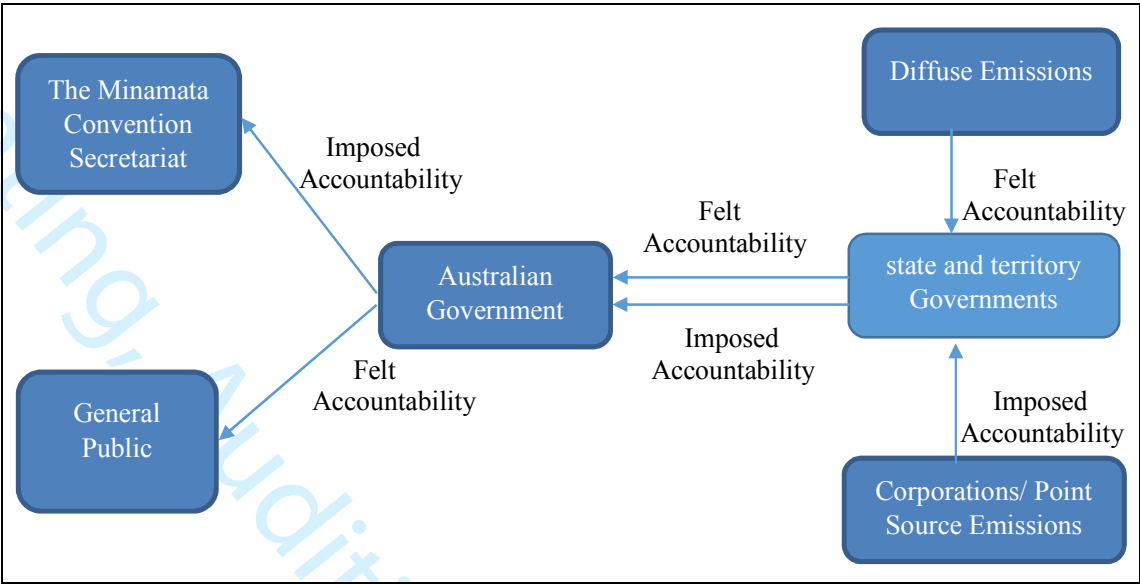
Once point source and diffuse data has been collected, this information is submitted to the Australian Government for formatting and entry into the NPI systems. Given the tight control by the Australian Government over point source emissions, for these emissions this arrangement is most accurately characterised as imposed accountability and the Australian Government expects deadlines to be met. Whilst there are no explicit sanctions, the fact that the Australian Government provides funding for state and territory NPI agencies means that the Australian Government has significant leverage. For diffuse emissions there is much less accountability; as the Australian Government has not processed much of the recent information provided by the states and territories these entities do not consider themselves under any pressure to report. Hence they do so only because they believe it is important to fulfil their mission – a classic example of felt accountability.

The Australian Government is responsible for disseminating mercury information to the general public. Though there is formal reporting under the NPI, the general public cannot

compel the government to release mercury information within a stipulated time and also has no authority over the type of information that is released. Thus there is little that the public can do about, say, the lack of diffuse source mercury reporting in recent times. Of course the ultimate sanction is voting the government from office, but in the case of mercury this is a blunt instrument. Responsibility is shared between the Australian Government and states and territories, meaning that identifying the culprit for inadequate reporting is difficult, and more importantly mercury is unlikely to be a leading issue in the minds of most voters. This means that the relationship between the Australian Government and general public is one of 'felt accountability' as it is largely out of a sense of mission that the Australian Government both developed and maintains the NPI.

The Australian Government will also be responsible for reporting under the Minamata Convention. As Australia is a signatory to the Minamata Convention there will be imposed accountability to report according to the Convention. A specified reporting format, content and timetables will apply to all parties of the Convention and reporting is also likely to be subject to some form of independent verification. While there are unlikely to be significant sanctions imposed for non-compliance (as is the case for virtually all international treaties) the desire to maintain an appropriate international profile will encourage compliance. Therefore while this has elements of felt accountability (in that there was no requirement for Australia to become part of the Convention) the relationship between Australia and the Convention Secretariat is best characterised as one of imposed accountability.

Figure 1. Imposed and felt accountability within the NPI mercury reporting process



Whilst the NPI reporting framework includes elements of felt and imposed accountability, it does not appear to be an example of ‘adaptive accountability’ as discussed by O’Dwyer and Boomsma (2015). Rather than improving over time via organisational learning, the process seems to be in decline, largely driven by the continual reduction in resources discussed in the previous section. There is little evidence at either the Australian Government or state and territory levels of ongoing innovation; rather the quality of reporting has reduced due to the backlog of diffuse emissions at the Australian Government level and the reluctance of state and territory managers to commission studies that may take years to be released. Our interviewees revealed that many actors had ideas as to how reporting might be improved – such as by providing further contextual information – but little faith that these ideas would be implemented in the foreseeable future.

Figure 1 depicts this complex network of accountabilities between the various actors. It is evident that even for reporting on a single substance the accountability relationships are diverse and that within each category of accountability there are further nuances; for example, the imposed accountability between corporations and state and territory regulators is quite different to that between the Australian Government and the Minamata Secretariat. Overall, it seems that imposed accountability might be the strongest in this case, if judged by the quality of reporting. Yet whilst imposed accountability does seem to drive more rigorous and timely reporting, it is not evident that this greater quality in reporting has resulted in reduced emissions. Therefore it would be premature to conclude that imposed accounting is

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3 somehow better than felt accountability. In this case, perhaps because of the lack of adaptive
4 accountability, neither imposed nor felt accountability are delivering optimal outcomes.
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7 Of particular interest is the fact that the main weakness is not at the corporate level but rather
8 with the governmental beauracracy surrounding it. Whilst there were some deficiencies in the
9 imposed accountability between governments and corporations, these failures were due to
10 problems with the reporting regime imposed by governments rather than corporate
11 malfeasance.
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15 16 **7. Conclusions**

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18 Mercury is one of the most toxic substances known to humanity. It cannot be destroyed
19 (WHO, 2017) but can be controlled and, over time, different local and international laws and
20 agreements have been initiated for this purpose (Selin & Selin, 2006). The most recent global
21 agreement for reducing mercury pollution is the Minamata Convention and a key element in
22 this Convention is mercury accounting and reporting. Appropriate accounting and reporting
23 of mercury would provide accurate mercury information for making policy decisions and for
24 holding emitters accountable for their emissions.
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30 Australia is a signatory to the Minamata Convention and as the NPI is the main source of
31 mercury data in Australia, it is expected to underpin Australia's mercury reporting
32 obligations under the Convention. This paper evaluates whether the NPI is of sufficient
33 quality to enable Australia to meet these obligations. The prior literature on mercury
34 highlights a number of quality limitations in mercury reporting processes, both overseas and
35 in Australia. Surprisingly, the quality of mercury reporting has not been the focus of prior
36 studies either within social and environmental accounting or in the broader literature.
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42 As a theoretical frame, this paper uses the notion of accountability and following Burritt and
43 Saka (2006) draws on the conceptual accounting framework as well as the concepts of
44 formal, felt and adaptive accountability outlined by O'Dwyer and Boomsma (2015). Data
45 comprises an extensive literature review and the results of semi-structured interviews with
46 mercury researchers, regulators and mercury reporters to examine the Australian mercury
47 accounting reporting processes.
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52 Overall, interviewees considered that Australian mercury accounting is sufficient to meet the
53 expected Minamata reporting requirements. This position, however, is largely justified on the
54 basis that many signatories are developing countries with little mercury reporting, and
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Australia's information is therefore sophisticated by comparison. We find reveal a number of limitations in measuring and reporting mercury under the NPI, particularly in relation to comparability, completeness and timeliness.

Regarding comparability, some organisations follow different methods of measurement and even different methods in different years, meaning that mercury information cannot be compared between reporters or even between years for individual reporters. These findings suggest that regulators should tighten the approach to mercury measurement and reporting in order to facilitate comparability of information. The study of Burritt and Saka (2006) observed the similar findings that the PRTR data of Australian corporations are not comparable with each other and it seems that in the intervening ten years to our study these issues have not been addressed.

Regarding completeness, the diffuse emission data is sparse and is not processed on a timely basis by the Australian Government. In addition, the information lacks any predictive elements or analysis of the impact of previous actions. Interviewees suggested that data could be presented in a more logical and structured way to improve the ability of users to understand the potential impact of reported emissions. For example, more extensive reporting of diffuse emissions, stack heights and correlating the emissions data with atmospheric and weather data would significantly aid the assessment of emission impact by users. These improvements do not require any additional reporting burden on reporting industries. An appropriate verification process improves the quality of data and was reported to be operating effectively, but is under threat from the ongoing reduction in resources available for the administration of the NPI.

Regarding timeliness, the facility level emissions are reported on a reasonably timely basis (though information from facilities that report on a calendar year basis is delayed) but the diffuse sources emissions are not disclosed to the public in a timely fashion due to the reporting process and lack of necessary funds at the state and territory level. Timeliness was also an issue raised by Burritt & Saka, (2006), though they found that though there was considerable delay in reporting PRTR data to the public, however, this delay is comparatively lower than Canada, Japan, Netherlands, the UK and the USA. Moreover, funding cuts by the Australian Government hinder mercury reporting, particularly the reporting of diffuse emissions. However, according to interviewees from the Australian Government, states and

territories have legislation in the form of the NPI National Environment Protection Measures and accordingly it is their obligation to manage and finance the program.

Following this observation, the key policy implication of the study is that sufficient funds should be made available to the states and territories for the NPI program and Australian Government agencies, most importantly in order to facilitate the timely processing of diffuse source data but also to maintain an appropriate level of verification of point source data. Whilst the regulators exhibited high levels of 'felt accountability', it is clear that they are constrained in discharging accountability by the level of resources available. In addition, possible enhancements to the program – such as presentation of contextual information to enhance understandability and usefulness – seems unlikely to eventuate in the current funding climate.

In relation to the accountability frame proposed by O'Dwyer and Boomsma (2015), the NPI reporting framework for mercury is a complex network which includes elements of felt and imposed accountability. However, it does not appear to be an example of 'adaptive accountability' as organisational learning is not evident; to the contrary it seems that the NPI regime is in decline as a result of lessening resources. The detrimental impact of a lack of resources on accountability highlights an important element that is not foregrounded in the O'Dwyer and Boomsma (2015) typology (nor indeed in much of the accountability literature): capability. Given that the need for adequate resources is known to be a critical element for national compliance with multilateral agreements (e.g. Zhao & Ortolano, 2003) this is surprising and an important area for future work.

The complexity of the observed accountability relationships – despite the study focusing on a single pollutant – has implications for the ongoing discussion within the social and environmental accounting community regarding mandatory reporting. There have been a number of calls for mandatory social and environmental reporting (Gray and Milne, 2002; Adams, 2004; Adams and Zutshi, 2004; Gray and Milne, 2004) but little investigation of current mandatory regimes.

Our study shows that while mandatory reporting may indeed enhance accountability it is not a 'silver bullet' for two reasons. First, while mandatory reporting may enhance 'imposed accountability', there are many elements of a mandatory reporting regime which contribute or undermine the extent of this accountability. For example, the level of comparability, oversight, audits and sanctions will all materially impact the quality of information provided.

Further, it is crucial that a mechanism is put in place to ensure that performance-related information is actually used to improve performance. In the case of mandatory mercury reporting, whilst the key reporting requirements are in place, deficiencies in critical areas and the lack of a performance focus of reporting diminish the extent of accountability ultimately achieved.

The second insight is that felt accountability is an important additional dimension to consider as there may be instances where imposed accountability is not present. In the mercury example, despite the absence of imposed requirements for reporting of diffuse emissions, some states and territories have continued. As it is unlikely that any imposed regime can be absolute, winning the ‘hearts and minds’ of reporters will be critical to establishing comprehensive accountability. Explicitly fostering felt accountability is therefore important even in a mandatory reporting regime.

These two caveats, however, should not be seen as arguments against the imposition of mandatory reporting. In our case, felt accountability alone was not sufficient to overcome challenges such as diminishing resources and institutional commitment in order to produce comprehensive information. This suggests that leaving reporting as a discretionary endeavour and trusting on the commitment of individuals involved is a risky endeavour, and corresponds with the experience of voluntary corporate sustainability reporting where despite well-meaning individuals the overall quality of such reporting is often lacking. In other words, while mandatory reporting may not be a silver bullet, it is still a potent weapon.

This study has several limitations which might be addressed by future research. First, formal reporting under the Minamata convention has not yet commenced. Future research could examine the extent to which this requirement has influenced ‘downstream’ accountability and reporting quality, which would provide important insights as to the utility of global reporting regimes for national and local communities. Second, while the NPI requires reporting of 93 substances, our study considers only mercury. Future studies might focus on the reporting of other pollutants and whether the accountabilities and accountability gaps noted in our study are replicated in relation to other substances. Finally our the study considered a single geographic area (Australia) with particular socio-economic conditions, culture, industry mix, level of corporate influence and so on. Given the NPI approach is similar to that of pollutant databases around the world, future research might explore the extent to which the Australian experience is consistent with that of other jurisdictions, and in particular whether there are

significant differences between countries with different cultural and development characteristics.

Notes

¹ Though there some differences, pollutant release and transfer registers (PRTRs) such as the NPI have similar functions and objectives around the world (Sullivan & Gouldson, 2007). Different PRTRs include different numbers of potentially harmful substances to be reported if these are emitted and transferred beyond a certain threshold level. Moreover, PRTRs wish to measure and report information on emissions from both point and diffuse sources. Inventories like the TRI and NPI aim to perform several functions: (a) help industry and government with environmental planning and management; (b) provide up-to-date information to the public about the exposure to toxic chemicals; (c) get businesses to conduct audits, find out what they are releasing, and bring this to the attention of senior executives; (d) generate the incentive for change through a combination of public pressure and a new corporate awareness; (e) provide useful data to researchers and environmental regulators; and finally (f) develop inventories to comply with international environmental reporting obligations (CEPA [Commonwealth Environment Protection Agency], 1994; Howes, 2001).

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Chapter 6

Compliance with Mercury Reporting Provisions under the Minamata Convention: A Developing Country Perspective

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Compliance with Mercury Reporting Provisions under the Minamata Convention: A Developing Country Perspective

Abstract

Purpose: *The paper responds to calls for greater SEA research in developing countries and examines reporting in the context of Multilateral Environmental Agreements (MEAs). MEAs are intended to provide long-lasting solutions to complex environmental problems, but compliance, especially by developing countries, is a serious concern. This paper explores the capabilities of one such developing country – Bangladesh – to comply with the reporting provisions of the most recent MEA, the Minamata Convention on Mercury.*

Methodology: *This paper draws upon the extensive public record of the deliberations of the Minamata Convention as well as on direct interview data. This data is analysed from an accountability theory perspective, more specifically from the dimensions of the prerequisites of accountability including capability, commitment, and sanctions. The study collected opinions of the key stakeholders including the academics, researchers, NGOs, and regulators through email interviews.*

Findings: *While Bangladesh has some capability for complying with the reporting provisions of the Minamata Convention, it needs more support from UNEP and developed countries. The Convention and the surrounding discussions acknowledge these challenges and the need for help, but whether the level of support provided will be sufficient remains unclear. Presently, while there are specific instances of raised awareness about mercury – such as among Bangladeshi dentists and dental colleges – there is limited awareness among government administrators, researchers, regulators and the general public.*

Implications: *The issues raised in this paper have implications for compliance with the Minamata Convention by other developing countries, as well as for compliance with other MEAs. The findings may also be relevant to improving compliance with other forms of sustainability reporting where resource constraints may adversely impact the quality of reporting, such as corporate reporting in developing countries, and by SMEs.*

Originality value: *This study explores the national reporting of an MEA in a developing country context. In addition, the study develops the element of capability within the theory of accountability, an element that is surprisingly absent from most previous discussions of accountability.*

Keywords: Multilateral Environmental Agreements, national reporting, Mercury, the Minamata Convention, accountability, developing country, Bangladesh

1. Introduction and Motivation

Multilateral Environmental Agreements (MEAs) are a mechanism for solving significant and complex environmental problems. Well-known examples include the Stockholm Convention (concerning persistent organic pollutants), the Montreal Protocol (depletion of the ozone layer), and the Kyoto Protocol (greenhouse gas emissions). The scope of most MEAs is global. Najam (2005) observed that while developed countries typically take a leading role in the creation of MEAs, developing countries are also highly active. Greater global participation is a prerequisite for the success of MEAs (O'Brien & Gowan, 2012), not least because developing countries are a significant source of environmental harm. Developing countries have significant environmental issues (Zhao & Ortolano, 2003) and therefore have a right to not only be a party to, but also to influence, such agreements. For example, ITT (2017) reported that 92% of all pollution-related mortality is in the developing countries, and 25% of the deaths in those countries are attributable to pollution.

MEAs are designed to address critical environmental issues, but their effectiveness is hampered by lack of compliance, which is especially acute in developing countries (Ambalam, 2014). This lack of compliance has been linked to a lack of monetary resources rather than being intentional. For example, Daudu (2008) observed that many African countries lack the financial capacity to fulfil their obligations under the Rotterdam Convention effectively. In addition, MEA compliance in the developing world has also been reported to be hampered by a lack of administrative capabilities (Kannan, 2012; Zaelke et al., 2005), appropriate policies and plans (Kannan, 2012; Zoeteman & Harkink, 2005), necessary equipment and skilled human resources (Raustiala, 1997), and scientific resources (Chayes & Antonia, 1995; Economic Commission for Africa, 2007; Kannan, 2012). These limitations can result in slower implementation of MEAs. For example, developing countries (including China and India) were given an additional decade to achieve the same target of the Montreal Protocol as other developed countries (Susskind, 2008), which has implications for both the developed and the developing world.

The most recent MEA – the first in a decade – was the Minamata Convention, which sought to address mercury pollution. Mercury is one of the world's most toxic elements and has diverse impacts on human health and the environment (ATSDR, 2001). Scientists have understood the impact of mercury since the 1950s, beginning with the Minamata incident in which tens of thousands of people were impacted (Yorifuji et al., 2012). The Agency for Toxic Substances

and Disease Registry has identified mercury as the world's third most hazardous substance after arsenic and lead (ATSDR, 2001), and it cannot be broken down or condensed into new substances that are not harmful to people and the environment (UNEP, 2011). The Minamata Convention is the culmination of decade-long discussions and efforts of the global community. After realising the impact of the mercury on the environment and human health in the 1950s, different national and regional attempts were made to reduce and eliminate mercury pollution starting in the 1970s, including the Mediterranean Action Plan (1975), the European Economic Council's directives and legislation, and Sweden's national goal of becoming mercury-free. Among others, protocols including the Oslo Convention (1972), the Paris Convention (1974), the OSPAR Convention (1992), the updated Barcelona Convention (1995), and the Hazardous Wastes Protocol (1996) have attempted to eliminate mercury along with other pollutants. Despite these efforts, mercury emissions are observed to be increasing and reaching dangerous levels. For example, despite stringent mercury-reduction provisions, 15 EU countries consumed approximately 300 tonnes of mercury in 2003 (Selin & Selin, 2006, p. 263). Observing the limitations of the national and regional efforts and considering the appeal of different organisations, UNEP conducted a global scientific assessment of mercury in 2001, which provided sufficient evidence to initiate a global legally binding instrument for mercury. Though several countries (including the USA, Japan, Canada, Mexico, Colombia and the Czech Republic, and Australia) initially argued for a voluntary approach, or regulating mercury under the Stockholm Convention on POPs in February 2009, the UNEP governing council agreed to initiate a global agreement, namely the Minamata Convention on Mercury.

The Minamata Convention applies to both developed and developing countries, as controlling global mercury emissions depends on the activities of both categories (Biancardi & Villani, 2014). Mercury is a trans-boundary substance with long-distance impacts (Rahman, 2011; Siddiquei et al., 1992), and developing countries are increasingly emitting mercury because of increased production and economic development activities. Referring to UNEP, AllAfrica (2013) reported that the increase in mercury emissions in the developing nations is creating serious health risks to humans and wildlife. Among others, artisanal small-scale gold mining (ASGM) is one of the significant sources of mercury in those countries, and the emissions of mercury from ASGM has doubled since 2005 (AllAfrica, 2013). The report suggested that the governments monitor emissions and collect data for improved understanding of mercury exposure, and develop legal frameworks ensuring necessary supports for encouraging safe commercial alternatives (AllAfrica, 2013).

Each party must report to the Convention's Secretariat on the actions it has adopted [Article 21]. Parties are expected to provide information where relevant on (a) mercury supply [Article 3]; (b) mercury import and export [Article 3]; (c) production, supply in commerce, and trade of mercury-added goods [Annex A]; (d) steps taken to phase out mercury-added products and the amount already reduced; (e) evidence of development with regard to reducing and eradicating atmospheric emissions and releases [Articles 8 and 9]; (f) financial and technical supports [Articles 13 and 14]; (g) evaluations of the improvements of implementation plans [Article 15]; (h) progress report on implementation plans; and (i) other data or reports as required by the Convention (UNEP, 2013b).

This study focuses on reporting provisions for two reasons: firstly, reporting is central to identifying the success or otherwise of adopting the other elements of the Convention; and secondly, prior research suggests that implementation (or otherwise) of reporting may itself be an indicator of broader success (or failure). Chambers (2008, p. 147) observes that “Noncompliance in MEAs occurs most frequently for parties not meeting their reporting obligations.”

To date, there has been little focus on developing countries' compliance with the Minamata Convention, especially regarding reporting provisions. Not surprisingly, mercury-related research has mainly consisted of scientific studies of the impacts of mercury and emission sources. For example, Nelson et al. (2009), Nelson et al. (2012), and Zheng et al. (2011) studied mercury sources, forms, estimation, inventory, behaviour, speciation, and fate; Telmer and Veiga (2009) and Valdivia and Ugaya (2011) studied mercury from an artisanal small-scale gold mining perspective; Zhang and Wong (2007), Hylander and Goodsite (2006), and Bastos et al. (2006) studied impacts of mercury on overall environments; Groth (2012) and Valera et al. (2011) emphasised the impacts of mercury on the health of humans; and Richardson et al. (2011) focused on the uses and impact of mercury in dental amalgam. A more limited strand has chronicled the development of the Minamata Convention, which includes the role of developing countries but does not focus on it. In relation to national reporting, the study by Strzelecka-Jastrzab (2018) is the only one that examines the reporting readiness of Poland (and finds it lacking), while Ullah et al. (2016) examine the reporting readiness of Australia (and find it broadly sufficient but with substantial room for improvement). There are indications that compliance may be problematic, however, as previous research suggests that many developing countries have negligible information on emissions despite significant mercury exposures (Trasande et al., 2016).

The setting for the study is Bangladesh, an emerging developing country with severe environmental risks (Futurism, 2018; ITT, 2017) and a signatory of the Minamata Convention on 10 October 2013 (UNEP, 2018). Bangladesh therefore provides an illustration of a developing country with the capacity to meet the recent Minamata Convention.

Bringing together the key elements of a developing country setting and reporting in such a setting, this study explores the following question: *To what extent will Bangladesh be accountable for compliance with the reporting requirements of the Minamata Convention?*

The remainder of the paper is structured as follows: Mercury in the context of developing countries is discussed in Section 2; Section 3 reviews relevant literature; Section 4 presents a discussion on theory; Section 5 elaborates on the methods used; Section 6 discusses the findings of the study; Section 7 explores the theory in the context of Bangladesh; and finally, Section 8 presents a conclusion and summary.

2. Multilateral Environmental Agreements and the Minamata Convention

In order to combat environmental degradation and threats to human health, the international community has increasingly implemented MEAs, leading to the more than 500 international environmental agreements including 323 regional agreements that currently exist (UNEP, 2007). The effectiveness of these agreements is questionable (Ambalam, 2014), especially given that that number of MEAs are increasing at the same time that deterioration of the environment is also accelerating (Crossen, 2003). Effective implementation and compliance with the MEAs are critical to halting environmental degradation, and as most of the compliance with the MEAs occurs at country level (Ivanova, 2002), MEA success depends on national compliance (Ambalam, 2014). Complying with MEAs is onerous, however, not only from a policy perspective but also from an administrative one.

Developing countries are now more active in the negotiation of MEAs, but several are unhappy with effective implementation of the agreements, particularly regarding the commitment of the developed world (Najam, 2005). Najam (2005) examined the behaviour of the developing countries with environmental agreements for three decades from 1972 to 2004 and observed that developing countries moved from being mostly absent (up to 1972), too-hesitant participants (1972–1992), and then fully engaged (1992–2004). Najam (2005) suggested that MEAs often reflected a struggle between the developing and developed countries on different issues of MEAs, with developing countries gradually becoming more active and organised in achieving their targets. However, developing countries remain unhappy that their priorities are

not addressed, and commitments to assistance by developed countries are not implemented fully (Najam, 2005; Najam et al., 2002; Wilson & Munnik, 2003) even though developing countries are prone to most of the environmental hazards (Remoundou & Koundouri, 2009). A critical issue is that developing countries have financial resource constraints that leave them “unable to cope with the extensive reporting and participation requirements of the current multilateral environmental structure” (Chambers, 2008, p. 290). An approach adopted by many MEAs is “common but differentiated responsibilities” on the developed and developing countries such as Principle 7 of the Rio Declaration (Eriksen & Perrez, 2014, pp. 201-203).

As with other environmental issues, the developing world both contributes to and is affected by mercury pollution. Mercury emissions are gradually increasing in the developing countries, driven partly by lack of alternative opportunities to mercury-intensive activities such as ASGM, emissions from which doubled in since 2005 (AllAfrica, 2013). Moreover, compared to the developed world, developing countries are generally less aware of and less careful about environmental protection (Biancardi & Villani, 2014). The study of AMAP/UNEP (2013a) showed that around 40% of the global anthropogenic emissions are from East and Southeast Asia, and 75% of the emissions of this region come from China, which actually comprises around one-third of the global emissions. Mercury emissions have impacted the developing world by adversely affecting both human and non-human health (AllAfrica, 2013).

In allocating responsibilities between the developing and the developed world, the Minamata Convention emphasises “common” as opposed to “differentiated” responsibilities. The Convention does not make any distinction between developed and developing countries except for giving the option for developing countries to request extensions or exemptions. The parties have the responsibility of reporting to the Minamata Secretariat on the steps that have been taken to implement the Convention, and also on the effectiveness of those steps (UNEP, 2013b). The reporting provisions are thus supposed to facilitate the implementation of the Convention.

Funding for developed countries was negotiated along with the compliance issues (Selin, 2014, p. 14). While the developing countries argued for treaty-specific funding from donors (similar to the Montreal Protocol), developed countries supported a funding approach similar to the Stockholm Convention, involving applying for funding to the Global Environmental Facility, a UN body that funds environmental projects across a wide range of environmental issues.

As with many MEAs, the compliance framework of the Minamata Convention is not disciplinary but facilitative. Although the developing countries expected assurance of funding as a condition of accepting the compliance mechanisms, however, they finally agreed to form a Compliance Committee *via* Article 12 (Selin, 2014, p. 16). The Committee would be “facilitative” and must attempt for consensus and could only pass a recommendation as a “last resort”, and even then only with a three-quarters majority vote. Moreover, the Compliance Committee “shall pay particular attention to the respective national capabilities and circumstances” of the parties to the Convention (Article 12). Despite these restrictions, given the abject failure to establish compliance mechanisms for the Rotterdam and Stockholm Conventions, Eriksen and Perrez (2014, p. 208) suggest that the agreement in the Minamata Convention is “ground-breaking”.

Bangladesh is a signatory to the Minamata Convention, and mercury is a critical issue for the country. The significant consumers of mercury are the chloralkali industry, coal-based power plants, producers of medical equipment (thermometers and sphygmomanometers), other measurement instruments, electrical appliances and switches, batteries, dental amalgam, and various other compounds and consumer products (such as cosmetics/beauty products) (Shahariar et al., 2012). The use of mercury and mercury-containing products is increasing rapidly in industrial processes; for example, the emission of mercury from the cement industry increased by 150% from 2007 to 2011 (Shahariar et al., 2012).

There is no specific legislation concerning mercury in Bangladesh, but the Shipbreaking and Hazardous Waste Management Rules introduced in 2010 identified mercury acetate, mercury fulminate, mercury methyl chloride, and phenyl mercury acetate as hazardous chemicals, and mercury-bearing sludge and brine sludge containing mercury as hazardous wastes (Bangladesh Government, 2010). These wastes are prohibited from import and export and must be reported (Bangladesh Government, 2010).

3. Literature Review

Despite their acknowledged importance, neither developing countries nor MEAs have received significant attention from SEA researchers. Furthermore, most of the SEA studies have been conducted from a developed countries perspective (Belal & Cooper, 2011; Belal & Roberts, 2010), although the experience of developing countries differs significantly from their developed neighbours. In terms of public awareness, legal structures, and their implementation, developing countries face multiple challenges including inadequacy of national regulations

(Barrios, 2004; Kuasirikun, 2005; Lodhia, 2003) and constraints to the implementation of the laws (Hossain & Alam, 2016; Nurunnabi, 2016). Research into SEAs might play a role in meeting such challenges (Belal & Roberts, 2010; Sobhani et al., 2012), but there is a dearth of SEA research that considers developing countries (Belal & Roberts, 2010; Sobhani et al., 2012).

MEAs have also received surprisingly little attention in the SEA literature, save for studies examining the impact of MEAs such as the Kyoto Protocol on corporate disclosures (for example see, Freedman & Jaggi, 2005, 2011; Jaggi et al., 2018). However, MEAs bring developing and developed countries together as the complex nature of environmental challenges means that countries are interdependent (Biermann & Klaus, 2004), and MEAs are a formal expression of international cooperation (United Nations Development Programme, 2003).

Outside of SEA, research has considered both the overall success of particular MEAs and their implementation in specific countries. Examples of the former are the work of Khan (2016), Barrios (2004), Zhao and Ortolano (2003), and Yoder (2003), who examined the Basel Convention, the Rotterdam Convention, the Montreal Protocol, and the Stockholm Convention respectively. Common themes of this work are the miserable environmental conditions, the impacts of global pollution on the developing countries, and the limited capability of complying with the MEAs. Yoder (2003) suggests practical provisions and broader participation as the dominant success factors. Zhao and Ortolano (2003) identified the significance of government, monetary motivation, local government participation, and administrative capability.

Research has also considered the ability of signatories to comply with MEA provisions. For example, Ghosh et al. (2016) evaluated the waste electrical and electronic equipment management system and Basel Convention compliance in Brazil, Russia, India, China, and South Africa (BRICS) nations. They found that these countries are facing similar hurdles and can learn lessons from the WEEE management systems of the USA and the EU. Daudu (2008) examined the capabilities of the African countries of complying with and implementing the Rotterdam Convention and observed that Nigeria and other African countries lack the capacity to fulfil their obligations effectively.

Few studies have focused on MEA reporting. One exception is that of Kurz and Apps (2006), who examined Canada's development of the National Forest Carbon Monitoring, Accounting

and Reporting System (NFCMARS) in support of its obligations to fulfil the reporting requirement under the Kyoto protocol and found that the NFCMARS would support the meeting of international obligations in coming years.

A pervasive theme of MEA research is that the administrative and financial incapacity of developing governments hinders the translation of agreements into reality (Barrios, 2004; Yale News, 2018; Zaelke et al., 2005). Among others, lack of capabilities and resources are significant factors that obstruct the parties in complying with the MEAs. Though there are some allegations of lack of willingness and commitment, commentators such as the German Advisory Council on Global Change (2001) consider that the key barriers are instead incapacity and a lack of resources. Importantly, lack of policies (Zoeteman & Harkink, 2005), planning and administrative arrangement (Kannan, 2012), tools and human resources (Raustiala, 1997; Selin et al., 2018), and capacities and financial, technical and scientific resources (Economic Commission for Africa, 2007; Kannan, 2012; Selin et al., 2018) prevent developing countries from incorporating the environmental issues in their national agendas and complying with the MEAs. Moreover, local politics and government interests (O'Brien & Gowan, 2012) and lack of motivation, short-term benefits, and lower penalties (Susskind, 2008) influence compliance with the agreements.

The specific issue of mercury and the Minamata Convention has not been addressed in the SEA literature. Outside of this literature, a few studies have been conducted on mercury from a developing countries perspective and have reported on the historical view of mercury emissions, impacts, and mercury phase-out challenges, but none of them explored the reporting quality and capability and commitment of the reporting countries in meeting the reporting provisions of the Minamata Convention. Gibb et al. (2016) and Chakraborty (2017) studied mercury concentration and its implication in India. Eqani et al. (2016) investigated mercury contamination in Pakistan, and Indonesia's mercury phase-out challenges and implications have been exposed by Spiegel et al. (2018). Wu et al. (2006) examined anthropogenic mercury emissions in China from 1995 to 2003, while Huang et al. (2017, p. 230) examined the same from 1980 to 2012 and found that mercury emissions increased by more than 480% (from 448 to 2151 tons) during this period, with coal combustion being the most significant contributing factor to these emissions. Zhang et al. (2017) evaluated the economic benefits of mercury control in China and other east Asian neighbouring countries and found that, among the four possible policy options, the most stringent mercury reduction in a coal-fired power plant in China will benefit the country by \$432 billion (96%), and neighbouring countries by 4%.

Trasande et al. (2016) examined the economic implications of mercury exposure in losing economic productivity in developing countries. They concluded that significant mercury exposures occur in developing countries, and that a substantial economic burden could be avoided by timely implementation of measures to prevent mercury exposures. More specifically, Garcia et al. (2007) examined the efficiency of the Program for Pollution Control Evaluation and Rating (PROPER), a public reporting database in the developing world. This study econometrically analysed the impact of emission rates on environmental decisions from the perspective of a developing country and found a positive response to PROPER through emission reductions, particularly from the firms with weak environmental compliance histories.

Prior research has also investigated the potential impact of the Minamata Convention on different regions and different industries but did not specify whether the developing countries have the capability of and commitment to complying with the reporting provisions of the Convention. These include a review of ecological economics and small-scale gold mining in Indonesia (Spiegel et al., 2018); illegal gold mining in Peru (Buccella, 2014); the likely impact on gold mining in Sub-Saharan Africa (Hilson et al., 2018; Spiegel et al., 2014); the likely impact on the US (Rotondi & Smaczniak, 2014); the impact on the EU (Jarvis, 2015); the impact on coal-fired power generation in Asia (Giang et al., 2015); the impact on coal-fired power stations in China (Ancora et al., 2016); and the impact on dental amalgam production (Meyer et al., 2016).

The reporting provisions of the Minamata Convention were considered explicitly by Evers et al. (2016) and Strzelecka-Jastrz b (2018), but they did not concentrate on the capability and commitment of the developing countries in meeting those provisions. Evers et al. (2016) proposed a reporting guide for evaluation of the effectiveness of the Convention, which is to be undertaken after 5 years of implementation. Strzelecka-Jastrz b (2018) investigated the reporting data sources of Poland and suggested that Poland would need to capture further information in order to meet its reporting obligations under the Convention.

As with other developing countries, mercury pollution and reporting in Bangladesh have received little attention. An early study was undertaken by Siddiquee et al. (2009), who investigated the critical Bangladeshi industry of shipbreaking. This study found that heavy metal pollution (including mercury) in sediments in the shipbreaking area of Bangladesh is alarming. Hossain (2012) also identified mercury-emitting products and other sources of

mercury emissions in Bangladesh. The main work in this area, however, is that of Shahariar et al. (2012). This study investigated mercury emissions in Bangladesh and found that Bangladesh is one of the countries most vulnerable to mercury hazards because rapid infrastructural development activities increased cement production from where mercury emissions have been increasing for last 5 years. Moreover, they also observed that 79% of the people of Bangladesh are not aware of mercury hazards. Shahariar et al. (2012) opined that the use of mercury and mercury-containing products is increasing rapidly in the industrial process and a wide variety of applications in Bangladesh. These studies identify the severity of the mercury emissions in Bangladesh and the lack of public awareness. None of these studies focuses on the era governed by the Minamata Convention, however, and hence the question of the extent to which Bangladesh has the capability and commitment to comply with the reporting provisions of the Convention remains unanswered.

Collectively, the literature highlights the importance of MEAs to both the developed and developing world, but also identifies key challenges that are especially acute for developing countries. While previous studies have examined compliance with MEAs in a developing country context, few have focused on reporting, and even fewer on compliance with the Minamata Convention, the most recent international MEA. Given that prior research demonstrates mercury pollution but a lack of widespread awareness of it in Bangladesh, examining the capability of Bangladesh to fulfil its reporting obligations under the Convention will be useful not just for improving outcomes in this country but also to further the understanding of the crucial issue of developing countries' compliance with MEAs. To address this issue, the following research question is posed: *To what extent will Bangladesh be accountable for compliance with the reporting requirements of the Minamata Convention?* This research question is explored, drawing on the theoretical perspective of accountability, as discussed in the following section.

4. Theoretical Framework: Accountability

Accountability is a multi-faceted term (Sinclair, 1995). Steccolini (2004, p. 332-333) identified a list of facets of accountability considered in previous literature including legal accountability, process accountability, performance accountability, programme accountability, policy accountability, financial accountability, managerial accountability, professional accountability, public accountability, political accountability, etc.

Social and environmental accountability has traditionally been described as the responsibility to justify past actions, to recognise social and environmental rights of current and future stakeholders, and to provide required information for facilitating actions and decision-making about the reporting entity (Bivins, 2006). For example, Gray et al. (1996) defined accountability as “the duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible”, whereby the actions included those with a social and environmental impact. This notion of accountability has been applied to organisations, whereby an entity is obliged to demonstrate the rationality of its activities to others by providing its accounts (Arrington & Francis, 1993).

Two elements of accountability discussed in the SEA literature that are particularly relevant for this paper are transparency and sanctions. Considerable SEA research has been concerned with investigating the amount and quality of corporate disclosures – and calling for improvements in this quality – which suggests a belief in a positive relationship between transparency and accountability (Rawlins, 2008). This positive relationship also underpins claims by organisations such as the Global Reporting Initiatives and CDP that improved reporting will ultimately translate into improved performance. SEA researchers have also identified limits to this relationship. For example, Owen (2007) suggests that accountability to stakeholders requires not only the provision of information to stakeholders but also the ability of stakeholders to influence organisational actions. More controversially, Roberts (2009) contends that transparency is both inevitably incomplete (as it is impossible to give a “full” account of any single individual, let alone an organisation) as well as counterproductive in certain “exceptional and important matters” (such as preserving the financial system). Empirical studies have also questioned the relationship between heightened transparency and improved action (*e.g.* Radcliffe et al., 2017). Nevertheless, transparency remains a crucial, though not necessarily sufficient, element of accountability and reporting, and hence remains a concern for social and environmental accounting researchers.

The second element of accountability is the imposition of penalties or sanctions. Sanctions are also considered to be a prerequisite for accountability, as penalties for non-reporting or poor reporting may motivate the reporting entity to report quality information and encourage them to be more accountable to the stakeholders. Bovens (2007) and Mulgan (2000) recognise the provision of sanctions as an integral element of accountability. Fox (2007) argues that transparency might not achieve “hard” (*i.e.* effective) accountability if the regulators do not impose sanctions. However, although sanctions generally involve disciplinary actions for non-

compliance of the provisions, some studies recognise that sanction may be a motivation or punishment: that is, positive or negative (Bovens, 2007; Mulgan, 2000). Sanctions thus work as a reminder to comply with the required regulatory processes (Feltus, 2014).

For the current paper, a fundamental question is how these elements of transparency and sanctions might apply in the arena of MEAs, particularly regarding the accountability of a developing country signatory to an MEA. As noted above, a central finding of prior research is that developing countries have financial resource constraints that may limit their ability to comply with the provisions of MEAs, including provisions relating to reporting (Chayes & Antonia, 1995; Daudu, 2008; Economic Commission for Africa, 2007; Kannan, 2012; Raustiala, 1997; Zaelke et al., 2005; Zoeteman & Harkink, 2005). For this reason, compliance and assistance are fundamentally intertwined.

The interrelationship between compliance and assistance makes the question of transparency (and by implication accountability) much more complicated in the context of developing countries' MEA reporting. In a nutshell, a lack of reporting could indicate a lack of national will, a lack of international assistance, or some combination of the two. To complicate matters further, a hallmark of MEAs is that there is little if any capacity for sanctions because there is no coercive force sitting above the nation-state. Finally, given the transboundary nature of MEAs and the fact that they are designed to address severe global environmental problems, the ultimate accountability of MEA signatories is to the world's citizens collectively.

These differences suggest that accountability theory needs to be framed differently in the context of developing countries' MEA agreements. Recent thought on this topic is provided by Gupta and Asselt (in press), who examine the issues of accountability and transparency regarding multilateral agreements on climate change (*i.e.* the Kyoto Protocol, the Cancun Agreement and the Paris Agreement). Gupta and Asselt note the particular problems that lack of effective sanctions poses to notions of accountability, and also the issue of the developed–developing world schism. As they explain, (Gupta & Asselt, in press, p. 8, emphasis added)

The UNFCCC context is one of state-to-state accountability, so the key question here is who, that is, which states should be accountable. This question lies at the heart of the notion of differentiation in the UNFCCC context. Differential treatment of developed and developing countries has consistently been the make-or-break issue in multilateral climate politics ... Differentiation is a lightning rod for conflict because it underpins fundamental disagreements about historical and continuing responsibility and burden

sharing for climate actions. *These conflicts over differentiating between developed and developing countries over who has to do what necessarily spill over into who has to be transparent about what.*

The critical point is that accountability and transparency in an MEA context flow in (at least) two directions: firstly, from signatories of MEAs to the relevant secretariat (acting as a proxy for the global citizenry) about the extent of compliance with the MEA; and secondly from the developed to the developing world regarding the extent of assistance provided in order to facilitate compliance.

An important question is the degree of emphasis on the two directions of accountability – or, as Gupta and Asselt (in press) state, the relative weight placed on responsibility *versus* capacity. They voice concern that the push for broader inclusion of the developing world in MEAs, while ostensibly beneficial, has also created a potent force for greater emphasis on improving developing countries' reporting capability. This emphasis is potentially at the expense of what they see as more urgent priorities, such as reporting on the collective success of the MEA as well as the fairness of individual country efforts, both of which they see as absent from climate-change MEAs. This conclusion is debatable (as it is by no means clear why it is infeasible to promote developing countries' capacity as well as improving developed country and aggregate reporting), but it is nevertheless an interesting example of how improved transparency may not materially impact accountability.

For the present study, the central insight from Gupta and Asselt is that for a developing country, both directions of accountability should be transparent; that is, the reporting of the developing country on the MEA and also the support they are receiving to implement and report on the MEA. A further insight is that the detailed reporting rules themselves are essential because the reporting rules have “a potentially transformative role for transparency, not only in revealing but also shaping actions”. In other words, the policies and practices of MEA signatories may be strongly influenced by the nature and type of MEA reporting required, which underscores the importance of an examination of the reporting provisions and processes. The method adopted to explore reporting in Bangladesh is outlined in the following section.

5. Methods

This paper draws upon both documentary data from the extensive documentation surrounding the development of the Minamata Convention and primary data from email interviews. The primary source of documentary data is the extensive record of meetings posted on the

Minamata Convention website. This site contains the agenda items and supporting documentation of the discussions in Intergovernmental Negotiating Committee Meetings 1 to 7, which cover the period from 2010 to 2016 (INC 1 to INC 7), two further preparatory meetings in 2013, and Conference of the Parties 1 (COP1) in 2017. Each of these meetings lasted several days, and extensive supporting documentation was provided in advance of the meeting, including proposed Convention articles, accompanying research (sourced from delegates and others) and commentary by the Secretariat. In addition, the International Institute for Sustainable Development (IISD)⁵ published a summary of the meeting discussions in the “Earth Negotiations Bulletin”, comprising 174 pages of text. Further relevant documentary data includes a report on availability of sustainability data in Bangladesh (GED, 2017) and an initial assessment of mercury exposure in Bangladesh (IPEN, 2015) as well as the Minamata Convention itself (UNEP, 2013b).

In addition to documentary data, interview data were collected by email. The email interview approach was used because (a) it permits collection of rich data as the respondents can be more honest and frank in responding to email than in face-to-face interview (McCoyd & Kerson, 2006; Motluk, 1997; Turkle, 1995); (b) it eliminates the “time and space constraints” and interviewer-to-interviewee biases and increases the chance of disclosing sensitive information (Motluk, 1997; Murray & Sixsmith, 1998); (c) it gives respondents more opportunity to consider the provision of an organised and more productive response (Burton, 1994; Hiltz & Turoff, 1978; Morgan & Symon, 2004); (d) as the respondents themselves type the response (Herring, 1996; McCoyd & Kerson, 2006), it eliminates time and cost of transcribing interview responses (Foster, 1994); (e) it is cost-effective, and it permits more comfortable access to the respondents (Alves & Szucs, 2001; Fyfe et al., 2001; Sills & Song, 2002); (f) it offers more control over the response since the respondent him/herself answered the questions using his email (Witmer et al., 1999); and (g) it allows widespread and lengthy dialogue at the respondents’ convenience (McCoyd & Kerson, 2006).

In conducting email interviews, the study observed the suggestions of Saunders et al. (2009) and the practical observations and suggestions of Hewson et al. (2003), Murray and Sixsmith (1998), and McCoyd and Kerson (2006). The email interview process was strictly followed as laid down in different research methodology books and research papers. Firstly, researchers prepared a list of relevant participants (Hewson et al., 2003), identifying them by using the

⁵ All INC meeting (1-7) detailed reports are available on the website of International Institute of Sustainable Development: <http://www.iisd.ca/mercury/inc>

UNEP programme participants' list from different UNEP documents, search engines, published research articles, and references from various experts.

Participants were selected according to the importance of their research experience on mercury based on their current profession, involvement with regulators, NGOs, or academic research activities (mostly identified from ESDO (2014)), and a set of interview questions was prepared based on the relevant literature review. An email was sent as a "pre-survey contact" advising them to expect a questionnaire (Saunders et al., 2009). The interview questions were sent along with a cover letter and a participants' consent form requesting their consent for participating in the interview. All of the suggestions of Hewson et al. (2003) and Saunders et al. (2009) were observed regarding sending email, cross-posting, timing of email, and first, second and third follow-up emails.

Table 1. The category of interviewees, the target sample and the sample interviewed

		Interviewed
1	Academic researcher	3
2	Professional researcher	2
3	Media/NGO/Doctor	1
4	Government regulator	1
5	Minamata Secretariat	1
	Total	8

The lead author developed a set of questions based on the literature review, which is reproduced in Appendix 1. A target group of 40 interviewees were selected to include academic researchers (10), professional researchers (10), Media/NGO/doctor (10), Government regulators from Bangladesh (5), and the Minamata Secretariat (5). After the third follow-up email, the interview sample finally numbered 8. Though this is a low number of interviewees, the response rate (20%) is above the 11% typically reported for interviews outside the organisation using the Internet (Saunders et al., 2009, p. 364).

Table 2. Details of the sample interviewed including category, age range, and education

	Interviewee Category	Age Range	Education
1	Academic Researcher	60-70	PhD
2	Professional Researcher	30-40	MS
3	Government/Regulator	50-60	PhD
4	Media/NGO/Doctor	40-50	MS
5	Academic Researcher	30-40	PhD student
6	Professional Researcher	30-40	PhD student
7	Academic Researcher	30-40	PhD
8	Minamata Secretariat	40-50	MS

Ethical issues are essential to protect the rights and confidentiality of the respondents. The study observed the ethical issues as delineated in papers by McCoyd and Kerson (2006) and Murray and Sixsmith (1998), the National Statement on Ethical Conduct in Human Research (2007), and the Macquarie University Human Research Ethics Committee. A participants' information and consent form were attached with the email. The consent form informed the participants regarding the following issues: (a) voluntary participation without monetary benefits; (b) maintenance and protection of the soft and hard copy of the collected data; (c) maintaining confidentiality of the identity of the participants; (d) dissemination of the confidential and sensitive information; and (e) withdrawal from participation at any time without any declared reason.

After collection of the interview responses, information was analysed based on the methods outlined by Ryan and Bernard (2000), Silverman (2000), O'Dwyer (2004) and O'Dwyer et al. (2011). The initial codes were ascertained from the discussions of the background and theoretical frames. Initial codes were used in the first coding pass, and new codes were included when new dimensions were identified. A draft was prepared as a tool for arranging interview themes. The following section presents the findings of the study.

6. Findings and Analysis

This section utilises the perspective of accountability developed in Section 4 to explore the findings of the study. Developing country signatories to MEAs accept that there are (at least) two dimensions to accountability: first, the performance by the developing country and the reporting on that performance, and second, the degree of assistance that they receive in order to improve (and report on) their performance. This section explores these elements of accountability about both the negotiation process and the final provisions of the Convention, as well as in the specific context of Bangladesh.

6.1 Developing country accountabilities under the Minamata Convention

Throughout the creation of the Minamata convention the discussions in the Intergovernmental Negotiating Committee (INC) highlighted the contested accountabilities between the developed and the developing world. This contestation was particularly evident in discussions regarding funding. At the very first meeting, IISD (2010), a paper was presented by the Secretariat that outlined options for financial assistance. Two alternatives were highlighted: funding tied explicitly to the Convention, termed the "Multilateral Fund" approach, and which

followed the example of the Montreal Protocol; and funding allocated from the broader pool of funding administered by the UN Global Environmental Fund, termed the “GEF” approach. (As discussed further below, the Convention ultimately adopted the GEF approach with some minor direct funding also available.) A second comparison was tabled at IISD (2011), which also outlined the objectives of a “financial mechanism”. This document highlights the dual nature of accountability in paragraph 19 where it states that the financial mechanism should “channel available funding to activities and projects that facilitate compliance with the obligations outlined in the mercury instrument”, indicating that the receipt of funds should facilitate the accountability of the recipient of the instrument. Paragraph 21 also highlights the accountability of the fund itself, stating that “a financial mechanism should be accountable to the governing body of the mercury instrument”.

A contentious aspect of the negotiation was the extent to which accountability by developing countries for meeting the requirements of the Convention should be considered as being contingent on receiving financial assistance. For example, in IISD (2011), concerning capacity building and financial assistance for reporting by developing countries, Nigeria asked for “capacity building” of the developing countries to get them ready for complying with the reporting provisions and therefore tying reporting obligations to the receipt of development assistance. This was refused by Japan and supported by Canada, and ultimately was not included in the Convention. Similarly, at IISD (2012), Argentina, Brazil, the African Group, Chile, and IPEN emphasised the need for financial assistance for creating National Implementation Plans. The Secretariat document tabled on financial assistance stated the following:

In developing provisions for the future legally binding instrument on mercury the Governing Council recognized in its decision 25/5, among other things, the need to specify arrangements for capacity-building and technical and financial assistance, recognizing that the ability of developing countries and countries with economies in transition to implement some legal obligations effectively under a legally binding instrument is dependent on the availability of capacity-building and technical and adequate financial assistance (paragraph 7).

The relationship between funding and the legitimacy of holding a country accountable for its performance was discussed at IISD (2013). As part the proceedings, a developing country proposed additional language, specifying that implementation difficulties of a developing

country party shall not be regarded as non-compliance if they are due to failure to promptly have full access to adequate financial resources. Another developing country added a reference to lack of access to adequate technology. Two developing countries also proposed the inclusion of an agreement that incapability of implementing the convention due to financial resources and lack of adequate technology should not be regarded as “non-compliance”, and numerous developing countries highlighted the relationship between resources and compliance (IISD, 2013). The developing countries supported this point with reference to Article 13 (4) of the Stockholm Convention, which states that effective implementation of the Convention by the developing countries would depend on the effective implementation of the commitments of the developed countries regarding financial, technological, and technical support. However, developed countries opposed this, stating that there should be no difference between developed and developing countries with regard to compliance with reporting provisions.

The weaknesses and capacity-building issues of the developing countries were discussed at IISD (2014) and the final IISD (2016). At INC 6, specific concerns were expressed that the lack of capacity of many countries would impinge on adequate reporting at this stage. For example, the issue of reporting guidelines proved to be a sticking point, as some developed countries pushed for increasing the detail required to include information such as the quantity of emissions and timeframes for action. This was resisted by delegates from developing countries who cited concerns about lack of capacity to provide such extensive data (IISD, 2014). At INC 7, India, supported by Pakistan, suggested a simple reporting format, or two different formats, for the developed and developing countries. However, this suggestion was rejected, and the draft reporting format was approved. Several representatives, including two from each group of countries, highlighted that developing country parties are in need of capacity-building and guidance for compliance with the reporting. Finally, one representative asserted that

the simultaneous reporting that would result from the alignment of the reporting cycle with those of other conventions might create an additional burden for developing-country parties and have a negative impact on reporting rates (IISD, 2016).

Ultimately, while there is no explicit statement that performance of developing countries is contingent on funding by developed countries, there are strong statements on the importance of assisting developing countries. According to the Convention, each party has undertaken to contribute necessary resources, according to their capabilities, for implementing the convention

[Article 13(1)] and parties are encouraged to manage funding from bilateral, regional, and multilateral sources [Article 13(3)]. The Convention [Article 13(2)] states that the parties will provide full support regarding funding for the “parties that are Small Island Developing States or least developed countries.” A mechanism designed for “adequate, predictable and timely” financial resources under the Convention was defined in Section 13(5): “The mechanism is to support developing country parties and parties with economies in transition in implementing their obligations under this Convention.” This mechanism includes (a) The Global Environment Facility (GEF) Trust Fund and (b) a Specific International Programme (SIP) to support capacity-building and technical assistance [Article 13(6)]. Both of these sources would be managed under the strategies, policies, programme priorities, eligibility and utilisation criteria set by the COP. In the event of provision of funds, the COP would consider the potential mercury reductions from the funded activities [Article 13(8)], and the COP would regularly evaluate the activities and capabilities of the entities dealing with this mechanism [Article 13(11)]. The Convention invites all parties, based on their capabilities, and other stakeholders to contribute to the mechanism voluntarily [Article 13(9)] and also encourages the parties to generate funds from other sources including the private sector [Article 13(12)].

In particular, the Convention articulates that the parties, based on their capabilities, shall extend appropriate and timely support for capability-building and technical assistance to the developing countries [Article 14(1)]. The COP shall regularly by its second consider the alternation technologies needed for the developing countries to implement the Convention [Article 14(4)(b)] and identify the challenges faced concerning technology transfer [Article 14(4)(b)]. In this regard, the Convention [Article 14(3)] states the details as follows:

Developed country Parties and other Parties within their capabilities shall promote and facilitate, supported by the private sector and other relevant stakeholders as appropriate, development, transfer and diffusion of, and access to, up-to-date environmentally sound alternative technologies to developing country Parties, in particular, the least developed countries and small island developing States, and Parties with economies in transition, to strengthen their capacity to effectively implement this Convention.

The Convention negotiations and final content illustrate the multiple accountabilities at play, particularly with regard to developing country signatories. On the one hand, the Convention requires these signatories to enact the provisions, including fulfilling their reporting obligations. On the other hand, the Convention puts an onus on the developing world to provide

appropriate levels of assistance. This is further complicated by the fact that the primary mechanism for the provision of this assistance, the GEF, sits outside the Convention. This results in further accountabilities between the GEF and the Convention (*i.e.* that the GEF funds activities that assist with implementation of the Convention), and accountabilities from GEF recipients to GEF administrators (*i.e.* that the funds provided actually deliver the promised outcomes). Finally, an important outcome of UNEP (2017a) was that the Memorandum of Understanding with the GEF was not finalised because of the divergent opinions of the parties and the GEF on the wording of the eligibility of securing GEF funds for the projects.

6.2 The accountability of Bangladesh under the Minamata Convention

The issues concerning accountability of developing countries are also evident in the specific case of Bangladesh. Regarding the ability of Bangladesh to meet its commitments under the Convention, there was significant concern expressed as to whether that capability currently exists. All of the interviewees admitted several weaknesses of Bangladesh in complying with mercury reporting provisions under the Minamata Convention, as discussed further below. As regards the assistance provided to Bangladesh, analysis of the Minamata discussions shows that the GEF is the primary instrument for assisting, and a grant has been given to Bangladesh regarding the initial assessment of mercury. Virtually no public information is available about the details of the grant, nor about progress in completing the initial mercury assessment.

As a starting point, an important concern is a general lack of awareness of the issue. Globally, awareness in the people and the countries has been gradually increasing after the initiation of the Minamata Convention. The Minamata Secretariat stated the following:

We believe that there is increasing awareness of the mercury issues globally as can be seen from the growing number of parties to the Minamata Convention, and growing capacity and commitments... (Interviewee VIII, Minamata Secretariat).

Interviewees provided a different opinion regarding mercury awareness among the researchers in Bangladesh. Some of them observed that only a few researchers work in this area, and most of them placed more emphasis on the sources of mercury than on the impact of mercury on human health and the environment. Conversely, others stated that mercury awareness among the researchers is excellent and that the level of awareness has been increasing gradually as a result of awareness-raising activities such as workshops and press briefings. One of the interviewees stated that

Some researchers are aware of the impacts of mercury; however, given the situation of mercury analysis, a very few are active. (Interviewee I, Academic Researcher)

Although two interviewees were of the opposite opinion, the remaining five interviewees reported that mercury regulators in Bangladesh are aware of the impacts of mercury and that they have been trying to develop a regulatory mechanism for regulating and controlling mercury emissions in Bangladesh:

Regulators are becoming aware on the impacts of mercury, but they need more attention to understand the issues of impacts. Generally in Bangladesh regulators are not experts, so it is important to enhance collaboration between experts and regulators (Interviewee III, Government/Regulator).

The general public is least aware of the impacts of mercury. Though many people are using mercury in the form of dental amalgam, most of them do not understand its impact on human health and the environment. Providing an example, Interviewee II stated that “*Mercury uses in dental amalgam are reducing due to awareness-raising activities.*” One of the interviewees depicted the mercury awareness of the general public as being low:

Only a small percentage of the general public is aware, and most of them are students in college, universities and medical college. People who are working in environmental and health sectors are also becoming aware due to awareness raising activities. The general public in rural areas are not aware of the impacts of mercury. Even they do not know what the mercury is (Interviewee II, Professional Researcher).

One particular initiative identified by the interviewees is the use of mercury in dental amalgam. Interviewee II stated that “*mercury uses in dental amalgam are reducing due to awareness-raising activities.*” After the initiation of the Minamata Convention, different organisations including the Environment and Social Development Organization (ESDO), and the Bangladesh Dental Society (BDS) in association with the Asian Center for Environmental Health and the World Alliance for Mercury-Free Dentistry implemented different initiatives for creating awareness of mercury-free dentistry in Bangladesh.

Table 3. Initiatives taken by different organisations for awareness development in Bangladesh

1	Phasing out of mercury in dental amalgam	The BDS declared “Phase out Mercury Dental Amalgam in the treatment of pregnant women, nursing mother and children in June 2018.”
2	Dentists recognised for mercury-free dentistry	Dr Humayun Kabir Bulbul (<i>Orient Dental</i>) Dr Md. Mosharrof Hossain Khandker (Dental Centre) (<i>In the whole of Asia, Bangladesh is the first country to take this kind of initiative.</i>)
3	Dental colleges recognised for mercury-free dentistry	Chattagram International Dental College and Hospital Mandy Dental College Pioneer Dental College Update Dental College
4	Dental curriculum	Exclude dental amalgam from the dental school curriculum and adopt mercury-free alternatives.
5	Mobile campaign	Different mobile campaigns have been organised to gain the attention of the government and the general public, aiming to create awareness and ultimately to ban mercury in dentistry.
6	Other campaigns: Social media and educational institutions	Arranging social media campaigns, mobile campaigns, and awareness-raising campaigns in educational institutions such as schools, colleges, and universities.
7	Workshops	Several workshops have been and are being conducted by ESDO, involving dental professionals, dentists, academicians, government representatives, and other relevant stakeholders.
8	Distributions	Posters, bookmarks, stickers, and booklets

Source: Developed by the author based on ESDO (2018)

One of the interviewees commented that the corporate sector is an essential element in the improvement in mercury performance:

Strong commitment from government and incentives to the corporations in implementing the provisions will help in controlling mercury emissions in Bangladesh especially in chemical and shipbreaking industries (Interviewee V, Academic Researcher).

Overall there is the view that progress has been slow:

Though Bangladesh signed on the “Minamata Convention on Mercury” the government has not taken yet any effective action in terms of proposing guidelines and national policy formulation to reduce mercury exposure (Interviewee IV, Media/NGO/Doctor).

In relation to the capability to report under the Convention, although Bangladesh has no specific provisions for accounting and reporting mercury, there are regulations regarding

environmental aspects, including The Bangladesh Conservation Strategy, 1995; the National Environment Management Action Plan (NEMAP), 1996; Bangladesh: the Poverty Reduction Strategy Paper (PRSP), 2005; the National Conservation Strategy, 2005; the Environment Court Act 2010; and the Environment Conservation (Amendment) Act, 2010. Under the Bangladesh Environmental Conservation Rules, 1997 (updated in 2010), the Ministry of Environment and Forest provided the national threshold limit for mercury in industry and drinking water, and the Bangladesh Standards and Testing Institution (Amendment) Act, 2003, has already decided the threshold value for mercury in cement, CFL light bulbs, and cosmetics production.

There are indications that these provisions may be insufficient, however. A data gap analysis for SDGs by GED (2017) found that data scarcity is acute in Bangladesh where data relating to 29% of the SDGs targets are readily available, while almost half (45%) are partially available, and 26% are not available. More specifically, no data is available in Bangladesh relating to target 3.9 (*By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination*) (GED, 2017, p. 16). Rahman et al. (2015, p. 53) examined the data quality in terms of “(i) relevance, (ii) accuracy and reliability, (iii) timeliness and punctuality, (iv) accessibility and clarity, and (v) coherence and comparability”, and observed that the quality of available data for measuring and monitoring sustainability, environment, and accountability relating to SDGs (4, 5, and 6) in Bangladesh is inferior (score 2 out of 5).

The interviewees held differing views of the capabilities of Bangladesh of complying with the reporting provisions of the Minamata Convention. Several of them think that Bangladesh has the required capability of reporting mercury levels, whereas others perceived the opposite. Interviewees identified specific capabilities that would help in complying with the mercury reporting provisions under the Minamata Convention. These specific capabilities included (a) skilled human resources of the Department of Environment and Ministry of Environment and Forest; (b) good reporting systems for different international conventions; (c) specialised NGOs and institutions ready for supporting government; (d) mercury experts working in the expert group created for the Asia-Pacific region; and (e) citizens willing to accept and grasp the key messages of the Convention.

However, all interviewees emphasised that the Bangladeshi capabilities could be improved. One of the interviewees reported that

Bangladesh is capable of complying the reporting under the Convention. In this case, capacity building training for the officials of concerned departments might be required (Interviewee II, Professional Researcher).

On the other hand, other interviewees suggested that Bangladesh may not yet be capable of complying and implementing the reporting provisions of the Minamata Convention. While interviewee II observed that Bangladesh has been complying with the reporting provisions of other MEAs, they considered that

The logistics and manpower are not good enough to comply with the reporting provisions (Interviewee II, Academic Researcher).

Interestingly, all of the interviewees emphasised that the reporting provisions should be different for developing and developed countries. One of the interviewees stressed that

in consideration of countries economic condition, technical skill and knowledge, developing and developed countries cannot be on the same streak. So [reporting] obligations should be different (Interviewee III, Government/Regulator).

Interviewees identified a range of assistance mechanisms that were required:

Funds for research projects, public awareness projects, training for govt. officials can boost the implementing process. Also, laboratory facilities are required for exposure study and mitigation measures. Expertise knowledge exchange program can enhance the ability to comply with implementing reporting provisions (Interviewee VII, Academic Researcher).

Though all of the interviewees emphasised financial assistance, one of the interviewees stated that administrative and regulatory binding supporting the capacity building would be more effective than financial assistance. Interviewee IV, in addition to financial assistance, expected that UNEP and the developed countries should provide the following support:

Providing general information, research toolkits, and training programs for capacity-building in inventory and the application of new technology. More assistance is needed in this field, including the transfer of appropriate technology (Interviewee IV, Media/NGO/Doctor).

The first major project is the creation of a comprehensive mercury account. Interviewees observed that a complete mercury account on the reserves, uses, sources, imports, and exports would facilitate the improvement of their commitments by realising the most accurate picture of mercury emissions and its impacts. Moreover, the mercury account would provide a clear projection of the mercury status in Bangladesh. One of the interviewees observed that

(...) mercury account will help to track the possible improvement to make national mercury profile available for the country. It will also help to build national capacity to undertake future actions regarding the implementation of Convention provisions assessed (Interviewee IV, Media/NGO/Doctor).

A national plan on mercury would be expected to improve the commitment of the developing countries in controlling this toxic metal. Interviewees emphasised that Bangladesh needs to prepare a national plan for mercury similar to the “National Arsenic Policy”. As there is no national plan at this stage, one of the interviewees also stressed that a national plan should be prepared for all pollutants, including mercury. Interviewee IV stated that a “National plan” could assist with the following:

(a) National Mercury Profile and Mercury Initial Assessment Report development; (b) National decision-making structure on mercury operational; (c) Implementation of policy and regulatory framework; (d) National capacity built to undertake mercury inventories (Interviewee IV, Media/NGO/Doctor).

In addition, some interviewees considered that additional research was required on specific elements of the Bangladeshi industry. For example, Interviewee V suggested that

[commitment] can be improved through large-scale evaluation of the effect of the vulnerable industries to the adjacent ecosystem and human health. Besides, physiochemical analysis at landscape level might help in improving the reporting of mercury (Interviewee V, Academic Researcher).

There was further debate regarding whether flexible provisions for sanctions would improve the compliance status of the parties. Though there is no provision for sanctions (penalties) for non-compliance with the reporting under the Minamata Convention, and some of the interviewees opposed incorporating the provisions for imposing sanctions, other interviewees argued that imposing sanctions could improve the level of compliance with the reporting provisions. Moreover, the interviewees rationalised that the number of penalties should be

determined by considering the economic conditions of the developing and developed countries. Interviewee II took an intermediate position:

Generally No; but if the government is awarded financial assistance and fail to comply with reporting provisions, following penalties can be considered: (a) All funds should be refunded, and (b) Impose ban for further funding until meeting the compliance (Interviewee II, Government/Regulator).

As noted from the above interviews, rather than sanctions, the key driver of performance is considered to be international assistance. To date, two grants have been provided to Bangladesh to facilitate its Minamata compliance. Interviewee IV stated that

Recently, to enhance/complete the convention ratification process, MoEF-UNDP submitted a project titled “Strengthen national decision-making towards ratification of the Minamata Convention and build capacity towards implementation of future provisions” (Interviewee IV, Media/NGO/Doctor).

There is also scant information available about this project, however. The Minamata website lists a single page detailing the project *Strengthen national decision-making towards ratification of the Minamata Convention and build capacity towards implementation of future provisions*. This page lists the recipients of a US\$ 1 million grant as Bangladesh, Guinea-Bissau, Mauritania, Mozambique and Samoa, and the project summary as “Undertake a mercury initial assessment to enable the governments of Bangladesh, Mauritania, Mozambique, and Samoa to determine the national requirements and needs for the ratification of the Minamata Convention and establish a national foundation to undertake future work towards the implementation of the Convention.” The timeframe is 25/2/15–“ongoing”. No further details about the project implementation or progress are provided.

The Minamata secretariat declined to comment on the accountabilities, capabilities, and commitments of Bangladesh. However, it identified “capacity building and awareness raising” as a challenge, and noted that assistance had been provided:

United Nations Development Programme is implementing a project in Bangladesh to develop a Minamata Convention Initial Assessment (MIA), which will review the sources of mercury emission in Bangladesh, review the existing legislation on mercury and determine national requirements and needs for the ratification and implementation of the Convention (Interviewee VIII, Minamata Secretariat).

There is also scant information available about this project. The Minamata website lists a single page detailing the project *Programme on Promoting Ratification and Early Implementation of the Minamata Convention on Mercury*. This page lists the recipients of a US\$ 875,000 grant as Armenia, Bangladesh, Costa Rica, Malawi, Tunisia, and Vietnam, and the area of work as “Legal review, Products. The project includes enabling activities, institutional strengthening, legal review, coordinating implementation [sic] of all four chemicals and waste convention, as well as activities about products and wastes”. The timeframe is 17/6/17–30/6/18. No further details about implementation of or progress on the project are provided.

The Bangladeshi context reinforces the aspects of accountability noted in reviewing the negotiation and outcome of the Convention. Interviewees recognise the importance of mercury to the citizenry of Bangladesh and feel that their government must act. They also consider that Bangladesh should meet its obligations under the Convention, including those regarding reporting. However, they consider that the international community must enable these actions by providing financial and other assistance. To date, some such support has been forthcoming, but there is a lack of transparency around this assistance such that it is impossible to determine the details, status, and outcomes of the funding provided to date.

7. Summary and Conclusion

This paper responds to the call for further literature on SEAs in the context of developing countries (Belal & Roberts, 2010; Sobhani et al., 2012), and the surprising lack of research about MEAs given their importance in terms of global environmental outcomes. Prior research on MEAs has identified the relationship between the developed and developing world as being a source of tension, with meaningful negotiations regarding the expectation of developed countries’ performance on the one hand and assistance to developed countries on the other. Theories of accountability suggest that transparency and sanctions are essential elements of accountability (Bovens, 2007; Fox, 2007; Mulgan, 2000), and it is therefore essential to consider how these elements might apply in the context of a developing country signatory to an MEA. Some guidance in this regard is provided by Gupta and Asselt (in press), who specifically consider accountability in MEAs, arguing that increased levels of reporting by developing country may not necessarily enhance accountability.

The focus of the study is the reporting under the Minamata Convention (the most recent MEA and a global effort to reduce mercury pollution) by Bangladesh, a developing country with significant mercury issues. Data has been drawn from the voluminous record of the extensive

negotiations posted on the Minamata website and a series of email interviews with mercury experts in Bangladesh.

The study finds that funding plays a key role in the multiple accountability relationships that exist. A review of the Minamata documentation shows that there were considerable discussions as to the extent to which funding should be tied to the performance given the lack of resources of developing countries, a concern of many prior studies (Barrios, 2004; Yale News, 2018; Zaelke et al., 2005). In the case of Minamata, these are the subject of separate provisions, but the agreement acknowledges in Article 14(3) that they are related. The situation is complicated by the fact that the primary funding mechanism – the GEF – sits outside the Convention, which means that there are additional accountability relationships between the Convention and the GEF, and the GEF and funding recipients. One of the critical outcomes of COP 1 was that the Memorandum of Understanding between the Convention Secretariat and the GEF has not yet been agreed.

The influence of funding on accountability relationships is also evident in the specific case of Bangladesh. Citizen awareness facilitates compliance with MEAs (Neumayer, 2002), but interviewees reported low levels of awareness, consistent with the previous assessment of Bangladesh conducted by Shahariar et al. (2012). Interviewees suggested that while Bangladesh has some capability of complying with the reporting provisions of the Minamata Convention, this is not sufficient. More resources are required to not only create greater public awareness but also to develop reporting skills, mercury measurements and inventory development, and to improve the technical and technological capabilities that enable compliance with the reporting provisions. The accountability of Bangladesh is thus mediated by the lack of available resources. There are efforts to address this resource deficiency *via* the provision of two global grants, both to groups of countries that include Bangladesh. However, there is scant public information on the details or progress of these grants, which suggests that there is much room for improvement regarding accountability for assistance provided and received under the Convention.

The concerns raised by Gupta and Asselt (in press) in relation to increases in transparency making little impact on enhanced accountability are also evident about Bangladesh. There is a focus on Bangladeshi reporting (as evidenced by the grants provided), yet there seems little evidence that the fairness of commitments made by different countries has been evaluated, or is intended to be evaluated, in any formal sense under the Convention. Suggestions as to

differentiated responsibilities or even reporting requirements between the developed and developing world were rejected, and it is up to each country to implement a National Implementation Plan. Regarding the concern that national reporting may overshadow the focus on overall progress, Article 22 of the Convention requires a review of progress after 6 years of implementation, although the form that this review is to take is not specified.

The findings have points of similarity and difference about corporate SEA studies. The findings about capability resonate with studies focusing on corporate reporting. Several studies in developed countries including Canada (Nazari et al., 2015), and the USA (Artiach et al., 2010), and developing countries including India (Kansal et al., 2014), Brazil (Lourenço & Branco, 2013), Turkey (Kuzey & Uyar, 2016), and China (Liu & Anbumozhi, 2009) gave evidence that capability is a determinant of sustainability reporting: that is, corporations with a higher level of resources are more likely than smaller corporations to publish a sustainability report. However, the importance of sanctions – prominent in most SEA conceptions of accountability – is mostly absent in the context of MEAs in general, and the Minamata Convention in particular.

This study is exploratory and as such there are some limitations as well as corresponding areas for future research. The paper was developed based on a single case of Bangladesh, with limited interviewees. Future research utilising a larger sample of developing countries and more interviewees may provide more evidence of the situation in that context. Future studies could explore the quality (and utility) of reporting by developing countries under the Convention. Further research could also focus on the accountability around assistance provided by the GEF from the perspectives of the Convention Secretariat, the GEF, and recipients of assistance. Finally, this paper only considered the Minamata Convention on Mercury. A comparative study could identify the lessons to be learned by developing countries from other MEAs.

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Appendix 1 Email interview question

Email Interview Questions

Mercury Reporting

Demographic Information:

Position :

(Qualifications, experience and role in relation to mercury)

Organisation :

Qualifications :

Age : ☐ 18 – 30 ☐ 30 – 40 ☐ 40 – 50 ☐ 50 – 60 ☐ 60 – 70 ☐ 70 & Above

General Questions:

1. How do you evaluate the awareness of the *Government* about the impacts of mercury?
2. How do you evaluate the awareness of the *Researchers* about the impacts of mercury?
3. How do you evaluate the awareness of the *Regulators* about the impacts of mercury?
4. How do you evaluate the awareness of the *General Public* about the impacts of mercury?
5. Are there any accounting and *reporting rules* and regulations regarding hazardous elements in Bangladesh? Is there anything *specifically* on *mercury reporting*?
6. How is mercury currently *reported* by Government/industries/NGOs in Bangladesh?
7. How would you evaluate the adequacy of the current mercury reporting in Bangladesh?
8. In your opinion, how might mercury reporting be improved in Bangladesh?
9. Is there any ‘National plan’ for Bangladesh in reducing mercury emissions? If not, should there be?
10. How may the ‘National plan’ assist in achieving the mercury reduction target in Bangladesh?

Reporting Questions—Minamata Convention

11. What is your general evaluation of the Minamata Convention?
12. How do you evaluate the overall capabilities of Bangladesh in complying with the *reporting provisions* under the Minamata Convention? (*Pls See Appendix*)
13. Are there any specific strengths of Bangladesh in complying reporting provisions under the Minamata Convention?
14. Are there any specific weaknesses of Bangladesh in complying reporting provisions under the Minamata Convention?
15. What assistance (financial and non-financial) does Bangladesh need from the UNEP Secretariat or other countries for implementing *reporting provisions* under the Convention?
16. Do you believe there should be sanctions (penalties) for non-compliance of *reporting provisions* under the Minamata Convention? If so, what should they be?
17. Should the *reporting obligations* of developing countries be different to developed countries? Why / why not?

- 18.To what extent do you think that *reporting provisions* of the Minamata Convention will help in controlling mercury emissions in Bangladesh?
- 19.To what extent do you think that the convention (including proposed *reporting provisions*) were motivated by the public interest? To what extent are national agendas influencing the convention?
- 20.How (if at all) will implementation of the Minamata Convention affect the *reporting* by Bangladeshi corporations?
- 21.To what extent would a Mercury Account (mercury balance sheet, mercury flow statement, etc.) help in improving mercury reporting in Bangladesh? For example, if the mercury statements show the total amount of mercury at the beginning, ending, and changes during the period, etc., will these improve reporting status?
- 22.If you have any other suggestions or comments....

== The End ==

Chapter 7

Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach

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Mercury Disclosure Practices of Major Emitting Companies: A Qualitative Content Analysis Approach

Abstract

This paper explores the extent and quality of voluntary mercury-related disclosures by large mercury-emitting firms. Despite the significant negative impacts of mercury, no prior studies have examined voluntary corporate mercury disclosures. The largest mercury-emitting companies are identified using data from Pollution Release and Transfer Registers (PRTRs) in the US, Australia, Canada, the UK and the EU. As there are currently no guidelines for corporate mercury reporting, a best-practice mercury disclosure framework was developed with reference to generic sustainability standards and specific mercury research. Content analysis was used to identify and analyse the contents of mercury disclosures for 2013 in the annual report, sustainability report, environmental performance report, or company website. The main finding was low levels of disclosure frequency and quality: Of the 79 reports analysed only 32% of these large mercury-emitting companies disclosed mercury information. One explanation may be differing levels of materiality assessment and/or assurance practices: Further analysis revealed that 46% of mercury-disclosing companies *versus* 26% of non-disclosing companies provide details of their materiality assessment process. These companies also had their environmental report externally assured. The results show that there is considerable room for improvement in corporate mercury reporting. The policy implications of the study are that standard-setters such as the Global Reporting Initiative should provide explicit guidance on corporate mercury reporting content. In addition, major emitting companies should identify that they are material emitters and improve disclosure practices. We also suggest that greater harmonisation of PRTRs would facilitate global corporate mercury disclosure practices.

Keywords: Mercury, Corporate Reporting, PRTRs, Minamata Convention.

1. Introduction

This paper evaluates the quality of voluntary mercury-related reporting by large mercury emitters. Mercury is one of the world's most toxic elements for both humans and ecosystems, with significant negative social and environmental impacts. In cooperation with the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry (ATSDR) compiled a priority list for 2001 called the "Top 20 Hazardous Substances" which identified mercury as the third most hazardous substance after arsenic and lead (ATSDR, 2001). Similarly, the highest-rated toxic pollution problem in 2013 reported by WorstPolluted was mercury pollution from artisanal gold mining (Worstpolluted, 2014). All categories of mercury have a detrimental effect on the human nervous system, and a significant level of exposure damages kidneys, hearing, memory, hearts, lungs, and fetuses (NPI, 2014). As an element, mercury cannot be broken down or condensed into new substances that are not harmful to people and the environment (UNEP, 2011). In an effort to reduce mercury emissions, the Minamata Convention, which commits signatory governments to reduce mercury emissions and trade, was signed and ratified in 2017.

Because of its toxicity, mandatory reporting of mercury emissions by facility is required in some countries *via* national pollutant release and transfer registers (PRTRs). PRTRs are governmental systems of collection and distribution of data on the emission and transfer of toxic substances to the environment by the corporate facilities. Some countries established PRTRs after the "Bhopal Disaster" in 1984, and the United Nations Conference on Environment and Development (UNCED)'s declaration of citizens' "right to know" about toxic chemicals (TRI, 2017). Notable PRTRs include the U.S. Toxic Release Inventory (TRI) (established 1987), the U.K. Department of Environment, Food, and Rural Affairs (DEFRA) (1991), the Canadian National Pollutant and Release Inventory (NPRI) (1993), the Australian National Pollutant Inventory (NPI) (1998), the Japanese Pollutant Release and Transfer Register (2001) and the E.U. European Pollutant Release and Transfer Register (E-PRTR) (2006). In countries with PRTRs, facilities emitting mercury above a given threshold are required to report these emissions to their regulator, and this information is publicly disclosed *via* inclusion in the respective PRTR.

While the corporate reporting of mercury emissions *via* PRTRs is important, it has also been argued that mercury should also be included in aggregate corporate reporting, *i.e.* *via* sustainability reports. Berthelot et al. (2012, p. 355) found that investors use and "positively value" corporate reporting, yet the reports provided by corporations to their respective national PRTRs contain only limited aspects of information on mercury. In addition, PRTRs accumulate data for separate regions, and therefore do not produce aggregate reports. Furthermore, PRTR

data has limitations in terms of consistency and reliability (Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010). These reasons suggest that corporate mercury emissions fall into the category of accounting information that the public has a right to know about (Hazelton, 2013).

Though the disclosure of mercury emissions is not specifically required under the Global Reporting Initiative (GRI), the general provisions of the standard mean that material mercury emissions should be disclosed in GRI-compliant reports. GRI's materiality criteria state that the information "reflecting the organisation's economic, environmental, and social impacts, or influencing the decisions of stakeholders" is material and should be disclosed in its reports (GRI, 2016a, p. 10). Moreover, the GRI, the UN Global Compact, and the World Business Council for Sustainable Development (WBCSD) initiated the SDG Compass in 2015 and identified the indicators in relation to the 17 Sustainable Development Goals (SDGs) as material issues to be disclosed by the corporations (GRI, 2018b). It should be noted that national reporting on mercury is also required by governments who are signatories to the Minamata Convention, which encompasses various aspects of mercury including emissions, sources, control mechanisms, and effectiveness of those procedures by the countries that are parties to the Convention. However, governmental mercury reporting falls outside the scope of this study.

Despite the importance of mercury, the key role of corporations in causing mercury pollution, and the (implied) requirements for mercury reporting under the GRI, no previous studies have specifically examined corporate mercury disclosures. Previous corporate disclosure studies have focused on specific environmental aspects, such as arsenic (Soumya, 2011), lead (Bae, 2012), carbon (Haslam et al., 2014; Saka & Oshika, 2014), and water (Leong et al., 2014). In addition, previous studies have considered mercury disclosures by governments (Evers et al., 2016; Strzelecka-Jastrz b, 2018). Mercury disclosure by corporations, however, has not been studied to date.

To address this research gap this study first identifies a best-practice mercury disclosure framework with reference to generic sustainability standards and specific mercury research. This framework is then used to assess the quantity and quality of the disclosures of the world's largest mercury-emitting companies, which are identified using PRTR data.

The remaining sections of the study are arranged as follows: Section 2 reviews the relevant literature. Section 3 provides the theoretical framework from the perspectives of the right to information and the utility of disclosure in reducing emissions, accountability, and materiality. Section 4 describes the methods of the study, including the development of the best-practice mercury disclosure framework. Section 5 reports the findings, and Section 6 offers conclusions, implications, and further research directions.

2. Literature Review

There is evidence that corporations play a major role in mercury emissions. For example, Winalski et al. (2005) found that only three chlorine plants emit one-third of all of the UK's mercury releases. Star News (2012) reported that the top 60 emitters in North Carolina emitted 97 per cent of the state's total mercury emissions to the atmosphere in 2010. Another historical mercury crisis that rocked the USA and Canada was the Great Lakes mercury crisis (1970–1972) involving Dow Chemical's plant at Sarnia, Ontario (Müller, 2018). The repercussions of this incident include enactment of the Water Quality Act (1972) by the USA, formation of the Department of the Environment (1971) and of the Fisheries Act (1972) by Canada, and also the agreement of both countries, in the Great Lakes Water Quality Agreement, to reinstate and safeguard the waters of the Great Lakes. The worst, and globally most focused, mercury crisis was also caused by a corporation, Chisso Petrochemical, in Japan in 1968 (Bergquist, 2017). The intake of fish and seafood contaminated by 81 tons of mercury from Chisso Petrochemical from 1932 to 1968 caused the death of an estimated 1,000 Japanese citizens (Bergquist, 2017), and more than 2,200 people suffered mercury poisoning (Minamata Disease Research Group, 1968; Yorifuji et al., 2012).

Previous studies have considered mercury disclosure, but only from a national point of view – no study has yet focused on the corporate disclosure of mercury. A few studies have considered mercury disclosures by governments (Evers et al., 2016; Strzelecka-Jastrzab, 2018). Evers et al. (2016) discuss the provisions of the Minamata Convention and suggest what the main reporting requirements should be for assessing the overall success of the Convention from a national point of view. The other study by Strzelecka-Jastrzab (2018) examines the data availability capability of Poland in meeting the reporting requirements of the Minamata Convention. Strzelecka-Jastrzab (2018) found that Poland is not ready and does not have all the necessary data to comply with the Minamata's reporting obligations. Furthermore, neither of these studies attempt to evaluate the reporting requirements using a theoretical framework.

Previous corporate disclosure studies have examined a variety of different aspects of disclosures (carbon, water, *etc.*), focusing on the quality of reporting (*i.e.*, a normative agenda), the reasons for particular levels of reporting (*i.e.*, a positive agenda), or some combination of the two. Subjects of disclosure studies have included carbon (Haslam et al., 2014; Nurunnabi, 2016), water (Hazelton, 2015; Tello et al., 2016), human rights (Cooper et al., 2011; Hazelton, 2013a), and biodiversity (Adler et al., 2018; Boiral & Heras-Saizarbitoria, 2017). Some studies have also focused on toxic substances disclosure in general (Centner, 2013), arsenic (Soumya, 2011), sulphur dioxide (Zhu & Zhang, 2012), and lead (Bae, 2012). Vogel and Roberts (2011), Centner

(2013), and Bunker (2012) examined the legal perspectives of the toxic substance disclosures. Overall, these studies have generally found a poor level of quantity and quality of disclosure, and there have been a number of calls for the mandatory reporting of corporate sustainability information (Adams, 2004; Adams & Zutshi, 2004; Belal et al., 2013; Gray, 2001; Gray & Milne, 2004; Gray, 2000; Tilling & Tilt, 2010).

Though most of the disclosure studies on SEA investigated various issues and uncovered interesting insights with significant policy implications, almost all of the studies are lacking in the reliability of the disclosed information because these studies used a single source of self-reported data including the annual report, the sustainability report, or the environmental report. The reported data were not being compared with the independently verified emission data provided in the databases. For example, Saka and Oshika (2014) studied Japanese manufacturing corporations' carbon-management disclosures, and Nurunnabi (2016) examined the corporate climate-change disclosures in Bangladesh using a single set of data. Use of data from a single data source makes the assessment of quality difficult. (For example, if a water disclosure is missing, is that because it is immaterial or because of poor reporting?) More generally, to what extent are material items being reported, or in other words, how complete are sustainability reports?

Self-reported single data sets may be inaccurate in most cases, and can unexpectedly lead to erroneous policy decisions. In identifying the ways in which self-reported information provides inaccurate data, Marchi and Hamilton (2006, p. 74) stated that "Some facilities might choose to expend resources to develop accurate estimates, others might avoid transaction costs and simply make rough guesses, while others could use their freedom to develop excessively optimistic reports of pollution reduction." As a result it is difficult to ascertain whether a poor level of emission disclosures means a low level of emissions or a low level of environmental risk (or indeed both). However, independent databases have reported that these corporations are the leading mercury-emitting corporations. On the other hand, significant undisclosed information reflects significant environmental risks and the need for changes in the regulatory initiatives.

Reporting regulations and guidelines are significant factors in influencing corporate self-reported disclosures. For example, Rankin et al. (2011) note that the firms using the GRI reporting guidelines disclose not only more information, but also more credible information. However, drawing attention to the limitations of the reporting guidelines, Gray and Milne (2002b) reported that GRI frameworks emphasise the specific issues of the organisation while overlooking the bigger picture of sustainability. Similarly, Fonseca et al. (2014) recognised the contribution of the GRI reporting guidelines to environmental sustainability, but suggest the need for its

continuous improvement, otherwise site-level application may camouflage unsustainable practices resulting in meaningless and inaccurate disclosures, more specifically in the areas having a contextual difference. Morhardt (2009) identified the lack of human rights reporting by large corporations due to the GRI guidelines and argued that re-writing of the guidelines requesting specific information on the processes and procedures that the firms exercise for materialising the expected human rights outcomes may improve the quality of disclosure.

Lack of or absence of reporting guidelines leads to poor-quality corporate disclosures. For example, Adler et al. (2018) observed very poor and inconsistent disclosures on biodiversity and threatened species. They found that more information was disclosed not only by firms having biodiversity partnerships but also by the low-profile companies for the sake of reputation. Comyns and Figge (2015) examined the quality of greenhouse gas (GHG) disclosures in the sustainability reports of oil and gas companies based on seven quality criteria (accuracy, completeness, consistency, credibility, relevance, timeliness, and transparency) and found that GHG information fulfilled the quality of timeliness and relevance, but was lacking in terms of completeness, accuracy, and transparency.

A standardised reporting guideline and a well-grounded disclosure structure could assist in high-quality corporate environmental disclosures. For example, Herold and Lee (2018) identified that differences in measurement and reporting on carbon hinder policy decisions, justifying the need for a uniform environmental reporting structure. Boiral and Heras-Saizarbitoria (2017) proposed a best-practice biodiversity reporting framework for corporations, dividing the activities into four quadrants: internal actions, external actions, managerial issues, and technical issues. The reporting framework expects to identify the relevant approaches, measures, strengths, and weaknesses of the corporate biodiversity reporting practices.

Commensurate with the paucity of research on corporate mercury reporting is an absence of corporate mercury-reporting guidelines. The GRI sets standards for sustainability reporting for businesses, governments, and other organisations in relation to the impacts of their activities on the economy, environment, and society. However, while the GRI covers a wide range of economic, social and economic issues, including emissions, its standard on emissions was developed specifically for GHGs and does not cover other emissions, the nature of which varies widely. Moreover, the reporting requirements for substances are not exactly the same under different global agreements.

Given these gaps, the present study makes two contributions:

- The study looks at mercury, an important pollutant.

- The study uses an independent data source to identify large polluters so that the paper can assess reporting quality more reliably than in many other studies that have used only voluntary disclosures.

The study first identifies the best-practice corporate mercury disclosure framework with reference to generic sustainability standards (such as the GRI) and specific mercury research. It then compares the current mercury disclosure practices of the main mercury-emitting companies (which the paper identifies using PRTR data) with the framework and assesses the quantity and quality of the disclosures. This paper thus aims to answer two research questions:

1. *What is a probable “best-practice corporate mercury disclosure framework”?*
2. *To what extent do the current disclosure practices of the highest mercury-emitting companies comply with the best-practice disclosure framework?*

Our approach is theoretically framed from the perspective that citizens have a right to information, and corporations have accountability for disclosures in relation to toxic elements such as mercury, the utility of disclosure in reducing such emissions, and the process of identifying material issues for disclosures. This framework is discussed in the following section.

3. Theoretical Framework

This paper argues that citizens have a right to information on mercury pollution by large mercury polluters, and draws upon the interrelated literature concerning the right to information, accountability, and materiality to substantiate this claim. The literature on the right to information describes the conditions under which stakeholders have a right to corporate environmental information. The accountability literature identifies how transparency and reporting is a necessary, but insufficient, element of accountability. The materiality literature explores what information reporting standards such as the GRI deem necessary to report. It is argued that from all three perspectives large mercury polluters should report on mercury emissions.

Accountability means the responsibility for justifying past actions, for recognising social and environmental rights of the current and future stakeholders, and for providing the required information for facilitating actions and decision-making in relation to the reporting entity (Bivins, 2006). Accountability ensures information justice by the provision of accurate and reasonable information to society, meaning that a person or organisation who is not accountable behaves unjustly (Hall et al., 2017). Developing more accountability is expected to create a greater sense of corporate responsibility, which should motivate the corporations in reducing social and environmental damage. However, corporations cannot always be fully accountable and provide

detailed information because of the limitations in measurements (Butler, 2005; Messner, 2009), and because the information needs of different stakeholder groups may significantly differ.

As a part of the community, organisations are not only accountable to the owners or capital providers but also to other stakeholders. In the case of financial accounting, corporations are mostly accountable to the capital providers solely for the financial implications; whereas in case of the SEA, accountability of corporations extends beyond the capital providers to all of the stakeholders, including society at large, for the monetary and non-monetary implications of their operations (Cooper & Owen, 2007; Gray, 2002b). Even future generations are included in the wider list of stakeholders to whom the organisations are expected to be accountable (Messner, 2009).

Transparency is a subset of accountability, in that reporting increases the accountability of an organisations' impacts on society (GRI, 2018a). In relation to financial reporting, transparency means having the qualitative characteristics of "access, timeliness, relevance, and quality", which is essential to ensure just capital markets (Vishwanath & Kaufmann, 2001, p. 41). In relation to environmental reporting, such information includes the volume of emissions, the emissions the emitters could reduce, and the emissions that could not be reduced and why not (Adams, 2004).

Access to transparent corporate information has been argued to be a right of citizens (Adams, 2004; Hadden, 1989; Roe, 2000; Sarokin & Schulkin, 1991). These claims are made on the basis that corporate actions significantly impact citizens' interests, and also that improved disclosure has the potential to lead to improved corporate performance (Kleindorfer & Orts, 1998; Roe, 2000; Tietenberg & Wheeler, 1998). Indeed, the disclosure of environmental information to the public is seen as a policy instrument that reduces, or even sometimes substitutes for, the need for more conventional command-and-control techniques (Stephan, 2002). Blackman (2010) similarly suggests that "public disclosure" and "voluntary policies" are optimal approaches; the former gathers and distributes environmental performance information while the latter encourages industries to decrease their emissions. After command-and-control and market-based approaches, public disclosure has been recognised as the "third wave" of environmental regulation (Tietenberg, 1998). Over the past two decades, both developed and emerging economies have increased their reliance on voluntary approaches and information disclosure programs (*e.g.*, the U.S. Environmental Protection Agency's Toxic Release Inventory) to target environmental problems that have traditionally been ignored or poorly managed by mandatory regulations (Earnhart et al., 2014).

Previous research identifies that the reporting of environmental information to the public can prompt industries to reduce their emissions because of the increasing pressure exerted by

stakeholders^f (Blackman et al., 2004). Soumya (2011) found that provision of information motivated behavioural changes that led to diminishing arsenic exposure. Bae (2012) studied residential lead paint disclosures and found that information disclosure to some extent influences the environmental risk-management behaviour of buyers. In another study on sulphur dioxide emissions information disclosure on (SDEID), Zhu and Zhang (2012) stated that power industries' SDEID is a useful tool for governments attempting to control acid rain and other environmental problems. Furthermore, previous studies also suggest that public disclosure may support emission reduction by encouraging industries to develop their internal structures and approaches to emission control (Blackman et al., 2004), which may also benefit firms (Environmental Leader, 2018). The empirical findings for developing economies also suggest that information disclosure programs offer some promise for improving corporate environmental performance (Earnhart et al., 2014). Conversely, some studies have also considered the harm of non-disclosure; for example, Centner (2013) argued that legal provisions that allow drilling firms to avoid disclosure, and non-disclosure of toxic substances of shale gas production in the US, may hinder emergency and health responses.

It is important to recognise, however, that transparency and accountability are not equivalent. For example, Fox (2007) argued that transparency is a necessary but not sufficient condition for ensuring accountability, and further distinguished between “opaque transparency” and “clear transparency” as well as between “soft accountability” and “hard accountability” (Fox, 2007, p. 663). Opaque transparency provides information, but this information is unreliable and does not reflect the organisation's actual situation, and hence it does not lead to accountability of the reporting entity. Clear transparency provides reliable information that reflects the behaviour of the reporting entity. This information creates accountability, which can be “soft” if there is no subsequent regulatory intervention, or “hard” if there is.

A particularly acute issue is that as organisations are involved in thousands of issues, and their activities encompass and impact on hundreds of aspects of society, they can never be “fully” transparent. It is true that the firm should evaluate the impacts of its actions and identify the probable effects of their future actions on the community (Bebbington et al., 2014; Dillard, 2007);

^f Blackman et al., (2004) cite a long list of such stakeholders, including buyers of goods, national and international accreditation organisations, capital providers, employees, regulatory bodies, lawmakers, different community groups, non-governmental organisations, industry associations, and the courts. Tietenberg (1998, p. 591) also identified seven “channels” impacting firms' behaviour because of public disclosure of accurate environmental information. Public disclosure may (a) affect the demand for firms' goods; (b) affect the demand for firms' securities; (c) affect firms' ability to hire and retain employees; (d) convince private citizens to initiate tort law actions against polluters; (e) build support for new pollution control legislation; (f) motivate private suits to force firms to undertake abatement; and (g) give rise to judicial actions in countries such as Colombia, Ecuador, and Chile, where the constitution guarantees citizens the right to a healthy environment.

yet complete transparency – and therefore accountability – is very difficult, if not impossible. As Messner (2009, p. 918) argued, “forcing” accountability for issues that are “very difficult or impossible to justify” is itself a form of “violence”.

The problem of which items to report is dealt with *via* the concept of materiality. The concept of materiality has a heritage in financial accounting and is measured based on not only quantitative but also qualitative factors such as the nature and dimension of the impacts of the issue and the interests of the stakeholders (Gray & Manson, 2008; IFAC, 2010). For example, the level of materiality differs among the management, auditors, and users of the reports because of the variation in their interest in the business (Edgley et al., 2015). Accountability Principles Standard (AA1000) provides that the process of identifying “material issues will change over time as issues mature and understanding improves” (AccountAbility, 2008, p. 13).

In SEA, materiality has a stakeholder-focused ethical lens which changes from “firm to firm, and context to context” (Edgley et al., 2015, p. 14), and considers not only current but also future impacts (Edgley et al., 2015, p. 8). Beyond the financial implications, materiality contemplates the social and environmental impacts of the companies’ non-financial activities. Social Environmental Reporting (SER), because of their qualitative and subjective nature, articulate materiality to satisfy the diversified information needs of their users (Edgley et al., 2015, p. 15). Material disclosures in SER may thus include water and energy usage, greenhouse gas emissions, hazardous substances, biodiversity, waste management, stakeholder engagement, the working environment, human rights and workers’ rights, and health and safety (AccountAbility, 2006a, 2006b; Edgley et al., 2015).

Organisations such as GRI, AccountAbility, IIRC, and KPMG recommended slightly different approaches to ascertaining material items for reporting. AccountAbility recommends a three-step approach, GRI suggests a four-step process, IIRC suggests a six-step process for materiality assessment, and KPMG suggested a robust seven-step approach for materiality assessment and stakeholder engagement and feedback. However, a common theme is the importance of stakeholder expectations in determining materiality. For example, the GRI (2016a, p. 10) states that material information is “reflecting the organization’s economic, environmental, and social impacts, or influencing the decisions of stakeholders”. The material information requiring disclosure may be identified based on stakeholder consultation or stakeholder engagement (GRI, 2016a; Mullerat, 2005). Such stakeholder engagement may suggest disclosures additional to those recommended by standards; for example, Adams (2004, p. 738) identified the concern of the stakeholders regarding pollution as follows:

Whilst the responsible care indicators are concerned with levels of emissions or discharges, stakeholders are at least as concerned with what is being done to reduce emissions and discharges of toxic substances, what the corporate targets are and why they have not been met.

Though stakeholder consultation is an important way of selecting and prioritising material issues, it also has its limitations. Firstly, organisations might not comply with the recommendations. A study by Ceres (2018) of more than 600 U.S. companies found that only 14 per cent engage stakeholders in the materiality assessment process. Given that identification of material issues is fundamental to the creation of a complete sustainability report, such a low level of stakeholder engagement gives rise to considerable concern.

Secondly, stakeholder consultation may not identify all relevant disclosures. For example, stakeholders mostly place importance on the issues “they hear and talk about frequently without objective checks” (Norris et al., 2014, p. 112), and not all of the stakeholders may be concerned about all material issues. Both Mullerat (2005) and GRI (2016a) therefore recommend incorporating additional sustainability issues and considering international agreements in prioritising material items for sustainability reporting. Mullerat (2005, p. 535) suggests identifying multilateral environmental agreements to identify other important issues to be reported in the corporate sustainability report, as “such broad-based concerns may derive, for example, from national policy and international conventions” (Mullerat, 2005, p. 535). Similarly, the GRI (2016a) also suggested the identification of any other elements having significant social and environmental impacts. In particular, the GRI asserts that corporations have the opportunity to contribute to achieving the SDGs as well as disclosing SDG-related impacts in SER (GRI, 2014). The GRI, along with the UN Global Compact and the World Business Council for Sustainable Development (WBCSD), initiated the SDG Compass in 2015 to enable this reporting (GRI, 2018). The SDG Compass guides the incorporation of sustainability into core business strategies as well as measuring the organisational contribution to achieving the SDGs. In addition, the SDG Compass supports the identification of the relevant GRI Standards for a particular area of SDGs (GRI, 2018).

4. Methods

4.1 Best-Practice Corporate Mercury Disclosure Framework

As noted in Section 2, there are currently no specific guidelines for corporate mercury reporting, and therefore, in order to evaluate the quality of corporate mercury reporting, we developed our own instrument. We selected 23 items and classified them into four groups: current emissions;

mercury management; reduction commitments, target and strategies; and regulation and compliance. We consulted GRI 305: *Emissions*, the draft national reporting format for mercury under the Minamata Convention; relevant literature including Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010) and Walcek et al. (2003), and Boiral and Heras-Saizarbitoria (2017); and sample disclosures of the major mercury-emitting companies including Company U (the US), Company A (Australia), and Company H (Canada)⁸ to develop the criteria for evaluating the mercury disclosure practices of the major emitting corporations around the world. This resulted in a final list of 23 items in four categories (emissions, management, reduction targets, and compliance with regulations), as shown in Table 1.

The composition of the best practice disclosure framework was determined via a five step process. The first step was the identification of standards relevant to the disclosure of mercury information including GRI 305 and the Minamata Convention. The second step was to review the existing disclosures of companies to identify best practices. The third step was to consolidate steps 1 and 2 and construct definitions of each disclosure element. Step four was to undertake a review of all of the companies utilising the framework and step five was to slightly refine the framework based and group each element into one of four categories.

Table 1. Criteria for evaluating mercury disclosures of the major emitting corporations

	Classes of Items	Definition of the Items
(A)	Current emissions	
1	Total mercury emissions (N)	Disclosure of the total mercury emissions of the company
2	Mercury emissions intensity (N)	Disclosure of data on the level of intensity of the mercury emissions of the company
3	Geographical site-level mercury emissions (N)	Disclosure of mercury emissions from different geographical sites (different plants/facilities/countries) of the company
4	Emission by type (<i>i.e.</i> , air, water, and soil) (N)	Disclosure of mercury emissions to air, water, and soil
5	Mercury-added products (T)	Disclosure of information on the products that contain mercury or mercury compounds. (Article 4, the Minamata Convention)
6	Manufacturing processes in which mercury or mercury compounds are used (T)	Providing information on the manufacturing processes of the company using mercury or mercury compounds (Article 5, the Minamata Convention)
7	Other sources of mercury emissions (T)	Reporting information on other sources of mercury (including naturally occurring mercury) available in the company
8	Changes in mercury emissions (N)	Reporting information on variations in the volume of mercury emissions in different years

⁸ The sample companies are given anonymous names such as Company A, Company B, *etc.*

9	Reasons for changes in mercury emissions (T)	Disclosure of information on the reasons for changes in the volume of mercury emissions
10	Impact of mercury emissions (T)	Disclosure on the effects of mercury emissions on the human health and the environment.
(B)	Mercury management	
11	Export/import of mercury (T/N)	Disclosure on export and import (trade) of mercury, or compliance with the rules of mercury export/import
12	Assessment of mercury across the supply chain (T)	Disclosure on whether the company evaluates the flow of mercury along the supply chain
13	Community concerns (T)	Disclosure on company concerns in relation to the community regarding mercury emissions
14	Materiality of emission (T)	Disclosure on the significance of the mercury emissions by the company
15	Ongoing mercury monitoring and management plan (T)	Disclosure on ongoing mercury monitoring and the management plan of the company
16	Risk-management process of mercury emissions (T)	Disclosure on the company's risk-management process for mercury emissions
(C)	Reduction commitments, target, and strategies	
17	Objectives and commitment to reducing mercury emissions (T)	Disclosure of the company's objective and commitment to reducing mercury emissions
18	Mercury reduction target (N)	Disclosure of the company's target for mercury reduction, in terms of percentage or volume of emissions.
19	Statement of progress on achieving target (T)	Disclosure of the company's achievement to date of the target for reducing mercury emissions.
20	Emission reduction strategies (including technologies) (T)	Reporting the strategies, including technologies, that the company used for mercury reduction
21	Mercury information exchange, public awareness, and education (T)	Disclosure on information exchange, public awareness, and education in relation to company's mercury emissions (Articles 17 & 18, the Minamata Convention)
(D)	Regulation and compliances	
22	Operational regulatory requirements, interactions, and compliance (T)	Operational regulatory requirements, interactions, and compliance: disclosure on whether the company fulfilled any operational regulatory requirements or interacted with regulatory bodies regarding dealing with mercury emissions.
23	Reporting requirements and compliance (T)	Disclosure on compliance with the reporting requirements of the company

Note: T = Text and N = Number

4.2. Data Collection

The objective of the paper is to examine the quality of voluntary disclosures by large mercury emitters, which were identified *via* PRTRs. The first step was to select countries or regions with PRTRs that also had high levels of mercury emissions. Secondly, major emitting companies were identified from the respective PRTRs. Thirdly, the best-practice mercury disclosure framework

was used to analyse the quality of mercury disclosure of the companies in their annual report, sustainability report, environmental performance report, or on the company website.

Major mercury-emitting countries were identified on the basis of total mercury emissions, calculated by aggregating the sectoral emission data provided by the UNEP in the Technical Background Report for the Global Mercury Assessment 2013 (UNEP, 2013a). Table 2 shows the 10 largest mercury-emitting countries and those countries with PRTRs in the top 55 emitters. Of the 55 countries with the most emissions, only five countries (Australia, Canada, Japan, the UK and the US^h) and the European Union have PRTRs. Because of the linguistic constraints we excluded Japan from the study. The selected PRTRs are therefore the Australian NPI, the Canadian NPRI, the EU's E-PRTR, the UK's DEFRA, and the US' TRI.

Table 2. Country ranking of mercury emissions and availability of PRTRs

Rank	Countries	Mercury Emissions (tonnes)	PRTRs?
1	China	575.205	No
2	India	144.733	No
3	Indonesia	78.207	No
4	Columbia	63.890	No
5	South Africa	60.448	No
6	Russia	58.996	No
7	Ghana	57.488	No
8	United States	56.262	Yes
9	Bolivia	45.567	No
10	Sudan	45.446	No
15	EU	29.577	Yes
17	Australia (and Christmas Island)	21.346	Yes
22	Japan	17.228	Yes
51	United Kingdom	4.820	Yes
54	Canada	4.470	Yes

Source: Ranked by authors based on UNEP data (AMAP UNEP, 2013)

Major emitting companies were identified from the respective PRTRs on the basis of total mercury emissions. Similar approaches were followed by Dragomir (2012), who selected the largest five oil and gas companies from the EU considering the contribution to the total amount of GHG emissions, while Clarkson et al. (2008) chose 191 sample firms based on the actual pollution discharge data from the U.S. Environmental Protection Agency (EPA)'s TRI database. Facilities were selected based on the volume of total mercury emissions from the facilities during 2013 or 2013–14, as this was the most contemporary data available across all the PRTRs. Identifying large corporate emitters required some manipulation of PRTR data, as data is

^h See the list of 55 countries in Appendix 6.

provided by the facility rather than by the company, and it may be separated by emission type. For example, the PRTRs of the EU and the UK reported mercury emissions of the facilities for air and water separately.

The initial intention was to rank the largest mercury-emitting corporations globally by aggregating emissions from different PRTRs and to examine the largest emitters. However, due to inconsistencies between the measurement of PRTR data between jurisdictions, this was not possible, so instead the highest-emitting companies from each PRTR were selected. Once total facility emissions were calculated, we selected the 20 highest mercury-emitting facilities from each PRTR. We then identified the parent companies of the facilities from the respective facility data available on the websites of the PRTRs. All the PRTRs provide parent-company information except for the UK, where we obtained this information by contacting the regulator directly.

In each jurisdiction some of the top 20 facilities were owned by the same company, so this process yielded a sample of 81 companies comprising 16 from Australia, 18 from Canada, 16 from the EU, 18 from the UK, and 13 from the US. While some of the companiesⁱ in the sample operate in multiple jurisdictions, only two (Company G and Company O) have top 20 facilities in two jurisdictions (Company G, US and Canada; Company O, UK and EU). This means that of the final sample, 79 are unique companies. The final sample is summarised in Table 3.

Table 3. Corporate sample selection

Country/ Region	Sample Facilities	Companies
Australia	20	16
Canada	20	18
The EU	20	16
The UK	20	18 (17 unique)
US	20	13 (12 unique)
Total	100	81 (79 unique)

For each company, the Web addresses of the companies were obtained from the PRTRs for tracing the mercury disclosures in self-produced reports, including the annual report, the sustainability report, the environmental performance report, and the company website (Freedman & Jaggi, 2005). For this purpose, we downloaded the reports and searched the word “mercury” to ascertain how much information, if any, companies disclosed regarding mercury. In addition, we searched the particular company website from September to November 2015 for mercury disclosures in relation to 2013. Primarily, we focused on the reports published in 2013 as we

ⁱ These companies include Company U (Australia, Canada and the US), Company V (Australia and the US), Company G (the US and Canada), Company X (the US and Canada), Company L (the US and Canada), Company I (the US and Canada), Company J (the US and Canada), Company O (the UK and the EU) and Company N (the UK and the EU).

considered the mercury emissions of the same period. In the case of unavailability of reports or no mercury disclosure during 2013, we examined the 2014 publications.

4.3. Data Analysis

The study identified the corporate mercury disclosure content in different reports, counted the number of words in the disclosure, and identified the methods of disclosing such texts, charts, and graphs. Content analysis is frequently used in social and environmental research (Gray et al., 1995; Tilling & Tilt, 2010) for analysing text and drawing a meaningful interpretation, and it is considered suitable for exploring environmental information in annual reports (Buniamin, 2012). Usually, studies using content analysis primarily concentrate on quantitative analysis, whereas this study relied on qualitative analysis of the content in addition to the extent of mercury disclosures. Elo et al. (2014, p. 1) stated that “qualitative content analysis is one of the several qualitative methods currently available for analysing data and interpreting its meaning.” Qualitative content analysis reduces the data by “creating categories” or “a model” (Bengtsson, 2016, p. 10), which in this case was ultimately the four classifications of the “best-practice mercury disclosure framework” discussed in Section 4.1. The contents were coded over a number of iterations as the coding categories were finalised.

The following section presents the findings of the study.

5. Findings

The study revealed that only 32% of major mercury emitters disclosed mercury information in a self-produced annual report, in a sustainability report or an environmental performance report, or on a website during 2013. Though only 32 per cent of companies disclosed mercury in their self-produced reports, all of these companies submit mandatory specifically formatted reports to their respective PRTRs. Among the four classes of disclosures classified in the mercury disclosure framework, major mercury emitters mostly disclosed information on “reduction commitments, targets, and strategies” (80%). On the other hand, companies provide the least information on certain elements including mercury information exchange, public awareness and education (3%), export/import of mercury (8%), mercury emissions intensity, assessment of mercury across the supply chain, risk-management processes of mercury emissions, and statements of progress on achieving the target (all 13%). These imply that companies are showing up their reduction commitments, targets, and strategies, but practically may be doing very little or nothing to disclose in the reports. Finally, the variation of disclosures between the jurisdictions justifies the need for specific standard and guideline for mercury disclosures.

Table 4 provides an overview of the reporting of mercury emissions. In terms of reporting frequency, only 32 per cent of major mercury emitters made publicly available disclosures during 2013. The study did not find the websites of 15% of the major emitters, and 53% of emitters did not report mercury information in their reports. Compared to other jurisdictions, more companies from Canada (44%) and the US (38%) reported mercury information. On average, voluntary reports were available for 30% of the total mercury emissions of the sample jurisdictions; it was highest in Australia (51%) and lowest in the EU (5%). These findings are quite similar to the recent findings that 55 per cent of companies worldwide (by market capitalisation) disclose environmental information (Environmental Leader, 2018).

Table 4. Corporate mercury-reporting frequency^j

Country/ Region	Sample Companies	Company Details Not Found	Companies Not Reporting Mercury Information	Companies Reporting Mercury Information	Percentage of Companies Reporting	Percentage of Total Emissions Covered by the Reporting Companies
Australia	16	2	9	5	31%	51%
Canada	18	3	7	8	44%	38%
EU	16	4	8	4	25%	5%
UK	18 (17 unique)	2	12	4	22%	22%
US	13 (12 unique)	1	7	5	38%	34%
Total	81 (79 unique)	12 (15%)	43 (53%)	26 (32%)	32%	30%

Table 5 provides further detail on the content of mercury emission disclosures. The 23 elements derived in the method section are classified under four headings: current emissions; mercury management; reduction commitments, targets, and strategies; and regulation and compliance. Table 6 shows that on average corporations disclosed most data on reduction commitments, targets, and strategies (80%), ongoing mercury monitoring and management plans (57%), operational regulatory requirements, interactions and compliance (50%), and current emissions (49%). This information may be disclosed most frequently due to the requirements of national and international environmental agreements that require the states/countries to achieve specific reduction targets and fulfil certain regulatory requirements. Overall, Australian companies disclosed most of the sample contents of the mercury information during 2013, followed by companies in the US. Peck and Sinding (2003) also reported similar findings, that Australian companies reported more environmental information than U.S. and Canadian companies.

^j Detailed reporting status of the companies is provided in Appendix 1 to Appendix 5.

Table 5. Summary of the qualitative mercury reporting practices of companies under five different jurisdictions^k

Sl No.	Sample Contents	Total /Avg.	Australia	Canada	EU	UK	US
	No. of reporting companies	26	5	8	4	4	5
	Average number of words disclosed	305	369	537	136	128	354
(A)	Current Emissions						
1	Total mercury emissions (N)	49%	60%	50%	50%	25%	60%
2	Mercury emissions intensity (N)	13%	40%	25%	0%	0%	0%
3	Geographical site-level mercury emissions (N)	27%	20%	25%	25%	25%	40%
4	Emission by type (<i>i.e.</i> air, water, and soil) (N)	31%	60%	25%	25%	25%	20%
5	Mercury-added products (T)	16%	20%	13%	0%	25%	20%
6	Manufacturing processes in which mercury or mercury compounds are used (T)	20%	20%	13%	0%	25%	40%
7	Other sources of mercury emissions (T)	45%	40%	50%	25%	50%	60%
8	Changes in mercury emissions (N)	37%	40%	25%	50%	50%	20%
9	Reasons for changes in mercury emissions (T)	32%	40%	25%	25%	50%	20%
10	Impact of mercury emissions (T)	39%	80%	50%	0%	25%	40%
(B)	Mercury Management						
11	Export/import of mercury (T/N)	8%	20%	0%	0%	0%	40%
12	Assessment of mercury across the supply chain (T)	13%	0%	25%	0%	0%	40%
13	Community concerns (T)	28%	40%	38%	0%	0%	60%
14	Materiality of emission (T)	28%	40%	25%	25%	50%	0%
15	Ongoing mercury monitoring and management plan (T)	57%	40%	63%	50%	50%	80%
16	Risk-management process for mercury emissions (T)	13%	20%	25%	0%	0%	20%
(C)	Reduction commitments, targets, and strategies						
17	Objectives and commitment to reduce mercury emissions (T)	38%	60%	13%	50%	25%	40%
18	Mercury reduction target (N)	20%	40%	38%	0%	0%	20%
19	Statement of progress on achieving target (T)	13%	40%	25%	0%	0%	0%
20	Emission-reduction strategies (including technologies) (T)	80%	80%	88%	75%	75%	80%
21	Mercury information exchange, public awareness and education (T)	3%	0%	13%	0%	0%	0%
(D)	Regulation and compliance						
22	Operational regulatory requirements, interactions and compliance (T)	50%	40%	25%	50%	75%	60%
23	Reporting requirements and compliance (T)	26%	40%	25%	25%	0%	40%

^k Only two companies have been counted twice in two jurisdictions. Company G was included in the US and Canada, and Company O was considered in both the UK and the EU.

Table 5 shows that the three most frequently disclosed elements are reduction commitments, targets, and strategies (80%); ongoing mercury monitoring and management plans (57%); and operational regulatory requirements, interactions and compliance (50%). These disclosure types are perhaps the most straightforward and seek to assure users that the emitters have plans in place to reduce their emissions, so this finding is consistent with the legitimization strategies observed in other studies. In addition, the discourse relates to aspects of the contemporary global environmental regulations. As the countries under study are the parties to these agreements and a significant portion of the countries' information is derived from the corporate information, corporations might be reflecting the needs of the compliance requirements of the countries to the global agreements.

The six least-frequently disclosed elements are mercury information exchange, public awareness and education (3%); export/import of mercury (8%); mercury emissions intensity; assessment of mercury across the supply chain; risk-management processes for mercury emissions; and statements of progress on achieving the target (all 13%). The low level of disclosures in these groups might be explained as being characteristic of sustainability reporting, which is primarily directed at the level of the firm (as opposed to the supply chain), rather than being risk-based. This is also typical of much of corporate sustainability reporting, to the extent that a key emphasis of the GRI standards is on broadening reporting to encompass the supply chain and to adopt a risk-based perspective. The poor disclosure level in these areas may also be because of contextual differences among the jurisdictions, or involvement of the companies in these activities. For example, among the 26 reporting companies, only one company from Canada reported on mercury information exchange, public awareness and education, as these activities are usually performed by government and commercial organisations and are not involved in these programs. Similarly, with regard to the export/import of mercury, only two companies mentioned their compliance with the USA Export Ban Act.

The elements with the most variation between countries are impact of mercury emissions ($M = 39$; $SD = 29.66$); community concerns ($M = 28$; $SD = 26.62$); mercury reduction targets ($M = 20$; $SD = 19.51$); and operational regulatory requirements, interactions and compliance ($M = 50$; $SD = 19.04$). This may be because companies from one country may have emphasised an issue that was totally or significantly ignored by the companies from other jurisdictions. For example, community concern and mercury-reduction targets have been highly disclosed by companies from the USA and Australia, whereas these two elements were completely omitted by companies from the EU and the UK. This might be because many of the major emitters are resource companies, which are more prevalent in the USA (KPMG, 2017) and Australia (CPA Australia, 2013), and which have historically had higher levels of sustainability disclosure.

6. Discussion

Overall poor mercury disclosures in annual reports, environmental reports, sustainability reports, or on websites show that most mercury emitting corporations are not discharging their accountability, nor recognising the right of the public to know the information on toxic emissions and their impacts on human health and the environment. Moreover, poor mercury disclosures would hinder corporate stakeholders' informed decision-making processes.

One possible reason for low levels of disclosure is that mercury emissions may not have been identified as a material issue by the companies involved. For example, Maag et al. (2007) and AMAP/UNEP (2013a) identified that stakeholders are not always aware of mercury exposures, and therefore stakeholder assessments may not identify mercury as a material issue for reporting.

A host of international organisations suggest that mercury is a material issue, though. Apart from being the focus of the global Minamata Convention discussed in Sections 1 and 2, industries such as mining have identified it as a significant issue. For example, ICM (2009) observed that "There are legitimate calls within the industry and from external stakeholders to manage it effectively."

Indeed, the GRI has itself identified mercury as being materially important. The GRI (2013) conducted a study for identifying the material items that the stakeholders consider relevant and suggest monitoring or reporting in a corporate sustainability report. Based on 194 stakeholder organisations consisting of five categories of stakeholders, (business associations, labour representatives, civil society organisations, information users, and experts), the GRI identified 2,812 topics, of which 1,612 are unique, in relation to 52 categories of business. According to the GRI (2013), stakeholders from five different categories of business – Electrical Equipment and Machinery (p. 51), Automobiles and Components (p. 56), Textiles, Apparel, Footwear and Luxury Goods (p. 61), Technology and Semiconductors (p. 107), and Electric Utilities and Independent Power Producers and Energy Traders (p. 126) – suggested that mercury should be monitored or reported in the corporate sustainability report. The study of the GRI (2013) also reflected that stakeholders in the other 47 categories of business including mining, the highest mercury emitting sector, did not explicitly recognise mercury as a material topic for reporting. However, the mining section suggested monitoring and reporting of heavy metals, which also includes mercury.

Global sustainable development agendas also recognise pollutants as material issues of disclosure, of which mercury is one of the most toxic. The 17 goals of the U.N. SDGs comprises 244 (232 unique) indicators for evaluating the achievement of 169 targets. The SDG Compass initiated by the GRI, the U.N. Global Compact, and the WBCSD in 2015 recognised these 244

indicators as material issues to be disclosed by the corporations (GRI, 2018b). Of these 244 indicators, at least 21 indicators are directly or indirectly related to environmental pollutants.

It is particularly difficult to justify a lack of mercury emission disclosures considering that a significant proportion of the total mercury emissions in each jurisdiction studied stemmed from just a handful of emitters. Table 6 shows that in each jurisdiction, the five highest-emitting corporations emitted 41% of the total emissions of that jurisdiction during 2013. The highest concentrations of the top five emitters were in Australia (62%) and the UK (49%).

Table 6. Corporate mercury emission concentration

Country/Region	Aggregate of the Five Largest Emitting Companies as a Proportion of Total Country Emissions
Australia	62%
Canada	38%
EU	15%
UK	49%
US	40%
Average	41%

Given the clear identification of mercury as a material issue for society as well as being particularly relevant for the extractive and power industries, non-reporting of mercury by major mercury emitters is a clear breakdown in the materiality assessment process.

Table 7. Disclosure of the materiality assessment process and reporting assurance by mercury-reporting companies

Country/Region	Sample Companies	Companies Reporting Mercury Information	Reporting Companies That Disclosed Materiality Assessment Process	Reporting Companies that Get External Reporting Assurance
Australia	16	5	4 (80%)	4 (80%)
Canada	18	8	2 (25%)	2 (25%)
EU	16	4	2 (50%)	2 (50%)
UK	18 (17 unique)	4	2 (50%)	2 (50%)
US	13 (12 unique)	5	2 (40%)	2 (40%)
Total	81 (79 unique)	26	12 (46%)	12 (46%)

Materiality assessment expects to increase the level of mercury disclosures in the self-produced corporate reports and external assurance of the corporate environmental reports. The data analysis in Table 7 shows that 46 per cent of the mercury-reporting companies disclose materiality assessment processes and also get external assurance on their environmental reports. This result shows that though the remaining 54 per cent of companies do not assess materiality

or do not disclose materiality assessment processes, they do disclose mercury information in their self-produced reports. This finding also recognises the importance of the disclosure of mercury information since the highest-reporting companies (54%) identify and report mercury information (most likely) without materiality assessment.

Table 8. Disclosure of materiality assessment processes and reporting assurance by mercury non-reporting companies

Country/ Region	Sample Companies	Companies Not Reporting Mercury Information	Non-Reporting Companies That Disclosed Materiality Assessment Process	Non-Reporting Companies That Get External Reporting Assurance
Australia	16	9	3 (33%)	3 (33%)
Canada	18	7	3 (43%)	3 (43%)
EU	16	8	3 (38%)	3 (38%)
UK	18 (17 unique)	12	3 (2 unique) (25%)	3 (2 unique) (25%)
US	13 (12 unique)	7	1 (0 unique) (14%)	1 (0 unique) (14%)
Total	81 (79 unique)	43	11 (26%)	11 (26%)

The data analysis in Table 8 shows that the mercury non-reporting companies that disclose their materiality assessment processes also externally verify their environmental reports *via* independent assurers. The table also shows that only 26 per cent of non-mercury-reporting companies disclose materiality assessments and get external assurance of their environmental reports, meaning that 74 per cent of non-reporting companies do not perform, or do not disclose, materiality assessment processes. It can thus be expected that if non-reporting major mercury-emitting companies assess materiality, they may identify mercury as a material issue and disclose it in reports. Interestingly, though all of the companies disclosing materiality assessment processes claim to use stakeholder engagement for ascertaining material issues, none of them considers the broad societal concern of “global environmental agreements” for this purpose.

7. Summary and Conclusion

This paper evaluates the voluntary mercury disclosure practices of major mercury-emitting companies in annual reports, sustainability reports, and websites. Mercury is a highly toxic substance and cannot be destroyed (WHO, 2017). The disclosure of pollutant information is consistent with every citizen’s right to know, and it also has the potential to improve pollution outcomes (Goetz & Jenkins, 2005 p. 147). Though several studies including those of Hylander and Meili (2003), Mohapatra et al. (2007), Nelson (2007), Nelson et al. (2009), Strezov et al. (2010), and Walcek et al. (2003) concentrated on various issues regarding mercury including its sources, measurement, and impacts, none of the studies specifically explored mercury reporting.

There has been no previous research exploring corporate mercury disclosures, and there is no specific corporate mercury-reporting framework available.

Following the work of Boiral and Heras-Saizarbitoria (2017), this study proposes a best-practice mercury disclosure framework which is intended to identify the approaches, measures, strengths, and weaknesses of corporate mercury-reporting practices. To develop the best-practice disclosure framework, we drew on a number of sources, including the GRI 305: *Emissions*, the draft reporting format for mercury under the Minamata Convention, the relevant literature, and sample disclosures. Major corporate emitters were selected by first identifying countries with major mercury emissions, then from this population those countries with PRTs in English (n=5) were selected, before identifying the 20 highest-emitting facilities for each country, and finally the companies operating these facilities (n=79). Mercury disclosures were identified in the annual reports, sustainability reports, environmental performance reports, and websites of those companies (Freedman & Jaggi, 2005). The best-practice disclosure framework was then used to evaluate the quality of this reporting.

The key finding is that the overall disclosure level is low: fewer than a third (32%) of the major mercury-emitting companies disclosed mercury information. This is somewhat alarming as our sample covered 30% of all mercury emissions in the US, EU, UK, Canada and Australia. Importantly, in each jurisdiction the five highest-emitting companies are responsible for 41 per cent of the total emissions: That is, only a few companies are responsible for a significant amount of global mercury emissions. It is therefore difficult to understand why companies in our sample could believe their mercury emissions to be immaterial. Our findings are also similar to those of Gray (2005), who highlighted that only a few companies report SEA issues, and those that do fail to reveal the whole picture, so that they ultimately fail to fulfil the objective of reporting and discharge their accountability (Adams, 2004; Adams & Zutshi, 2004; Gray, 2001; Gray & Milne, 2004; Gray, 2000). As mercury is one of the most toxic substances known, these highest mercury-emitting corporations are found to be doing little to reduce mercury poisoning. In addition, although Australian corporations voluntarily disclose GHG information to gain competitive advantage (Rankin et al., 2011), major mercury-emitting firms globally, including Australian firms, do not disclose significant mercury information.

It should be acknowledged, however, that this study considers the corporate mercury disclosures in 2013, and the major push for broader disclosures happened after this. The SDGs and accompanying SDG Compass were first published in 2015, and the GRI materiality assessment was published in 2016 (GRI, 2016a; WBCSD, 2018). Moreover, the global agreement on mercury, the Minamata Convention, was initiated in 2013 but not ratified until 2017. It is

therefore possible that awareness of mercury pollution has now increased, a matter that might be explored in future studies.

The second main finding of this study was that the extent and content of mercury disclosure differed significantly among the reporting companies. The sample companies disclosed highly in some areas. Specifically, 80 per cent of reporting companies reported on emission-reduction strategies (including technologies), and more than half of the companies disclosed ongoing mercury monitoring and management plans (57%) and operational regulatory requirements, interactions and compliance (50%). Other important areas of disclosure include total mercury emissions (49%), other sources of mercury emissions (45%), the impact of mercury emissions (39%) and objectives and commitments to reduce mercury emissions (38%). On the other hand, the highest mercury-emitting corporations place the least emphasis on “mercury information exchange, public awareness and education” in disclosing mercury information in annual reports or on their websites. This implies that these companies do not recognise their obligation to global citizens.

The third key finding is that our study reveals major limitations in the current reporting regime in relation to corporate mercury emissions. Given that mercury is one of the most toxic elements, awareness of the general public, including corporate stakeholders, regarding mercury impacts is fundamental. UNEP has initiated a global agreement for eliminating mercury emissions, as corporate mercury disclosure is significant for the world; however, mercury disclosure in corporate reports is lacking.

The findings suggest that there may be fundamental problems in the way in which corporations identify material information for disclosures. Determining material items based on stakeholder consultation is an incomplete process because it usually does not include all stakeholders. Even if it did, all stakeholders are not aware of all the environmental pitfalls, and most of the stakeholders identify those issues that they heard from others without appropriate justification. As a consequence “the reports cover few stakeholders, cherry-pick elements of news and generally ignore the major social issues” (Milne & Gray, 2013, p. 17). Vogel and Roberts (2011) and Centner (2013) identified the limitations of the existing regulations in ensuring corporate disclosures and suggested updating of those frameworks. Our study also identified the limitations of the existing guidelines as well as weaknesses in applying the materiality assessments.

With the above in mind, implementation of the existing reporting guidelines along with a more focused emphasis on the international environmental agreements could solve these issues. However, using GRI guidelines may not provide meaningful and accurate information due to the contextual differences in reporting. For example, the very different nature of mercury including

transboundary and significant uncertainties in measurement require updating and contextualising of the GRI reporting guidelines (Fonseca et al., 2014). This situation applies not only to mercury but also to other pollutants such as lead, arsenic, and sulphur dioxide (Matsumura et al., 2014; Milne & Gray, 2013).

The fourth and final main finding is that the quality limitations, including lack of mercury reporting consistency, may well be attributed to the lack of a recognised corporate reporting framework, which we suggest should be a priority for international environmental standard-setters such as the GRI. In addition, there are fundamental limitations to the tracking of mercury reporting *via* PRTRs. Of the 55 countries with the highest mercury emissions, we identified only six with PRTRs, only five of which are available in English. Furthermore, due to measurement differences, the results of these five databases are not directly comparable. In line with the efforts to reduce mercury emissions *via* the Minamata Convention, we therefore suggest the creation of a global mercury PRTR. In addition, corporate mercury reporting could be enhanced by improving the imposed accountability by enacting provisions for mandatory mercury reporting and developing felt accountability by encouraging and campaigning for the public's right to information concerning mercury.

This paper contributes to the literature on social and environmental disclosures by exposing the limitations of the reliability of previous studies that used data from a single source. These self-produced corporate reports are lacking in comparability and reliability, particularly where there is no specific reporting standard or guideline. This implies the need for further emphasis on the verification and assurance of the corporate environmental disclosures. Moreover, SEA researchers need to be more cautious in using such single-source data for future research.

This paper also contributes to the literature by developing a best-practice mercury disclosure framework that might be utilised in future mercury studies as well as for investigating the reporting of other pollutants. The paper contributes to the theory by identifying the defective practices of the corporate materiality process applied in SER in identifying material issues for disclosing in their reports. More specifically, the regulators might provide a robust materiality assessment process listing the detailed steps required for application in such complex areas as social and environmental disclosures. The paper also contributes to policy by recommending changes in regulatory initiatives by ascertaining whether low disclosures mean low environmental risk, and low emissions or a high level of undisclosed information reflect high environmental risks. The present study is the first to systematically explore the incidence and quality of corporate mercury reporting *via* annual reports, sustainability reports, and websites.

This study has a number of limitations that might be addressed by future research. The study considered only public disclosures of a sample of 100 facilities from five jurisdictions with one year of data. It is noted here that these corporations also submit mandatory (private) mercury reports to their respective PRTRs. Future studies may conduct a longitudinal analysis and broaden the sample size to better generalise the findings. Further studies might also consider the motivations for both reporting and non-reporting using other methodologies, such as interviews and/or case studies to gain a deeper understanding of the reporting and disclosure practices of the mercury-emitting corporations. Future research may also identify the determinants of mercury disclosures for assisting regulators and policy makers in articulating corporate governance policies. In addition, as the study showed that the corporations that disclose materiality assessment processes also had their environmental reports independently audited, future studies might further investigate the association between materiality assessments and environmental assurance.

Finally, no attempt was made to evaluate the accuracy of corporate mercury disclosures, nor the consistency between what was reported *via* corporate reports and in PRTRs. This evaluation would also be a very valuable addition to our emerging understanding of corporate mercury disclosures.

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Appendices

Appendix 1. Comparative Mercury Reporting Practices of Australian Companies

Sl No.	Sample Contents	A	B	C	D	E	%
	Facilities in Top 20	2	3	2	1	1	
	Emissions by Facilities in Top 20	28.48%	10.24%	6.92%	4.57%	0.60%	
	No. of Words Disclosed	1,308	241	62	182	51	
(A)	Current Emissions						
1	Total mercury emissions (N)	√	√	√	×	×	60%
2	Mercury emissions intensity (N)	√	√	×	×	×	40%
3	Geographical site-level mercury emissions (N)	√	×	×	×	×	20%
4	Emission by type (i.e., air, water, and soil) (N)	√	√	×	√	×	60%
5	Mercury-added products (T)	×	√	×	×	×	20%
6	Manufacturing processes in which mercury or mercury compounds are used (T)	×	√	×	×	×	20%
7	Other sources of mercury emissions (T)	√	√	×	×	×	40%
8	Changes in mercury emissions (N)	√	√	×	×	×	40%
9	Reasons for changes in mercury emissions (T)	√	√	×	×	×	40%
10	Impact of mercury emissions (T)	√	×	√	√	√	80%
(B)	Mercury management						
11	Export/import of mercury (T/N)	×	×	×	×	×	0%
12	Assessment of mercury across the supply chain (T)	×	×	×	×	×	0%
13	Community concerns (T)	√	×	×	×	√	40%
14	Materiality of emission (T)	√	×	×	×	√	40%
15	Ongoing mercury monitoring and management plan (T)	√	×	×	√	×	40%
16	Risk-management process of mercury emissions (T)	√	×	×	×	×	20%
(C)	Reduction commitments, target, and strategies						
17	Objectives and commitment to reducing mercury emissions (T)	√	√	×	√	×	60%
18	Mercury reduction target (N)	√	√	×	×	×	40%
19	Statement of progress on achieving target (T)	√	√	×	×	×	40%
20	Emission reduction strategies (including technologies) (T)	√	√	√	√	×	80%
21	Mercury information exchange, public awareness, and education (T)	×	×	×	×	×	0%
(D)	Regulation and compliances						
22	Operational regulatory requirements, interactions, and compliance (T)	√	×	×	√	×	40%
23	Reporting requirements and compliance (T)	√	×	×	√	×	40%

Appendix 2. Comparative Mercury Reporting Practices of Canadian Companies

Sl No.	Sample Contents	F	G	H	I	J	K	L	M	%
	Facilities in Top 20	3	1	1	1	1	1	1	1	
	Emissions by Facilities in Top 20	16.88 %	7.29 %	4.23 %	3.32%	2.01 %	1.68 %	1.53%	1.53 %	
	No. of Words Disclosed	16	436	2,667	183	111	67	668	149	
(A)	Current Emissions									
1	Total mercury emissions (N)	x	√	√	x	x	x	√	√	50%
2	Mercury emissions intensity (N)	x	x	x	x	x	x	√	√	25%
3	Geographical site-level mercury emissions (N)	x	√	x	x	x	x	√	x	25%
4	Emission by type (i.e., air, water, and soil) (N)	x	x	x	x	x	x	√	√	25%
5	Mercury-added products (T)	x	√	x	x	x	x	x	x	12.5 %
6	Manufacturing processes in which mercury or mercury compounds are used (T)	x	√	x	x	x	x	x	x	12.5 %
7	Other sources of mercury emissions (T)	x	√	√	x	x	√	x	√	50%
8	Changes in mercury emissions (N)	x	x	x	x	x	x	√	√	25%
9	Reasons for changes in mercury emissions (T)	x	x	x	x	x	x	√	√	25%
10	Impact of mercury emissions (T)	x	x	√	√	x	√	x	√	50%
(B)	Mercury management									
11	Export/import of mercury (T/N)	x	x	x	x	x	x	x	x	0%
12	Assessment of mercury across the supply chain (T)	x	√	√	x	x	x	x	x	25%
13	Community concerns (T)	x	√	x	x	x	√	x	√	37.5 %
14	Materiality of emission (T)	x	x	x	x	x	√	√	x	25%
15	Ongoing mercury monitoring and management plan (T)	√	√	√	x	√	x	√	x	62.5 %
16	Risk-management process of mercury emissions (T)	x	x	√	√	x	x	x	x	25%
(C)	Reduction commitments, target, and strategies									
17	Objectives and commitment to reducing mercury emissions (T)	x	x	√	x	x	x	x	x	12.5 %
18	Mercury reduction target (N)	x	x	x	√	x	x	√	√	37.5 %
19	Statement of progress on achieving target (T)	x	x	x	x	x	x	√	√	25%
20	Emission reduction strategies (including technologies) (T)	√	√	√	√	√	x	√	√	87.5 %
21	Mercury information exchange, public awareness, and education (T)	x	x	√	x	x	x	x	x	12.5 %
(D)	Regulation and compliances									
22	Operational regulatory requirements, interactions, and compliance (T)	x	x	x	√	x	x	√	x	25%
23	Reporting requirements and compliance (T)	x	√	√	x	x	x	x	x	25%

Appendix 3. Comparative Mercury Reporting Practices of E.U. Companies

Sl No.	Sample Contents	N	O	P	Q	%
	Facilities in Top 20	1	1	1	1	
	Emissions by Facilities in Top 20	1.45%	1.42%	1.37%	0.84%	
	No. of Words Disclosed	246	32	16	250	
(A)	Current Emissions					
1	Total mercury emissions (N)	√	×	√	×	50%
2	Mercury emissions intensity (N)	×	×	×	×	0%
3	Geographical site-level mercury emissions (N)	√	×	×	×	25%
4	Emission by type (i.e., air, water, and soil) (N)	×	√	×	×	25%
5	Mercury-added products (T)	×	×	×	×	0%
6	Manufacturing processes in which mercury or mercury compounds are used (T)	×	×	×	×	0%
7	Other sources of mercury emissions (T)	√	×	×	×	25%
8	Changes in mercury emissions (N)	√	×	√	×	50%
9	Reasons for changes in mercury emissions (T)	√	×	×	×	25%
10	Impact of mercury emissions (T)	×	×	×	×	0%
(B)	Mercury management					
11	Export/import of mercury (T/N)	×	×	×	×	0%
12	Assessment of mercury across the supply chain (T)	×	×	×	×	0%
13	Community concerns (T)	×	×	×	×	0%
14	Materiality of emission (T)	√	×	×	×	25%
15	Ongoing mercury monitoring and management plan (T)	×	×	√	√	50%
16	Risk-management process of mercury emissions (T)	×	×	×	×	0%
(C)	Reduction commitments, target, and strategies					
17	Objectives and commitment to reducing mercury emissions (T)	×	√	×	√	50%
18	Mercury reduction target (N)	×	×	×	×	0%
19	Statement of progress on achieving target (T)	×	×	×	×	0%
20	Emission reduction strategies (including technologies) (T)	√	√	×	√	75%
21	Mercury information exchange, public awareness, and education (T)	×	×	×	×	0%
(D)	Regulation and compliances					
22	Operational regulatory requirements, interactions, and compliance (T)	√	√	×	×	50%
23	Reporting requirements and compliance (T)	×	×	√	×	25%

Appendix 4. Comparative Mercury Reporting Practices of U.K. Companies

Sl No.	Sample Contents	R	S	T	U	%
	Facilities in Top 20	1	1	1	1	
	Emissions by Facilities in Top 20	13.15%	3.33%	4.08%	1.76%	
	No. of Words Disclosed	32	246	186	49	
(A)	Current Emissions					
1	Total mercury emissions (N)	×	√	×	×	25%
2	Mercury emissions intensity (N)	×	×	×	×	0%
3	Geographical site-level mercury emissions (N)	×	√	×	×	25%
4	Emission by type (i.e., air, water, and soil) (N)	√	×	×	×	25%
5	Mercury-added products (T)	×	×	√	×	25%
6	Manufacturing processes in which mercury or mercury compounds are used (T)	×	×	√	×	25%
7	Other sources of mercury emissions (T)	×	√	√	×	50%
8	Changes in mercury emissions (N)	×	√	√	×	50%
9	Reasons for changes in mercury emissions (T)	×	√	√	×	50%
10	Impact of mercury emissions (T)	×	×	√	×	25%
(B)	Mercury management					
11	Export/import of mercury (T/N)	×	×	×	×	0%
12	Assessment of mercury across the supply chain (T)	×	×	×	×	0%
13	Community concerns (T)	×	×	×	×	0%
14	Materiality of emission (T)	×	√	√	×	50%
15	Ongoing mercury monitoring and management plan (T)	×	×	√	√	50%
16	Risk-management process of mercury emissions (T)	×	×	×	×	0%
(C)	Reduction commitments, target, and strategies					
17	Objectives and commitment to reducing mercury emissions (T)	√	×	×	×	25%
18	Mercury reduction target (N)	×	×	×	×	0%
19	Statement of progress on achieving target (T)	×	×	×	×	0%
20	Emission reduction strategies (including technologies) (T)	√	√	√	×	75%
21	Mercury information exchange, public awareness, and education (T)	×	×	×		0%
(D)	Regulation and compliances					
22	Operational regulatory requirements, interactions, and compliance (T)	√	√	√	×	75%
23	Reporting requirements and compliance (T)	×	×	×	×	0%

Appendix 5. Comparative Mercury Reporting Practices of U.S. Companies

Sl No.	Sample Contents	V	W	X	Y	Z	%
	Facilities in Top 20	3	4	1	1	1	
	Emissions by Facilities in Top 20	20.54%	9.09%	3.33%	0.76%	0.15%	
	No. of Words Disclosed	820	370	436	80	65	
(A)	Current Emissions						
1	Total mercury emissions (N)	√	√	√	×	×	60%
2	Mercury emissions intensity (N)	×	×	×	×	×	0%
3	Geographical site-level mercury emissions (N)	√	×	√	×	×	40%
4	Emission by type (<i>i.e.</i> , air, water, and soil) (N)	√	×	×	×	×	20%
5	Mercury-added products (T)	×	×	√	×	×	20%
6	Manufacturing processes in which mercury or mercury compounds are used (T)	√	×	√	×	×	40%
7	Other sources of mercury emissions (T)	√	√	√	×	×	60%
8	Changes in mercury emissions (N)	√	×	×	×	×	20%
9	Reasons for changes in mercury emissions (T)	√	×	×	×	×	20%
10	Impact of mercury emissions (T)	√	√	×	×	×	40%
(B)	Mercury management						
11	Export/import of mercury (T/N)	√	√	×	×	×	40%
12	Assessment of mercury across the supply chain (T)	√	×	√	×	×	40%
13	Community concerns (T)	√	√	√	×	×	60%
14	Materiality of emission (T)	×	×	×	×	×	0%
15	Ongoing mercury monitoring and management plan (T)	√	√	√	×	√	80%
16	Risk-management process of mercury emissions (T)	√	×	×	×	×	20%
(C)	Reduction commitments, target, and strategies						
17	Objectives and commitment to reducing mercury emissions (T)	√	√	×	×	×	40%
18	Mercury reduction target (N)	√	×	×	×	×	20%
19	Statement of progress on achieving target (T)	×	×	×	×	×	0%
20	Emission reduction strategies (including technologies) (T)	√	√	√	√	×	80%
21	Mercury information exchange, public awareness, and education (T)	×	×	×	×	×	0%
(D)	Regulation and compliances						
22	Operational regulatory requirements, interactions, and compliance (T)	√	√	×	×	√	60%
23	Reporting requirements and compliance (T)	√	×	√	×	×	40%

Appendix 6. Country Ranking by Mercury Emissions

Sl No.	Countries	Hg (Emission)	Sl No.	Countries	Hg (Emission)
1	China	575.205	29	COD	11.488
2	India	144.733	30	Iran	10.100
3	Indonesia	78.207	31	Zimbabwe	9.293
4	Columbia	63.890	32	Bulgaria	8.146
5	South Africa	60.448	33	Venezuela	7.767
6	Russia	58.996	34	Uzbekistan	7.577
7	Ghana	57.488	35	Korea, Republic of	7.223
8	United States	56.262	36	Mongolia	6.906
9	Bolivia	45.567	37	Pakistan	6.614
10	Sudan	45.446	38	Ukraine	6.546
11	Peru	39.303	39	Greece	6.513
12	Brazil	39.214	40	Papua New Guinea	6.178
13	United Republic of Tanzania	36.023	41	Malaysia	6.130
14	Philippines	33.135	42	Suriname	6.122
15	EU	29.577	43	Spain	5.980
16	Mexico	23.392	44	French Guiana	5.709
17	Australia (and Christmas Island)	21.346	45	Taiwan	5.493
18	Chile	19.353	46	Egypt	5.380
19	Ecuador	18.300	47	Argentina	5.053
20	Germany	17.730	48	Romania	5.027
21	Mali	17.348	49	France	4.926
22	Japan	17.228	50	Czech Republic	4.896
23	Nigeria	16.326	51	United Kingdom	4.820
24	Turkey	15.824	52	Zambia	4.685
25	Thailand	14.858	53	Italy	4.598
26	Poland	11.758	54	Canada	4.470
27	Vietnam	11.612	55	Mozambique	3.216
28	Guyana	11.579			

Source: Ranked based on UNEP data (AMAP UNEP, 2013)

Chapter 8

Summary and Conclusions

Summary and Conclusions

8.1. Introduction

A review of previous literature (Deegan, 2017; Gray & Laughlin, 2012; Mathews, 1997; Parker, 2011) shows that SEA research has made significant advances across a wide variety of social and environmental issues. However, evolving environmental issues raise concerns that have not yet been considered by SEA (Bebbington & Larrinaga, 2014). Gray and Laughlin (2012, p. 228) observed that “researchers appear to be less willing to examine the fundamental issues that originally motivated the development of the field”. Deegan (2017, p. 85) argued that “there really are some very real social and environmental problems ‘out there’ that need to be addressed and probably rather urgently”. Gray et al. (2014a, p. 327) also noted their frustration that “the really serious accounts of sustainability have yet to be imagined”. In identifying the reasons for this apparent failure, Cooper (2002, p. 454) highlighted that academics in SEA research at the start of this century concentrated on writing “theoretical pieces” using “impenetrable language”, which discourages a wider audience than those who research in this area. Deegan (2017, p. 69) also identified that most of the SEA research was not engaging or accessible and “tended to explain what is happening rather than evaluating the implications or ethics of what is occurring”.

Mercury is an apposite example of an urgent environmental issue yet to be explored within SEA research. Since 2013, mercury has been of increasing interest to environmentalists around the world due to the introduction of the Minamata Convention. Mercury’s toxicity was highlighted in the 1950s by the Minamata incident (Minamata Disease Research Group, 1968; Yorifuji et al., 2012). Mercury damages the nervous system and, at a high level of exposure, damages kidneys, lungs, babies in the womb, hearing, and memory (NPI, 2014). As an element, mercury cannot be destroyed (WHO, 2017) or reformulated into non-harmful substances (UNEP, 2011). Due to its transboundary nature (WHO, 2007), mercury can easily spread to other regions *via* air or water (Rahman, 2011; Siddiquei et al., 1992), and consequently, different national and regional agreements for controlling mercury have not been able to achieve their expected outcomes (Selin & Selin, 2006). In response to this issue, a global approach to controlling mercury, the Minamata Convention, is currently being developed by the United Nations Environment Programme (UNEP, 2016).

The global tool for mitigating the most severe environmental crises, the multilateral environmental agreement (MEA), has not received significant attention from the SEA perspective, though it has been the subject of research in other disciplines. For example, Khan (2016) evaluates the Basel Convention, Barrios (2004) examines the Rotterdam Convention,

Zhao and Ortolano (2003) investigate the Montreal Protocol, and Yoder (2003) examines the Stockholm Convention. All of these studies commonly focused, among others, on the dynamics that facilitated success: practical provisions and wider participation (Yoder, 2003; Zhao & Ortolano, 2003), the support of government, funding, local government involvement, and administrative capacity. Other studies identified the issues that hinder the countries in complying with the MEAs, identifying the lack of several factors such as resources (Ambalam, 2014), administrative capacity (Kannan, 2012; Zaelke et al., 2005), policies and plans (Kannan, 2012; Zoeteman & Harkink, 2005), skilled human resources (Raustiala, 1997), and scientific resources (Chayes & Antonia, 1995; Economic Commission for Africa, 2007; Kannan, 2012). The lack of such factors significantly adversely influences the implementation of MEAs, particularly in the developing world.

Though corporations are the significant mercury emitters globally, monitoring of corporate mercury emissions is not emphasised. For example, just three chlorine plants emit one-third of all the UK's mercury emissions (Winalski et al., 2005), and 97 per cent of total mercury was emitted to the atmosphere by only 60 plants in North Carolina in 2010 (Star News, 2012). Although some of the developed countries including Australia, Canada, Japan, the UK, and the USA have PRTRs to monitor their corporate emissions, most countries in the world do not. Furthermore, though corporations report mercury to the PRTRs, these reports do not meet the quality requirements. The mercury reports have limitations in terms of accuracy, understandability, completeness, timeliness, comparability, and verifiability (AMAP/UNEP, 2013a; Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009; UNEP, 2013a; Walcek et al., 2003). However, the parties to the Minamata Convention expect to collect mercury information from the corporations through PRTRs and submit it to the Minamata Secretariat, and so the extent to which these reports would meet the requirements of the Convention is in question.

Given the above concerns, mercury accounting, reporting processes, reporting quality, and accountability are potential fruitful avenues of research. This thesis offers empirical evidence in relation to the the quality of the reporting structure from the perspective of developed and developing countries, and also to the role of the Minamata Convention in ensuring mercury reporting and accountability of the parties to the Convention, and the mercury accounting and reporting quality of corporations, as important emitters of mercury. The four papers explore mercury accounting and accountability, drawing on interviews with the people engaged in the mercury-reporting process, evaluation of the Minamata Convention, UNEP publications, annual reports, sustainability reports, environmental performance reports, and evaluation of the discussions at the Intergovernmental Negotiating Committee (INC) meetings and the

Conference of the Parties (COP), as well as the reporting template for mercury reporting. Collectively, this work responds to calls for innovation in SEA research as well as moving beyond the focus on theory criticised by Cooper (2002). In addition, this work considers both the ethics and implications of SEA, in this case mercury reporting, as called for by Deegan (2017).

Paper 1 explores the reporting quality, commitments, and accountability of the parties to the Minamata Convention in a global context. While previous studies (Nelson, 2007; Nelson et al., 2009; Strezov et al., 2010; Telmer & Veiga, 2009; Walcek et al., 2003) have observed the quality limitations of mercury reporting, this paper addresses the question of how far the reporting provisions of the Minamata Convention will ensure the accountability of the countries for mercury emissions, and how the reporting provisions can be improved to ensure that accountability. This paper adopted a qualitative case-study approach and conducted documentary analysis comprising the relevant literature, UNEP technical reports, the proceedings of all the seven Intergovernmental Negotiating Committee (INC) meetings, discussions of the first COP, and the reporting format. Following the methods of the NPRI (2017b), O'Dwyer et al. (2005), Comyns and Figge (2015), the OECD (2008), and Burritt and Saka (2006), this paper applies the Conceptual Framework of Accounting (qualitative characteristics of accounting information) to identify the quality challenges of mercury reports and reported information (AASB, 2009; FASB, 1980), and uses O'Dwyer and Boomsma (2015) theory of accountability to explore the level of accountability of the parties to the Minamata Convention regarding mercury emissions, and how this accountability might be strengthened. This study reveals that the mercury reporting process and mercury disclosures are significantly lacking in quality, which makes them deficient in discharging accountability of the reporting parties to the Convention. Consequently, there is a significant risk in using the reported mercury information for decision making. The paper suggests further exploration of the extent to which felt accountability can address the gap in imposed accountability under the Convention.

Paper 2 explores the quality of Australian mercury reporting in the light of the Minamata Convention. As a signatory of the Convention, Australia is going to report to the UNEP Secretariat through COP. However, various studies, including those of Nelson (2007), Nelson et al. (2009), Telmer and Veiga (2009) and Strezov et al. (2010) have identified quality challenges in relation to Australian mercury reporting and reported information. In this context, there is reason to believe that Australia may not be in a position to meet the reporting provisions of the Minamata Convention. This paper thus addresses the research question, “*Is the Australian National Pollutant Inventory’s mercury accounting and reporting adequate to meet the reporting obligations under the Minamata Convention?*” Following the approach of the NPRI

(2017b), Comyns and Figge (2015), the OECD (2008), and Burritt and Saka (2006), this paper used the qualitative characteristics of accounting information – understandability, accuracy, comparability, verifiability, completeness, and timeliness (AASB, 2009; FASB, 1980) – to assess the quality of the existing reporting regime and explain the findings based on accountability typologies including imposed, felt, and adaptive accountability as described by O'Dwyer and Boomsma (2015). Based on eight interviews with 11 interviewees, the study found that while the Australian reporting is of sufficient quality to meet the obligations of the Minamata Convention, there are some deficiencies in reporting regarding understandability, comparability, and timeliness, particularly in relation to governmental determination and reporting of diffuse mercury emissions. Resourcing is identified as a significant factor that undermines the quality of mercury reporting in Australia.

Paper 3 explores mercury reporting accountability from a developing country's perspective. This paper is a response to the demand for social and environmental accounting research from the perspective of developing countries (Belal & Cooper, 2011; Belal & Roberts, 2010). Though developing countries are the worst victims of global environmental disasters (ITT, 2017), compliance with MEAs, especially by developing countries, is a serious concern (Ambalam, 2014). Lack of capabilities, commitments, and policies and plans constrain developing countries from complying with the reporting provisions of MEAs (Daudu, 2008; Kannan, 2012; Raustiala, 1997; Zoeteman & Harkink, 2005). However, developing countries are increasingly contributing to global mercury emissions (AllAfrica, 2013). In light of this, this paper answers the research question, *“To what extent will Bangladesh be accountable for compliance with the reporting requirements of the Minamata Convention?”* The study collected the opinions of the key stakeholders including academics, researchers, NGOs, and regulators through email interviews. The interview data is analysed from an accountability theory perspective, more specifically from the dimensions of the prerequisites of accountability including capability, commitment, and sanctions, as well as the emerging understanding of accountability within the context of MEAs. The study finds that Bangladesh is to some extent has capable of complying with the reporting provisions of the Minamata Convention, but it needs more support from UNEP and developed countries. The Convention, discussions in the INC meetings, and COP1 all acknowledge these challenges and the need for help, but whether the level of support provided will be sufficient remains unclear. Presently, while there are specific instances of raised awareness about mercury – such as among Bangladeshi dentists and dental colleges – there is limited awareness among government administrators, researchers, regulators, and the general public.

Paper 4 explores the volume and quality of voluntary disclosures of mercury emissions by major mercury-emitting corporations. As mercury is one of the most toxic substances known, stakeholders have the right to be informed about these emissions (Hadden, 1989; Roe, 2000; Sarokin & Schulkin, 1991). However, previous literature including that by Gray (2005) observed that corporations do not provide a complete picture of their activities, although accurate reporting of emissions motivates corporations to reduce their level of emissions (Blackman et al., 2004) and discharge their accountability (Gray (2000)). This paper answers the research question, “*To what extent do major corporate mercury emitters voluntarily disclose information about their mercury emissions?*” A qualitative content analysis was undertaken to evaluate the corporate mercury disclosures, based on a “Best-Practice Mercury Disclosure Framework”, in the annual report, sustainability reports and environmental performance report, and on the website. After evaluating the 100 highest-emitting facilities from five PRTRs including the US’s TRI, the Australian NPI, the Canadian NPRI, the UK’s PI and the EU’s E-PRTR, the study found that only a few corporations report mercury information, although just a minority of them emit the vast majority of mercury emissions. The study suggests that the development of a mandatory corporate mercury reporting standard, and unification of the PRTRs in order to increase their comparability, would substantially enhance corporate mercury accountability.

Whilst the four papers explore distinct elements of mercury reporting, considered collectively they highlight a number of implications. The following sections discuss these implications at the global, national, and corporate levels, together with the wider implications of the study for SEA research.

8.2. Sufficient Resources at the National and Global Level Are Required

A key barrier to implementing a comprehensive system for mercury reporting is resources. This thesis has shown that resource constraints to implementing environmental agreements are not only an issue in developing countries but also in developed ones. Moreover, divergent opinions of the parties in the global forum make the funding mechanism uncertain. Overall, failing to prioritise funding of the environmental mechanisms such as the Minamata Convention at the national and global level may make future life on the planet unsustainable.

An important finding of the thesis is that even developed countries may not be allocating sufficient funds for mercury reporting in their own countries, let alone contributing to funding the developing world. It is highlighted in Paper 2 that even for a rich country such as Australia, lack of resourcing is a key quality constraint in mercury reporting. Interviewees consistently pointed out that adequate resourcing is fundamental for high-quality mercury reporting, but that

government support for mercury reporting is insufficient to continue and improve the reporting programs. As a result, the significant level of mercury emissions from the diffuse sources is not being appropriately reported, and the reporting process is being delayed by years.

In a developing country context, financial resources (together with technical expertise and technological infrastructure) are also critical for the production of quality reports. However, discussions in the INC meetings reviewed in Paper 1 did not indicate that sufficient resources were likely to become available. Paper 3 evaluated the Minamata Convention, INC discussions, and proceedings of the COP1, and observed that the financial mechanism was among the most important issues under discussion. Most recently, COP1 could not sign the Memorandum of Understanding with the Global Environmental Facility (GEF), the main financial mechanism of the Convention, because of the divergent opinions of the parties and the GEF on the wording of the eligibility for receiving GEF funds for the projects.

An integrated approach to reporting of closely connected MEAs may reduce the funding burden. Considering the cost, time, and resources required for complying with the MEAs, a synchronised approach of reporting among the closely related MEAs could ease the burden of the parties, develop the quality of information, and improve the supporting and monitoring actions of the UNEP. Following the approach of the Basel, Rotterdam and Stockholm convention secretariats, a coordinated approach could reduce the unnecessary administrative activities, number of meetings, duration of meetings, number of reports, and ultimately the time and costs. The toxicity of mercury is such that a compelling “business case” for such a reporting method exists – but it is clearly yet to be made, at least to those with the capacity to fund it. To make the Minamata convention a success and maximise emission reductions, INC discussions did consider the possibility that signatory countries support funding for developing countries or for countries with economies in transition. However, no agreement has yet been reached on this issue.

8.3. Improved Country-Level Information Capture and Reporting Is Required

Given the significant impact of mercury emissions, accountability is a fundamental concern. This thesis shows, however, that there are no global reporting standards beyond the proposed reporting of the Minamata Convention, and reporting requirements under the Convention have a number of deficiencies. The key global implication of the study is, therefore, the necessity to improve national and global mercury reporting and to integrate this with corporate reporting.

Paper 1 showed that the Minamata Convention did not include any verification process for evaluating the quality of mercury reports provided. Indeed, the published discussions of the INC meetings did not emphasise quality criteria and accountability of mercury reports. To

ensure the quality of mercury reports, as with other multilateral environmental conventions, the Minamata Convention needs to include a verification process and also impose sanctions for poor- or non-compliance with the reporting provisions. Moreover, exclusions of some areas of mercury emissions from the convention could compromise the successful outcome of the convention.

Even more fundamentally, the basic data for national emissions reporting will be sourced from national databases, such as the Australian NPI. Paper 2 showed, however, that key aspects of mercury emissions – namely, emissions from diffuse sources – are collected only on an *ad hoc* basis. Furthermore, publication of this information may be delayed for years due to resource constraints in the central agency. As noted above, from the developing countries perspective, Paper 3 also identified resource constraints as one of the fundamental barriers to compliance with the reporting provisions of the MEAs.

Whatever the limitations of the Australian NPI, interviewees in Paper 2 were quick to point to one key strength – that the NPI exists. The validity of this claim was confirmed in Paper 4, which shows that only a handful of major mercury emitters have a publicly available database of mercury emissions. In addition, Paper 4 shows that the databases of those countries with emission databases are difficult, if not impossible, to compare.

The collective implication of these findings is that regulatory attention needs to be focused not just on the production of mercury reports but also on the underlying national reporting mechanisms used to compile these reports. Paper 2 showed that improvement of national reporting instruments is critical for improving reporting quality and ensuring accountability of the reporting parties. Ideally, a consistent method and tool would answer the call of Paper 4 and be constructed to enable public access to country-level emissions information around the world. In this way, emissions data would be able to be not only located but compared, with the ultimate outcome being the reduction of emissions. This was the case with the implementation of the TRI in the US: Pollution reductions were observed at a national level. This conclusion resonates with the studies of Hitchcock et al. (2013) and Mee (2011), who also called for global comparability of PRTRs.

In relation to corporate accountability, a standardised approach to the national collection of corporate mercury emissions data is especially important because Paper 4 shows that corporations, in most cases, do not disclose information, or disclose only insignificant information, on mercury in their annual report or their sustainability reports, or on their website. Moreover, reported mercury information is not comparable because there are no standards for reporting of this voluntary information.

8.4. Mercury-Specific Corporate Reporting Guidelines Are Required

Paper 4 evaluated corporate mercury information in annual reports, sustainability reports, environmental reports, and on the websites of 100 facilities working in 79 companies from five jurisdictions around the globe. The overall findings were of poor-quality disclosures of mercury information. Moreover, only a handful of the sampled major mercury-emitting companies (32%) disclose mercury information, even though five of the highest-emitting companies on average emitted at least 41 per cent (based on 100 facilities only) of global mercury emissions. The findings of this paper suggest that some major emitters did not disclose at all. Importantly, the reported information is neither comparable nor consistent as there are no mercury reporting standards. This is an urgent requirement if mercury accounting and reporting are to be improved.

Paper 4 highlighted the fact that even corporations with significant mercury emissions do not recognise mercury disclosures as comprising material information. Only 26 per cent of the non-mercury-reporting companies and 46 per cent of the mercury-reporting companies (on average only 29 per cent of the sample companies) conduct environmental materiality assessments or disclose materiality assessment processes. Paper 3 observes that different NGOs are taking initiatives to make the people aware of the impacts of mercury, which might help to develop awareness among the corporate managers and stakeholders in identifying mercury as a material element for sustainability reporting.

Paper 2 identified that corporate data submitted to NPI underpins national reports, but these data are inconsistent. For reporting of mercury information, different corporations use different bases, methods, and approaches, which restricts the consistency and comparability of the information. Furthermore, in some cases corporations use different methods in different years. Paper 4 articulated that lack of reporting standards/formats significantly impacts quality and quantity of mercury disclosures in annual reports, sustainability reports, environmental reports, and website content.

Paper 1 showed that there was no corporate-specific information included in national mercury reporting under the Minamata Convention; hence, whilst particular governments may capture corporate mercury emissions data, corporate accountability is unlikely to be significantly enhanced by the national reporting regime constructed under the Convention.

Collectively, the four papers show that there is an urgent need for the development of specific guidelines for the corporate reporting of mercury. This might be undertaken by global sustainability standard-setters such as the GRI or SASB, or under the umbrella of the Convention and the United Nations (perhaps linked to the Global Compact). Paper 4 provides

a starting point for the content of such a standard. More broadly, as pollutants differ significantly in terms of measurement and reporting, separate guidelines for a single pollutant or a cluster of pollutants have the potential to facilitate the reporting process and to ensure quality reporting. Accounting standard-setting institutions, regulatory bodies, and other government agencies could play a vital role in this respect.

Papers 2 and 4 identified the quality limitations of the corporate and national mercury-reporting process and information reported in their reports. To eliminate these quality limitations, the convention was expected to provide a reporting framework or format that would improve the quality of the reports. However, Paper 1 identified that the reporting format for mercury reporting under the Convention does not reflect the qualitative characteristics of accounting information, and hence there are no existing drivers of improvements to mercury reporting and the accountability of the reporters.

8.5. Wider Implications for SEA Research

As noted throughout this thesis, SEA research has advanced from a general concern with corporate reporting to focusing on particular significant social and environmental issues, including carbon (Haslam et al., 2014), water (Hazelton, 2015; Tello et al., 2016), human rights (Cooper et al., 2011; Hazelton, 2013a), climate change (Cooper & Pearce, 2011; Milne & Grubnic, 2011), and biodiversity (Samkin et al., 2014; Tregidga, 2013). Importantly, the majority of previous SEA studies focus on corporate reporting and its quality limitations (Deegan, 2017; Gray & Laughlin, 2012; Mathews, 1997; Parker, 2011). However, Paper 2 identified that the role of governments is also paramount in ensuring and improving emission accounting and reporting. Indeed, Paper 2 showed that the primary limitation in Australian mercury emissions data was not poor-quality corporate reporting of point-source emissions, but rather poor-quality government reporting of diffuse emissions. The implication for SEA research is that within each specific area of focus there are likely to be both government and corporate actors with important accounting and accountability roles, and that future research might consider more explicitly the role of governments in terms of directly collecting and disseminating information, as well as their role in regulating corporate disclosures. In particular, this study shows that governments play a central role in reporting under global conventions, but that these reporting regimes may not be robust. The results of this study of the Minamata Convention may be relevant for researchers exploring other pollutants and/or the operation of other conventions, including carbon under the Paris Agreement and the Kyoto Protocol, ozone-depleting substances under the Montreal Protocol, persistent organic pollutants under the

Stockholm Convention, and wastes that are transboundary in nature under the Basel Convention.

The study also seeks to make a contribution to SEA theory by showing how the conceptual framework of accounting is not only suitable for evaluating the qualitative characteristics of financial reporting, but can also serve as a useful tool for assessing the quality of environmental accounting and reporting. Some of the qualitative characteristics of accounting information as delineated in the conceptual framework of accounting have been used by O'Dwyer et al. (2005), Comyns and Figge (2015), and Habek and Wolniak (2016), Burritt and Saka (2006). The GRI (2011), the OECD (2008), and the NPRI (2017b) also suggest the use of these parameters for ensuring and providing higher-quality data to the users. This study extended the use of these characteristics in the case of mercury information under a global convention.

In relation to accountability, the study identified that resources, financial capabilities, administrative capacities, appropriate plans and policies, and skilled human resources at the country level and the global level are fundamental to achieving the objectives of the MEAs. At the national level, the developing countries face challenges of managing funds for projects on the environment after meeting their basic needs, while on the other hand, developed countries prioritise other areas over environmental causes in resource allocation. In the global context, due to the divergent needs and eligibility perspectives of the countries, global funding pathways also get obstructed. Lack of resources and capability may limit the accountability of the reporting entities, and consequently the reporting entities could either ignore the accountability or discharge reporting accountability irresponsibly by providing information that may lead to a deficiency in the qualitative criteria, including transparency. Again, as transparency is a prerequisite of accountability, lack of the same would negatively impact reporting accountability.

As noted above, in relation to accountability, a traditional view is that a necessary but not sufficient element of accountability is transparency, which is facilitated *via* reporting. Regulations and sanctions are imposed to facilitate and compel parties to report (Chenhall et al., 2010; Ebrahim, 2009; O'Dwyer & Boomsma, 2015). However, in the context of the Minamata Convention where there is national environmental reporting to a secretariat, there is little scope for imposing regulations and sanctions on the member states. The question therefore arises as to how such accountability could be achieved. In addition, the level of accountability differs among the countries based on their capacity and responsibility. Drawing on the insights of Gupta and Asselt (in press), accountability in this context flows in a number of directions: from the developed countries to the respective secretariat for reporting requirements, and also

from developed countries to the developing countries for funding to enable compliance with reporting requirements. Accountability of the developing countries also flows from developing countries to the secretariat for reporting, and from the developing countries to the developed countries, or to the people of the world for the funding they receive for implementing the MEA. Moreover, the Convention emphasises reporting, but there is little evidence of verification of the country reports, which consequently limits the achievement of accountability. In the context of the Convention (and other MEAs), therefore, felt accountability (O'Dwyer & Boomsma, 2015) – that is, improving the motivation of the parties to the Convention to preserve the environment by positive sanctions, such as giving preference in trade agreements and providing loans from the global monetary agencies for achieving environmental targets – may facilitate the achievement of accountability. The implication for SEA is that the theoretical model of accountability needs to be broadened in order to effectively engage with these more complex environmental issues and MEA arrangements.

In the corporate realm, this thesis also offers important insights in relation to materiality. Issues of capability, transparency, and sanctions may not ensure disclosure in the corporate reports unless the corporations understand that a particular element constitutes material information to be disclosed. This thesis has shown that a thorough materiality assessment based not only on stakeholder consultation but also on broad-based societal concerns, including MEAs, is required to identify the important environmental elements for reporting (Mullerat, 2005). MEAs are global efforts to mitigate universal environmental threats, which the party countries are expected to report. Non-recognition and non-reporting of the global environmental challenges by the corporations, the major emitters, makes the corporate reports unreliable and should be a priority for standard-setters, auditors, and practitioners.

8.6. Areas for Further Research

This thesis is an initial exploration of the issues regarding mercury accounting and accountability under the Minamata Convention. The four papers have identified a number of areas pertaining to mercury that future studies may take into consideration.

Paper 1 identified that the parties' rates of compliance with reporting provisions under different multilateral environmental agreements differ. A study could be conducted to identify the determinants motivating or hindering the rate of compliance with these agreements. Paper 1 also showed that there is a lack of accountability of countries in complying with the reporting provisions of the Minamata Convention. However, the paper did not indicate ways to improve the accountability of the parties. Further research might concentrate on ways of improving accountability for enhancing accounting and reporting quality. In addition, future studies might

explore other toxic elements, including lead, arsenic, carbon, or POPs. Comparative studies could be conducted on different parties to conventions such as the Paris Agreement, the Montreal Protocol, the Stockholm Convention, and the Basel Convention to determine their compliance status with regard to reporting provisions.

Paper 2 studied the quality of mercury reporting in the developed country context only. However, the capabilities of the national reporting instrument and the regulatory structure in the developed and developing countries may be different. Research could therefore be conducted to identify the current status, strengths, and limitations of the mercury reporting of developing countries in general, or of a group of developing countries, or a specific developing country. Paper 2 also recommended the development of a structure for preparing national mercury accounts, including a “National Mercury Balance Sheet” and “Mercury Flow Statement”, which could be the subject of further research. Future studies might also concentrate on mercury reporting by the high-emitting countries identified in Paper 1, as well as industries with high mercury emissions such as artisanal gold mining. Paper 2 also showed that the capture and reporting of Australian mercury emissions from diffuse sources was problematic. Further studies might be conducted comparing the approaches to dealing with the diffuse emissions around the globe and identifying effective ways of dealing with diffuse emissions. Such research might identify the lessons to be learned from the successful approaches to dealing with diffuse emissions in different countries.

Paper 3 was developed based on a single case of a developing country, Bangladesh, using a limited number of interviewees. Further studies comparing the capabilities and commitment of different developing countries based on more interviewees would provide more grounded and generalisable findings. Future studies might also concentrate on the accountability around funding provided by the GEF from the perspectives of the Convention Secretariat, the GEF, and recipients of assistance.

Paper 4 showed that the level of voluntary mercury information disclosure is low around the world, although it did not explore the reasons behind this. In view of this, future studies might explore why corporations disclose limited mercury information in their annual reports, sustainability reports, or website content. Are there any specific barriers to mercury disclosures? A study could be conducted to identify the determinants of mercury disclosures by determining the association between mercury emission levels, disclosure levels, and firm-specific characteristics. Further studies might explore the ways of improving the level of mercury disclosures. Do corporations need any motivational or regulatory support for increasing the level of disclosures? As discussed above, a key recommendation is the

development of mercury accounting and reporting standards. Future studies might determine the approaches, needs, and bases for mercury accounting and reporting standards, building on the framework developed in Paper 4.

8.7. Final Notes

This study explores the ways in which the quality of mercury reporting and of the reported information can be improved from three different perspectives, with particular reference to the Minamata Convention. Mercury is a toxic substance with wide-ranging negative impacts on human health and the environment, yet a number of national and regional approaches to controlling mercury emissions have failed. In a global approach to reducing mercury pollution, the Minamata Convention is currently being developed by the UNEP. As with other pollution conventions, the Minamata Convention also includes reporting provisions as a mechanism of accountability for reduction of mercury emissions. The author of this study is not aware of any study on mercury that has been previously conducted from a social and environmental accounting perspective, although studies focusing on mercury toxicity and its impact have mentioned the quality limitations of mercury reporting. To fill this research gap, this thesis has examined mercury-reporting quality and accountability from three perspectives: corporate mercury reporting, country-level mercury reporting (focusing on Australia), and global mercury reporting under the Minamata Convention. This study contributes to the understanding of the current challenges pertaining to mercury reporting processes and identifies approaches to overcome those challenges.

Collectively, the four papers show that while there is a mandatory mercury-reporting structure in some jurisdictions, the reporting process and the information reported suffers from major quality challenges in terms of meeting user needs for controlling mercury emissions. To achieve the objective of the Convention, a funding mechanism having sufficient contributions from the donors at the global level, and allocation of necessary funding for mercury accounting, reporting, and monitoring at the national level, are critical. Accurate reporting by corporations and countries needs improvement. In particular, corporate materiality assessment needs to consider the broader societal issues raised by MEAs in ascertaining the items to be reported in the environmental reports. This thesis complements the current literature by identifying the quality challenges of mercury reporting and exploring the ways of overcoming those hurdles. Specifically, introducing a verification process for country-level reports to the UNEP Secretariat, incorporating all the areas of emissions within the orbit of the Convention, enhanced assistance for reporting, and development of mercury accounting and reporting standards for corporations will all contribute to enhanced accountability. As this thesis

represents the first research to the author's knowledge to focus on mercury reporting, there are a number of possible future research trajectories. Future research is urgently needed to develop robust mercury reporting structures for corporations, to review national mercury accounting and reporting standards in countries other than Australia, and to further develop the reporting practices of parties to the Minamata Convention.

Overall this thesis shows that there is a troubling lack of quality in mercury reporting. The corporate, national, and even global reporting structures for mercury do not fully satisfy the quality criteria as stated in the conceptual framework of accounting. Paper 1 found that the global reporting framework under the Minamata Convention also suffers from important limitations. Given the importance of reducing mercury emissions, it is encouraging that a global agreement such as the Minamata Convention has been initiated. At the national level, Paper 2 identified the role of the government as being critical for the regulation of an environmental information reporting structure and for the quality of national mercury information, and it is the government that ultimately achieves the success or failure of the program. The paper found various deficiencies in this process, primarily due to a lack of funding for the reporting program. Paper 3 shows that a lack of funding restricts the developing world from complying with the MEAs in general and the Minamata Convention in particular. The implications of non-compliance with the Minamata Convention are significant as this convention has been introduced to eliminate an element that is transboundary in nature. Paper 4 shows that most of the major mercury-emitting corporations (68%) are not disclosing any information on their emissions in their annual reports or sustainability reports. Some corporations (32%) are producing environmental reports, but the reports do not reflect the actual emission states of the corporations. In summary, this thesis reveals that much work remains to be done in order to create the robust mercury accounting framework required to achieve the objectives of the Minamata Convention.

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Appendix 1. Ethics Approval Letter

Appendix 1 (pages 287-288) removed from Open Access version as they may contain sensitive/confidential content.