A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Evaluating the Role of Information Disclosure for Environmental Governance in China

Natalie CHEONG

May, 2013

Budapest

Erasmus Mundus Masters Course in Environmental Sciences, Policy and Management

MESPOM

This thesis is submitted in fulfillment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

Supported by the European Commission's Erasmus Mundus Programme

Notes on copyright and the ownership of intellectual property rights:

(1) Copyright in text of this thesis rests with the Author. Copies (by any process) either in full, or of extracts, may be made only in accordance with instructions given by the Author and lodged in the Central European University Library. Details may be obtained from the Librarian. This page must form part of any such copies made. Further copies (by any process) of copies made in accordance with such instructions may not be made without the permission (in writing) of the Author.

(2) The ownership of any intellectual property rights which may be described in this thesis is vested in the Central European University, subject to any prior agreement to the contrary, and may not be made available for use by third parties without the written permission of the University, which will prescribe the terms and conditions of any such agreement.

(3) For bibliographic and reference purposes this thesis should be referred to as:

Cheong, N. 2013. *Evaluating the Role of Information Disclosure for Environmental Governance in China.* Master of Science thesis, Central European University, Budapest.

Further information on the conditions under which disclosures and exploitation may take place is available from the Head of the Department of Environmental Sciences and Policy, Central European University.

Author's declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Natalie CHEONG

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:

Natalie CHEONG

for the degree of Master of Science and entitled: Increasing the Effectiveness of China's Open Environmental Information Measures: The Role of Information Disclosure

Month and Year of submission: May, 2013.

The outcome of China's Open Environmental Information measure (2008) is evaluated using a new methodological framework developed for the context of this research. This framework combines three concepts and evaluation tools related to transparency and policy, to form a framework that improves the structure and comprehensiveness of evaluation to analyse transparency interventions. The resultant findings show multiple points of weakness in using transparency as a tool for traditional environmental governance in China, as weaknesses within the system are re-embedded. Despite this, alternative pathways have emerged from this toenact genuine changes in enterprise behavior. Central to these pathways are nongovernmental actors. These contextual findings provide adequate context for the second stage of the research, which aimed to evaluate the extent to which a Pollution Release and Transfer Register (PRTR) that is being trialed in Tianjin, China, can contribute to the Open Environmental Information measures.Findings show that a PRTR can contribute to the existing context via increasing the scope and quantity of pollutants reported. A key weakness the pilot-PRTR continues to entrench however, is the poor verifiability of data accuracy.

Keywords: Open Environmental Information Measures, Environmental Policy, Governance-by-disclosure, Transparency Evaluation Framework, Pollution Release and Transfer Register, China

---

Table of Contents

1 Introduction

The environment of modern industrial China deviates from its traditional philosophy that emphasizes harmony between humans and their environment. Concepts such as Yin and Yang, are cornerstone to traditional Chinese culture and are found in Chinese religion, philosophy, poetry and art(Fan 2000; Jenkins 2002). The catalysts for such deviation are held to be the regimes of Mao Zedong, who called for 'man to conquer nature' in the 1950s, and Deng Xiaoping, who initiated the Open Door Policy of China in 1978(Economy 2010).

The reform strategies that the Chinese government has undertaken have proved to be a remarkable economic success. China's economic growth has averaged at ten per cent a year over the last two decades(Paltsev et al. 2012). Its GDP per capita (PPP) has increased over 20 times from US$379 (1980) to US$7632 (2010)(Cai and Lu 2013). This has lifted more than 600 million people out of poverty, increased literacy from 20% to 91%(Hannum, Liu, and Frongillo 2012), and increased average life expectancy from 65 to 75 from 1975 to 2010(Mok et al. 2011). In 2007, China outpaced Japan to become the world's second largest economy, and continues to have an influential presence in the global economy (Barboza 2010; Shambaugh 2011). In spite of this, there have been significant costs. The intensification of environmental destruction and degradation that followed has resulted in a loss of ecosystem services, thus lowering the natural capacities of forests, water and soil to purify air, and breakdown harmful substances(S. Cao, Wang, and Chen 2010; Piao et al. 2010).

Impacts of Pollution: Urgency and Extent

The impacts of pollution are prominent throughout China. Placed in a global context, China is home to 16 of the 20 most polluted cities in the world(Yu et al. 2012). The pollution produced within its local boundaries has transboundary impacts. It has for example resulted in significant acid rain problems in Korea and Japan(Kelly 2010; Henry, Kim, and Lee 2011). On a local scale, it is estimated that up to 90 per cent of China's rivers and lakes are

polluted(Economy 2010; Palaniappan et al. 2011). Air quality is severe and deteriorating in many cities, and one-third of the 113 cities surveyed by China's Ministry of Environmental Protection (MEP) in 2010 failed to meet ambient air quality standards set by the World Health Organization, which also estimates that only one per cent of China's city dwellers breathe air of acceptable levels(Dansie, Lanteigne, and Overland 2010). The rate of lung cancer has increased by 465% in 30 years (Zhao et al. 2010) and it is estimated that some 650,000 deaths are caused by air pollution annually(L. Lee and Lv 2009; Chen 2013). Information about the state's soil pollution from a 5-year survey conducted from 2006-2010 is considered a national secret, and continues to be withheld by the MEP(Huang et al. 2010).

With climate change exacerbating the rate at which global climatic systems affect environments, the environment in China faces growing pressure(Piao et al. 2010; Xiong et al. 2010). Climate change has been attributed to the Gobi desert expanding south, towards the north of China where its capital city Beijing is located(Jiao 2010). Mega-engineering projects, such as the North-South Water Diversion Project are underway to counter desertification and provide water to residents in the North(Dong et al. 2011). The quality of water diverted is critical to human and ecosystem health; in addition, the diverted water will result in lower volumes of water in the Southern rivers, and therefore intensify pollutant concentration(Ren et al. 2011).

China is increasingly recognizing that the impacts of climate change and pollution will be resource intensive to resolve, and cannot for example, simply be resolved through technocratic means. In China's 11th and 12th Five-Year Plan (FYP), China recognized climate change, and even considered it a key objective(J. Li and Wang 2012; K. Lo and Wang 2013). It has been suggested that the environment could be an avenue through which fundamental, systemic change within the Chinese government occurs(Wong 2009).

'New media's' influence on Environmental Governance

The advent of 'new media' within China has significant impacts on environmental governance. 'New media' is content that can be accessed on-demand through digital devices, regardless of geography and time. It also allows for individuals to generate new and unregulated content.(J. Wang 2010; Castells 2011) This 'virtual social platform' is a source of dilemma for China, a governance system in transition. On one hand, connection to networks of knowledge is critical for the economic emergence of China. For the advancements of its political and economic ambitions both locally and globally, access to new ideas and streams of information is essential for its population at all levels(J. Wang 2010). On the other hand, access to information enables the population to challenge the government's legitimacy, disseminate sensitive information, and organize social movements against the government(Stockmann and Gallagher 2011).

Despite these concerns, access to the Internet is supported by the Central Government's 12th FYP, and to date, access to virtual information has grown rapidly in China. The number of Internet users increased from 65 million to approximately 500 million from 2002 to 2011(Grumbach 2013). Sina Weibo; a micro-blogging site, where access to discussions of politically sensitive issues, injustices and first-hand information about protests and disasters are featured, has seen a six-fold increase in the number of micro-bloggers to 350 million from 2011 to 2012(Guo et al. 2013). This information platform has altered the citizen-government relationship, considering that traditional media within China was, and in some areas, continues to be heavily controlled by the state(Stockmann and Gallagher 2011).

An example of this alteration was observed during the winter of 2012-13, which saw air pollution in Beijing at record high levels, exceeding the official scale of 500 on the Air Quality Index (AQI)(Embassy 2013). Information released by the state government was almost consistently lower than data released by the US Embassy in Beijing on Twitter(J.

Zhang 2013). 'New media' facilitated comparisons and exposed persistent contradictions, which were publicized widely throughout the 'new-media platforms' such as QQ Weibo and Sina Weibo. This successfully resulted in the Chinese Ministry of Environmental Protection (MEP) altering the timeliness of reported data to minimize opportunity for data manipulation(J.-J. Cao et al. 2012).

The utilization of 'new media' has also facilitated the swift organization of social movements that occur outside of formal structures such as NGOs, unions and political parties. Environmental demonstrations regarding new developments or persistent polluters are increasingly organized via 'new media'. This occurred most recently in Dalian and Shifang(LAGERKVIST 2012; Goron 2012), successfully resulting in the eviction and relocation of polluting companies. Notwithstanding environmental protests, research from Tsinghua University estimates that in 2010, there were 180,000 protests, riots and mass gatherings in China(G. He et al. 2013; Stevens et al. 2013). According to the Chinese Police Academy, this has increased from 90,000 protests in 2006 and 8,700 in 1993 (Göbel and Ong 2012).

1.1 Research rationale & site of study

In the last 30 years of China's rapid development, the willingness of the central governmentto enforce the environmental policies it has developed has fluctuated, and has been generally weak. This is attributed tothe prioritization of economic objectives(Breznitz and Murphree 2011). As a result, the funds that are allocated to the Ministry of Environmental Protection and local environmental protection bureaus are severely inadequate for environmental protection(Y. Li et al. 2013). These bodies are often understaffed and lack technical capacity and opportunities for knowledge development(C. He, Zhang, and Rui 2012).

Capitalizing on Opportunities

From an environmental governance point of view, the advent of 'new media' is a key opportunity to increase the number of 'unofficial' environmental officers.The significant potential to use information as a tool for improved governance has not gone unnoticed by China'sMinistry of Environmental Protection (MEP), which developed the Measures on Open Environmental Information (OEI) in 2008(L. Zhang et al. 2010; Tan 2012). This measure affects both local governments and heavily polluting enterprises. Itaims to propel the generation of environmental data, and increase public access to environmental information to improve the transparency, effectiveness and legitimacy of environmental governance in China.This style of governance, where transparency is used to improve outcomes, is termed, 'governance-by-disclosure(Gupta 2010).'

A further intervention that could support 'governance-by-disclosure' in China is a pilot 'Pollution Release and Transfer Register' (PRTR), which is a pollution catalogue of emissions released by industriesthat will be made available to the public. The pilot project is funded under the Environmental Governance Program (EGP), which is a joint partnershipbetween the European Union and the Government of China.

The pilot-PRTR is currently under development, and will be trialed in Tianjin-Economic Technological Development Area (TEDA),150 kilometres southeast of Beijing. TEDA is situated within a Special Economic Zone in Tianjin city, known as the Tianjin Binhai New Area (TBNA). Within this area, several sub-zones of industrial clusters exist. TEDA is one such industrial cluster.

The pilot-PRTR trial will be carried out in two phases. Phase I will be conducted from January 2013 to December 2013in the TEDA sub-zone, whilst phase II will be conducted in the following year from January 2014 to December 2014, and will include three additional

sub-zones; namely, the 'port free zone,' 'harbour industrial zone,' and the 'hi-tech industrial zone.'

Figure 1-1: Administrative, financial and political influences of the pilot-PRTR

(Source: Created by author)

From the EU perspective, the overarching aim of this program is to gain a clearer insight into operational procedures of China's legislative, political and operational context, and to advocate the use of transparency within environmental governance. Conversely, from the perspective of the Chinesegovernment, this project aims to maximize the transfer of knowledge from the EU to facilitate the ease of pollutant reporting by companies. Further details on the implementation of PRTR in TEDA will be elaborated later.

1.2 Problem definition

This research will address two main problems. The first problem is a gap within the academic literature examining how a PRTR, as a tool for environmental disclosure, fits into the environmental governance context of China. The second problem is the absence of a

comprehensive methodological tool that is able to evaluate an environmental transparency intervention with adequate structure, breadth and depth.

This research thus has two aims. The first is to provide improved insights to how a Pollution Release and Transfer Register (PRTR) can contribute to improving China's environmental transparency policy. This study provides a distinct contribution to this field, as although PRTR has been implemented in more than 40 countries, China provides a unique governance contex, which has not been previously explored.

The second aim of this research is to develop an environmental transparency evaluation framework that provides a clear structure,which broadens and deepens possibilities for locating key opportunities and gaps in transparency policy. Existing environmental transparency evaluation tools fail to make explicit the 'structural process' of transparency, or solely focus on 'transparency criteria,'(Fung et al. 2004)and in doing so, neglect other criteria necessary to consider when evaluating a policy. The new framework merges the strengths of three existing frameworks, thus allowing deeper and broader examination of the context. It could also serve as a future evaluation tool for TEDA's pilot-PRTR. These two aims thus set the boundaries of the research questions presented below.

1.3 Research question

The research will examine two questions:

RQ 1: How can transparency and environmental policy tools and concepts be integrated to evaluate information disclosure interventions?

*RQ 2:*How can a PRTR contribute to the achievement of China's Open Environmental Information measures?

1.4 Research overview

The five key points listed below correspond with figure 1-2 bekiw to depictthe structure and logic used to address this research question:

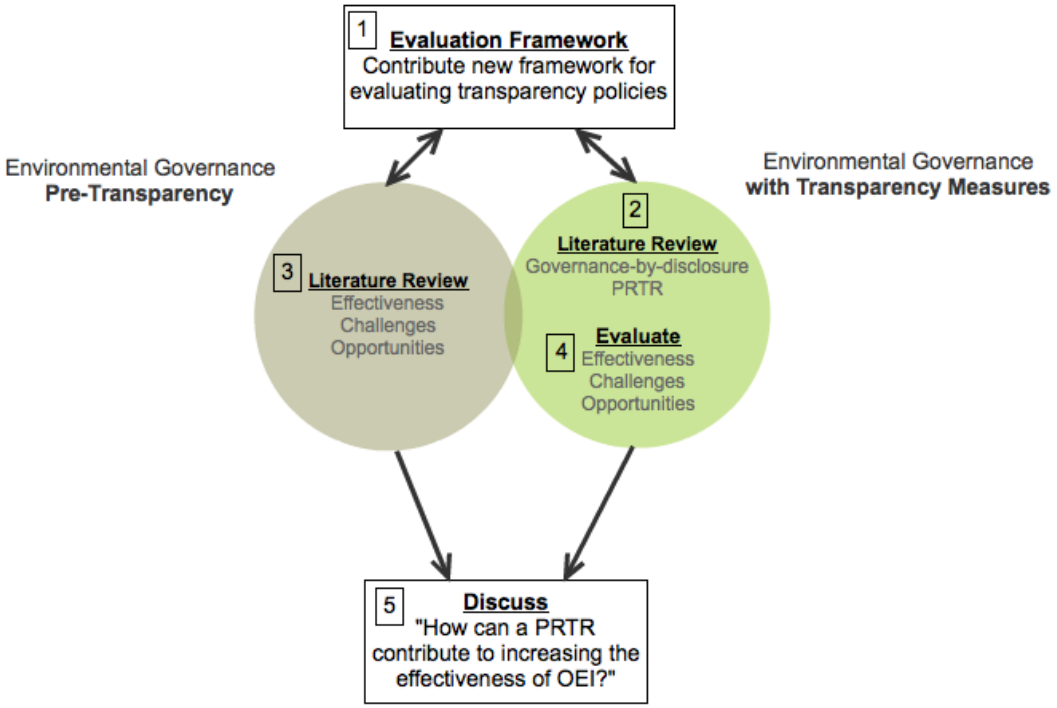


Figure 1-2: Overview of research contributions, relationships and outputs (Source: Created by author)

(1) A new environmental transparency evaluation framework was developed to bridge the gaps within existing frameworks. Its development was influenced by the Chinese governance context and China's OEI transparency policy

(2) A literature review on 'governance-by-disclosure' and PRTR was conducted to examinie the development, strengths and limitations of this new form of governance

(3) A literature review of the environmental governance context in China prior to the introduction of the OEI transparency policy was conducted to examinethe extent of its effectiveness

(4) An evaluation of the OEI transparency policy within China was conducted to examine how it fits with the context of governance, and the extent of its

effectiveness. This is followed by field-research findings on how the pilot-PRTR will be implemented.

(5) From the findings above, a discussion answering the research question, "howcan a PRTR contribute to increasing the effectiveness of OEI?" ensued

1.5 Disposition

Chapter 1 provides the environmental and social rationale for the development of governance-by-transparency in China. It introduces the relevance and value of this research, at a juncture where a pilot-PRTR is being developed in China. This chapter also includes the methods used to collect research findings.

Chapter 2 introduces a new methodological/analytical framework developed by the author, to evaluate environmental transparency policy in China. It is suggested that this new framework can be used to evaluate the outcome of the pilot-PRTR in 2014. The chapter then proceeds to identify research limitations and describes the audience for which this research may be useful.

In Chapter 3 lists the research limitations and scopeand Chapter 4 provides a more thorough overview of the literature regarding'governance-by-disclosure'. This will follow by a literature review of 'PRTR' in Chapter 5.This will provide context for the use of such concepts and tools within environmental governance.

Chapter 6 provides context on environmental governance in China, it provides an overview of the governance structure, and highlights key limitations. It also provides a summary of environmental legislation, and key policies relevant for the research discussion.

Chapter 7 presents the findings on the 2008 transparency *Measures on Open Environmental Information,* a key governance-by-disclosure policy measures in China. It will use findings from

the field and academic literature, and structure its findings according to the methodological framework.

Chapter 8 presents findings from field research on the implementation of PRTR in China. Using the findings from the given chapters above, Chapter 9 answers the research question by discussing the contribution that a PRTR can make within the existing environmental governance context of China. Chapter 9 then concludes the paper by summarizing the key research findings.

1.6 Method

'Methods' are defined as tools, such as 'interviews,' which are used to extract findings from 'bodies of knowledge,'which are for example,academic literature and knowledge possessed by interviewees. This is differentiated from 'methodology,' which is the approach undertaken. Methodology can be used to guide research and organize research findings in a structured way. In spite of this distinction, there is a close relationship between methods and methodology. For instance, methodology can influence the types of methods selected, and in turn, findings derived from the methods are inputs for the methodological framework.Although the methodology influenced the choice of research methods, this section will first focus on the methods applied within this research.

The 'bodies of knowledge' on which research methods were utilized includes (i) academic literature (ii) documentaries and 'new media' and (iii) field-research. Prior to the field-research, background studies were conducted over three months, to develop a deeper contextual understanding, and shape field-research processes.Academic literature was central to this research, and themes explored include 'environmental transparency evaluation methodologies,' 'governance-by-disclosure,' 'PRTR,' 'environmental governance context of China' and 'Open Environmental Information Measures'.

Table 1-1: An overview of methods and thematic content explored

	Literature / Media Reviewed	**Outputs**
1	*Literature review* • Policy & Environmental Policy Evaluation Frameworks • 'Governance-by-transparency' concepts • Models of effective communication *Field research* • Observation and interviews to adapt evaluation criteria to context	Methodology
2	*Literature review* • Environmental governance structure in China • Environmental legislation in China • Environmental policies: effectiveness, limitations, opportunities	Pre-Transparency Environmental Governance: *Opportunities and Gaps*
3	*Literature review* • Governance-by-disclosure • Measures on Open Environmental Information ○ Effectiveness, challenges, opportunities • Pollution Information Transparency Index (PITI) • Greenpeace: 'Silent Giants;'research on industry compliance *Media review:* • Twitter: following BeijingAir (US Embassy's Official Air Quality Index), ChinaEconomist, ChinaReview etc. • Online news: ChinaDaily, NASA, Reuters etc. • Academic's blogs: Hsu, A. (Yale Environmental School), Andrews, S (Environmental Consultant in Beijing) etc. • Documentaries: PBS, CNN, Vice *Field-research* • CSR reporting (quality and extent) • Drivers of transparency • Institutions	Environmental Governance with Transprency
4	*Literature review* • Development History • Characteristics *Field-research* • Design and planned implementation in TEDA	PRTR

'New media'was also examined to contextualize environmental governance and pollution in China. The mediums included online news articles, twitter and web-journals of academics, journalists and consultatnts. Documentaries made by both television channels (i.e.: PBS) and

ordinary citizens (i.e. VICE) were also examined. As emphasized in the introduction, media, in particular, 'new media' has a growing importance as a tool for raising environmental awareness andorganizing social movements in China. Table 1-1 depicts the themes and outputs of the literature and media reviewed.

Field-research was conducted in Tianjin-Economic Technological Development Area (TEDA) and in Beijing from April 7th to April 17th 2013. The purpose of the field research was to (i) develop a place based understanding of PRTR development and its planned implementation in TEDA (ii) verify findings within the academic literature, and (iii) access information that could not be located within the academic literature and other information sources.

Research methods employed during the field-research included*semi-structured interviews* with relevant stakeholders,*participant observation* during seminars and feedback sessions held for companies in TEDA; where observations on relationships, response, and gaps could be made from interactions between stakeholders, and a *review of documents* provided by TEDA, which included surveys conducted with companies regarding their views on PRTR, and TEDA annual reports. Table 1-2 summarizes the field research components.

Table 1-2: Field research components (Source: Created by Author)

Interviews	***Participant observation***
(s) *TEDA:* Eco-center, EPB, EPA, Administration Commission	(v) Feedback sessions with companies
(t) *NGO:* Institute of Public and Environmental Affairs (IPE)	(w) Training and information seminar with companies and TEDA authorities
(u) *Outsider views:* NDRC	(x) Conference with experts on PRTR pollutant development list
Document Reviews (Provided by TEDA)	
• Raw survey data on industry motivations, limitations and assistance required for voluntary participation in PRTR	
• TEDA and Eco-center Annual Reports	

Interviews were held with representatives from TEDA Administrative Commission (AC), TEDA Environmental Protection Bureau (EPB), TEDA Environmental Protection Agency (EPA), TEDA Eco-Center (TEC) and the Institute Public and Environmental Affairs (IPE). The description below of each stakeholder group represented demonstrates their deep involvement in the PRTR project, their knowledge and relationship with environmental governance in China, and their anticipated roles in the pilot-PRTR. These thus provide therationale for their selection.

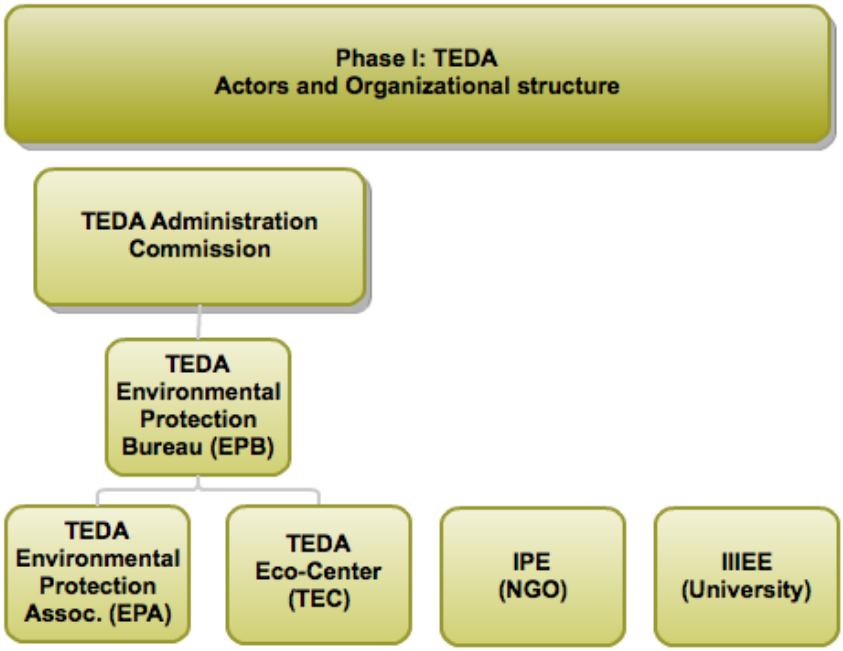


Figure 1-3: Actors and Organizational Structure

(Source: Created by Author)

TEDA Administrative Commission(AC) is the headquarters of the TEDA sub-zone, comprising of departments that manage various activities within TEDA. Although the AC's structural architecture parallels that of a local government ministry, it should be understood as a management body that operates under the guidiance of the Tianjin local government.

The environmental department within the AC is the authority involved within this project. It provides general direction for the environmental protection bureau (EPB) and is also the body that Eco-TEDA reports directly to. The vice-director of TEDA administrative commission also oversees the environmental department and was interviewed for this project.

*TEDA Environmental Protection Bureau (EPB)*has four main functions; this includes conducting environmental impact assessments (EIA), environmental monitoring, environmental supervision and an environmental office. The bureau is empowered with the authority to enforce law and issue fines for violations. It has 35 staff members. Its breakdown is outlined in table 1-3 below.

Table 1-3: Breakdown of staff members in TEDA EPB (Source: TEDA TEC 2013)

Functions	**Staff numbers**
Environmental Impact Assessment	7
Environmental Monitoring	16
Environmental Inspection	7
Environmental Office	5

TEDA EPB's environmental officers will undergo a training to be equipped with the necessary skills for this project, and together with the EPA will work together with industries to develop solutions to lower the pollution emission quantities. The vice-director of TEDA EPB and the chief monitoring inspection officer were interviewed for this project.

*TEDA Environmental Protection Association (EPA)*works with industries within the TEDA sub-zone. Hazardous chemical and heavy industries are members of the EPA. This is a channel of feedback and communication between target industry groups and the

sub-zone. TEDA EPA acts as the communication body for best practices, and aim to work together with industry to develop environmental solutions.

The main role of EPA within this project is that of a communication, and training of environmental health and safety officers from industries. Together with the EPB, the EPA will work together with companies during site visits to develop pollution reduction solutions. Administratively, the agenda of the EPA is influenced by the EPB, which it reports to. The EHS training officer from EPA was interviewed for this project.

*TEDA Eco-Center (TEC)*is a non-governmentalbody in TEDA that was founded in 2006 to advocate low-carbon technologies amongst industries. It has also been a platform for the development and co-ordination of past pilot-projects including energy-efficiency, industrial symbiosis and waste management. The TEC is funded by the EPB, and reports to both EPB and TEDA administrative commission.

TEC is the central body for the co-ordination of the pilot-PRTR project. It communicates with all main stakeholders, and organizes workshops, feedback sessions, and seminars for the industy partners. The director of TEC and project manager of the pilot-PRTR initiative was interviewed for this project.

*The Institute of Public and Environmental Affairs (IPE)*is a non-profit organization based in Beijing, which aims to improve environmental outcomes in China by promoting transparency and increasing the accuracy and availability of environmental information to the public. It has been involved in ranking China's local governments based on environmental information transparency, and also works directly with companies who violate environmental legislation for improving environmental outcomes. IPE is funded by the Rockefeller Brothers Fund, Energy Foundation and SEE Foundation <基金会>.

IPE's role in this project is to develop a list of pollutants specific to China's context, develop documents through which companies report their emissions, and is also a partner in conducting training workshops for companies. The director of IPE was interviewed for the purpose of this project.

Interview and post-interview methods

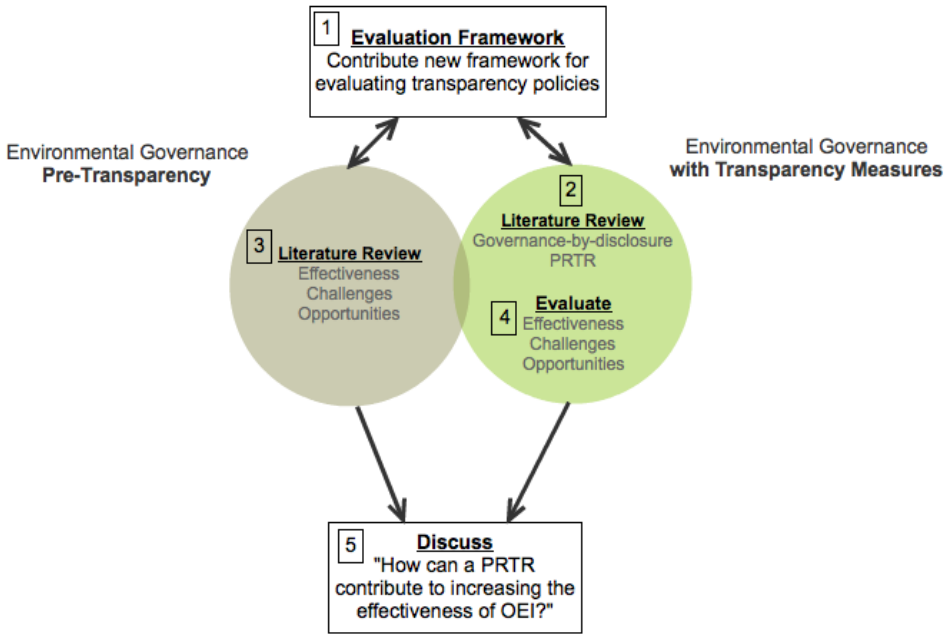
Semi-structured interviews were used, as they provided opportunities to explore themes relevant to this research, whilst keeping prospects for new inflow of information open. This method of interviews was selected, as the contextual understanding of TEDA was unclear. Semi-structured interviews thus helped to supplement existing knowledge gaps.

During the course of the interview, several other techniques were employed. This included **'*mind-mapping*,'** where requests were made to draw the logic and flow of processes. This technique was especially useful in instances where administrative structures and relationships were depicted. Other techniques used during interviews were ***triangulation***, where the same question was posed to different interviewees. This was used to examine the consistency of findings. Where inconsistency arose, for example, regarding the numbers of staff in EPB, or number of enterprises within TEDA, these interview findings were compared against statistical-data (i.e.: annual reports), and re-verified with interviewees.

The ***research questions were formulated*** individually for each stakeholder group, in accordance with their expertise, existing role and future roles in the PRTR project. The breadth and depth of questions were guided by criteria within the '*environmental transparency policy evaluation framework*," which will be introduced in the methodological framework section below. The interview findings were then processed using ***coding*** to identify themes, and accordingly included within the structure of this paper.

2 Methodological Framework

The methodological framework presented within this chapter, is a new contribution developed for the purpose of evaluating environmental transparency policies and interventions. It is known as the 'Integrated Transparency Evaluation Framework'. The framework is an integral part of the research, and was used to both guide the data collection for field research, and structure research findings. Its application within this research was elaborated on in the research overview and disposition sections above, and is demonstrated



in figure 2-1 below.

Figure 2-1: Situating the methodological relationships and roles
(Source: Created by author)

In turn,as a necessary precondition of its embeddedness within the research, the methodology was developed based on the research focus and characteristics. These characteristics include environmental transparency policy, PRTR, the characteristics of China's governance and the inherent normative bias towards democracy in a 'transparency disclosure' tool. An elaboration of how these elements have shaped the methodology will be

presented on after a brief overview of the tools used to develop the Integrated Transparency Ealuation Framework. It is useful to note that although this framework was developed for this research, its application is flexible, and can be used for the ex-post evaluation of transparency interventions, including that of TEDA's pilot-PRTR, and as a guiding tool for ex-ante evaluation.

2.1 Overview: Integrated Transparency Evaluation Framework

This section first begins with an overview why a new framework was created, and how selected concepts and frameworks were integrated and finally provides the reader a visual overview of the Integrated Transparency Evaluation Framework. A deeper insight into the process of its development is then presented in the following section.

The methodologyis an integration of elements from three different tools, as well as from findings in the field. The integration has served to strengthen the depth and structure of the evaluation. The three tools used are (i) the environmental policy evaluation framework (Mickwitz 2003)(ii) the targeted transparency framework (Fung, Graham, and Weil 2007)and (ii) transparency system 'action cycle' concept(Fung et al. 2004). These tools are used to support two overarching elements are necessary for the evaluation of environmental transparency policy.

The first is a comprehensive list of *criteria*relevant for the evaluation, and the second, is a clear understanding of the structure of *transparency systems*. Relevant criteria are important for adequately examining the breadth and depth of a context; whist a clear idea of the stages within transparency systems ensures that all stages are considered during the evaluation process. Figure2-2below demonstrates how each of the three selected tools, and the field-research findings contribute to meet the two overarching aims.

Within the literature, existing methodological tools have largely used these two concepts separately, or at best, have made implicit reference to the other(Mickwitz 2003; H. Wang et al. 2004; Bellver and Kaufmann 2005; Fung et al. 2004; Fung, Graham, and Weil 2007; Gupta 2010; Lindstedt and Naurin 2010). The 'targeted transparency evaluation' for example only lists five criteria relevant for transparency evaluation, without making reference to the specific stages within a transparency process that need to be considered. This limitation, as depicted within table 2-1, could result in result in poorly structured findings, and disregard the importance of 'process' that the transparency system provides. Likewise, solely using the transparency system as a framework without key criteria to provide depth to the evaluation of each stage, can result in gaps within the evaluation.

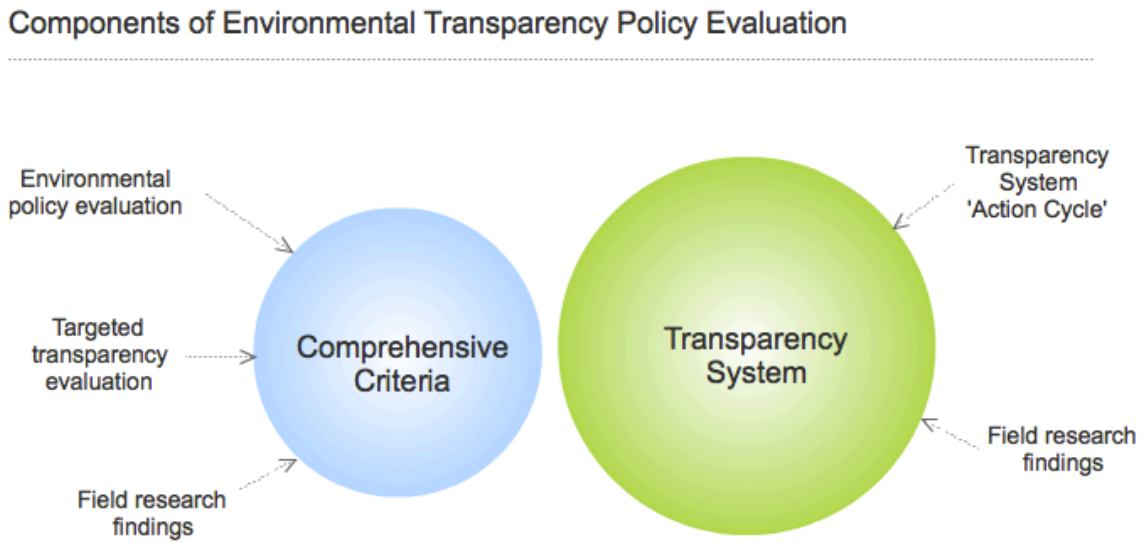


Figure 2-2: Key tools contributing to the development of the Integrated Transparency Framework

Table 2-1:Description and limitations of frameworks, tools and concepts utilized (Source: Created by author)

Comprehensive criteria	**Description**	**Limitations**
Environmental policy evaluation framework	Comprehensive criteria to evaluate environmental policy	Although criteria is essential for evaluating components of the system, it lacks a structure to understand how transparency systems function
Targetd transparency evaluation framework	Provides criteria uniquely targeted at evaluating transparency	
Field research findings	Incorporates a criterion specific to Chinese context	
Transparency system	**Description**	**Limitations**
Transparency system 'Action Cycle'	Denotes key stages of the transparency process, which are necessary to structure how transparency systems work	The 'Action Cycle' lacks depth necessary for showing sub-processes embedded within each stage
Field research findings	Adapts 'action cycle' to the Chinese context	

Integrating components of the two overarching concepts addresses limitations that exist within the tools and provides the structure, breadth and depth to necessary to evaluate the assumptions, gaps and opportunities within an environmental transparency policy context. Figure 2-3 is a diagramatic example of the final 'Integrated Transparency Evaluation Framework' that is depicted in table 2-2 below.

The following two sections will provide a more detailed insight into the relevant steps taken to develop the Integrated Transparency Evaluation Framework. It will then describe the development of the list of critiera, and proceedto provide the rationale behind the choice of tools, and the background for the development of these tools.

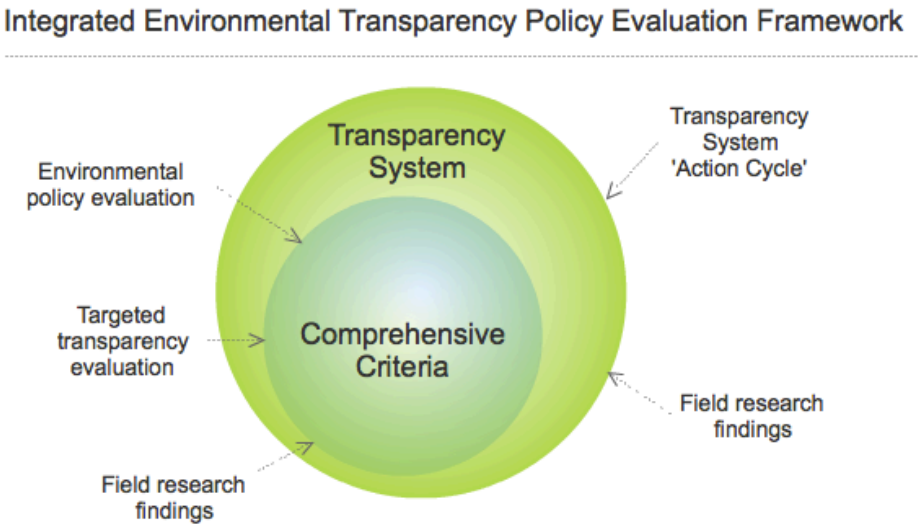


Figure 2-3: Integration of the two overarching elements; comprehensive criteria and the transparency system

Table 2-2: Integrated Environmental Transparency Policy Evaluation Framework(Sources: Modified from Mickwtiz (2003), Fung et al. (2004), Fung et al. (2007))

'Action Cycle' stages (modified)	**Criteria description**
Goal development for intervention	**Relevance**: is the intervention suited to the context? Are the suitable human, financial and knowledge resources available? Are there programs to increase its appropriateness?
Scope and method of data collection	**Enforceability:** What is the degree of success? Is it mandatory, how will it be enforced? Who will enforce? What types of reporting is required? What are the consequences of non-participation?
Data collection	**Compatibility:** The compatibility of information with the existing decision-making structures of users i.e.: strategic planning cycles of governments, production cycles of companies
New information publicly available	**Comprehensibility:** To what extent is the information understandable for decision-makers? Is it technical? Does it require expert knowledge?
User perception/ calculation	**Impact:** Is it possible to identify impacts that are clearly due to policy instruments and their implementation? All impacts may be considered in the light of this criterion, irrespective of their occurrence inside or outside the target area.
User action	**Effectiveness:** To what degree do the achieved outcomes correspond to the intended goals of the policy instrument? Similarly, the effectiveness of reaching other public goals can also be assessed as long as these are first identified.
Discloser perception/ calculation	**Persistence:** Is the effect of this intervention long-term? Are there incentive structures in place to facilitate continuity? What are the drivers of change?
Discloser response	**Flexibility:** Can the intervention cope with changing conditions?
	Predictability: Is it possible to foresee the administration, outputs and outcomes of the policy instrument? Is it thus possible for those regulated, as well as others, to prepare and take into account the policy instrument and its implications?
	Feedback: Are there channels to communicate user decisions, communications and actions back to disclosers?
	Legitimacy: To what extent is it designed to be accepted by stakeholders? Who is designing it? How comprehensible is it?
	Transparency: How transparent is its development? Who is involved? What outcomes of the process will be shared?
	Equity: How are the outcomes and costs of the environmental policy instrument distributed? Do all participants have equal opportunities to take part in, and influence the processes used by the administration?

2.2 Developing the Criteria catalogue

The selection of appropriate criteria has (i) provided both breadth and depth to the research (ii)played a key guiding role in forming the contextual understanding of governance in China and in the (iii) development of interview questions, and finally (iv) provided appropriate support for the evaluation of Open Environmental Information measures (OEI) in China.

Two key tools, as well as field-research findings have been used to develop criteria relevant for the context of this evaluation. The tools include (i) the environmental policy evaluation framework (Mickwitz 2003) and (ii) the targeted transparency framework (Fung, Graham and Weil 2007).

The environmental policy evaluation framework providesbroad criteria for the evaluation of *policy* specific to the *environmental domain*, whilst the targeted transparency framework contributes criteria that aredirectly relevant to the functioning of *transparency systems*. Finally, the field-research findings add one criteria of 'enforceability' to enrich the criteria catalogue. This list of criteria isrepresented in table 2-3, 2-4 and 2-5 below, and is paired with related questions tofacilitate the understanding of the criterion scope and definition.

Table 2-3: Environmental Policy Evaluation Framework (Mickwitz 2003)

	Criteria	Related questions
General	**Relevance**	Do the goals of the instruments cover key environmental problems? On a general level this criterion is trivial, but specific norms or rules can be questioned using this criterion.
	Impact	Is it possible to identify impacts that are clearly due to policy instruments and their implementation? All impacts may be considered in the light of this criterion, irrespective of their occurrence inside or outside the target area.
	Effectiveness	To what degree do the achieved outcomes correspond to the intended goals of the policy instrument? Similarly, the effectiveness of reaching other public goals can also be assessed as long as these are first identified.
	Persistence	Are the effects persistent in such a way that they have lasting effect on the state of the environment? The effects outside the target area and unintended effects that may create new problems can also be considered via this criterion.
	Flexibility	Can the intervention cope with changing conditions?
	Predictability	Is it possible to foresee the administration, outputs and outcomes of the policy instrument? Is it thus possible for those regulated, as well as others, to prepare and take into account the policy instrument and its implications?
Economic	Efficiency (Cost-benefit)	Are the benefits worth the costs? Both benefits and costs are valued in monetary terms?
	Efficiency (Cost-effectiveness)	Do the results justify the resources used? This is a cost-results criterion in which the benefits are not valued in monetary terms. Could it have been achieved with fewer resources?
Democracy	**Legitimacy**	To what degree do individuals and organizations, such as non-governmental organizations, interest organizations and firms accept the environmental policy instrument?
	Transparency	To what degree are the outputs, outcomes of the environmental policy instrument, as well as the processes used in the implementation observable for outsiders?
	Equity	How are the outcomes and costs of the environmental policy instrument distributed? Do all participants have equal opportunities to take part in, and influence the processes used by the administration?

The final catalogue of criteria that was selected is included in solid boxes within of tables 2-3, 2-4 and 2-5. This catalogue consists of, relevance, enforceability, compatibility, comprehensibility, impact, effectiveness, persistence, equity, flexibility, predictability, feedback, legitimacy, transparency and equity. These criteria were selected based on their relevance to the research.

Table 2-4: Targeted transparency framework (Source: Fung, Graham and Weil 2007)

Criteria	Description
Value	The value of information to potential users i.e.: citizens, employees, enterprises, and governments.
Compatibility	The compatibility of information with the existing decision-making structures of users i.e.: strategic planning cycles of governments, production cycles of companies
Comprehensibility	To what extent is the information understandable for decision-makers? Is it technical? Does it require expert knowledge?
Cost-benefit	Are the benefits of taking action greater than the costs?
Feedback	Are there channels to communicate user decisions, communications and actions back to disclosers?

Table 2-5: Making explicit 'Enforcability' from Field-research findings (Source: created by author)

Criteria	Related questions
Enforcability	What is the degree of success? Is it mandatory? How will it be enforced? Who will enforce? What types of reporting is required? What are the consequences of non-participation?

The criteria that were omitted include economic cost-efficiency, economic cost-effectiveness and value. The criterion of 'value' was omitted because it overlapped with the criterion of 'relevance,' whilst the economic criteria – although acknowledged to be of high significance, were excluded as they require the use of economic methods, which are not within the scope of this research. They may however, be included to provide an economic angle to the research.

Description of selected criteria

The evaluation themes of policy, environment and transparency that these tools encompass, were selected for their direct relevance to the goals of China's Open Environmental Information measures (OEI), which seek to improve transparency, governance and environmental outcomes. Descriptions of the selected criteria are as follows.

The criterion of *relevance* is important for questioning the fundamental assumptions of the intervention during the development phase of the intervention (ex-ante). It can also be used on hindsight (ex-post), and be examined with other key issues that emerge. Likewise, *impact* is useful at multiple stages of the evaluation process. *Effectiveness* is most relevant for ex-post senarios, and can be used to evaluate the extent to which objectives were achieved. *Persistence* is useful to examine the long-term orientation of the intervention. *Flexibility* considers the resilience of the intervention to external changes such as politics; industrial composition etc. and *predictability* can further accentuate the findings in flexibility.

Transparency evaluates the openness of releasing relevant information, as well as operational procedures, to the public. *Legitimacy* is the extent to which the policy is acceptable to stakeholders. It is closely intertwined with participation. *Equity* considers the distribution of cost and benefits.*Compatibility* examines how well the new intervention fits with existing decision-making 'time-frames'. *Comprehensibility* is the extent that information is understandable to decision-makers and *feedback* refers to the channel that communicates the action of users to disclosers. Finally, the criterion of *enforceability* examines the characteristics of how an intervention will be enforced.

Not all critera are of equal relevance in every evaluation. Some become more useful during ex-post evaluation, as compared to ex-ante evaluation. The flexibility of this framework allows for criteria to be added and adapted to fit the context. For example, depending on the context evaluated, some criterion can overlap or become a "sub-set" of another criteria. For example, the *'predictability'* of an outcomecan be dependent on how adaptable a policy is to changing outcomes (*'flexibility'*), and the stability of the institutional structures that exist to support its continuity (*'persistence*'). This flexibility that the framework provides, thus allow criteria to be modified fit the research context.

Adding 'process' to criteria

As mentioned and cited within the overview, the sole usage of criteria to evaluate contextual outcomes can result in result in poorly structured findings, and disregard the importance of 'process' that the transparency system provides. The following section thus introduces the transparency system 'action cycle' concept, to provide structure to the findings.

2.3 The Transparency System 'Action Cycle'

The transparency system 'action cycle' is a concept developed by Fung et al. (2004) to demonstrate the core procedures integral to all transparency-based initiatives (i.e.: governance-by-disclosure, corporate labelling etc.).

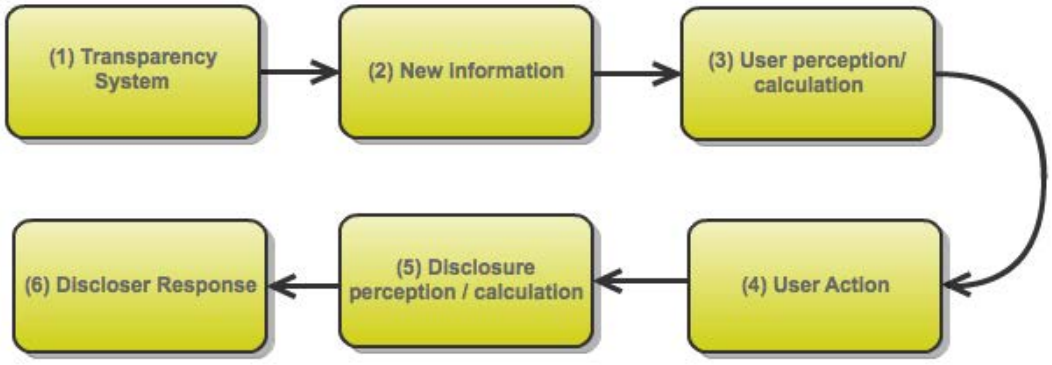


Figure 2-4: Transparency system 'Action Cycle' (Source: Fung et al. 2004)

For an information transparency initiative to work, it requires that the (1) transparency system (2) is able to generate new information from relevant stakeholders such as government bodies, corporations, and other organizations, and effectively make the information public. (3) If applicable to relevant stakeholders, such as residents, consumers, employees etc., the information will be incorporated into routine decision-making processes (4) and result in changes in actions. (5) This change sends feedback signals that may be interpreted by disclosers, (6) to which they could respond.

Modifications to the 'Action Cycle'

Modifications to the action cycle concept were made to increase the context specificity of stages. These additional stages are added based primarily on observing the development of PRTR during the field-research. These modifications are supported by findings within the academic literature. Actions taken to modify the framework include:

1. Broadening the action cycle to include phases of 'goal development for intervention,' 'scope and method of data collection,' and 'data collection' (refer to figure 2-5 below). These phases were selected to increase the contextual fit of the action cycle to policy-making, as well as the context of China.

2. Making the non-linearity of influence within the 'action cycle' explicit, as the existing diagram falsely exaggerates the linear dependence of each phase. Figure 2-5 below inserts opportunities for unanticipated external influences on each phase. This more strongly implies that the (2) scope and method of data collection is not solely determined by (1) environmental policy goals, instead, it can also be determined by other unanticipated influences such as availability of financing, technology, manpower, knowledge and political will.

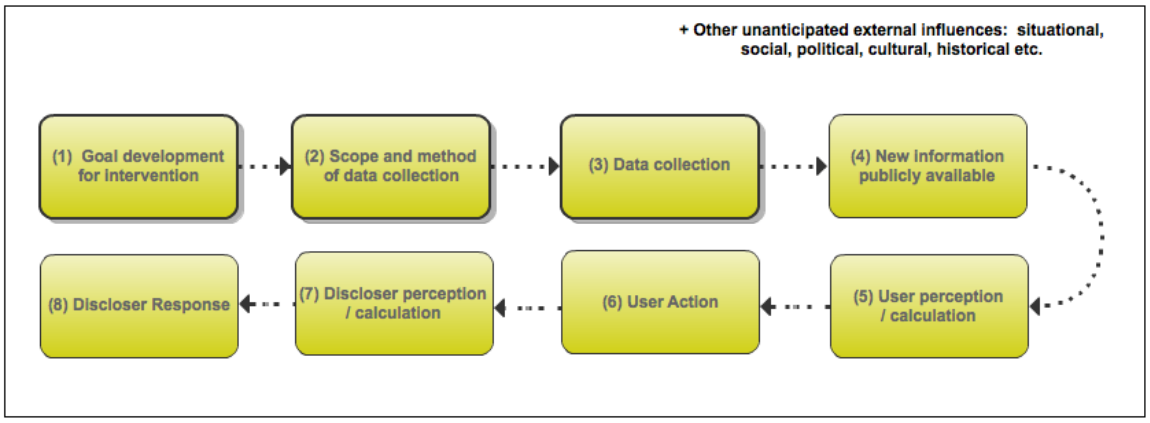


Figure 2-5: Modified transparency system 'action cycle'

(Modified by author, after Fung et al. 2004)

The representation in figure 2-5 is a useful tool for depicting processes and outcomes within the context. Thus, although the following section provides the final methodological framework, the visual value of this modified action cycle will continue to be utilized within the course of this paper.

2.4 The 'Integrated Transparency Evaluation Framework'

To create the Integrated Transparency Evaluation Framework, selected criteria and the transparency system action cycle are merged. As each of the two components are characterised by unique breadths and depths, table 2-6 demonstrates how this merger provides opportunities to allow a more complete identification of opportunities and gaps within the context.

Table 2-6: Depicting 'breadth' and 'depth' of methodological tools (Source: Created by author)

	Modified environmental policy evaluation criteria	**Modified Action Cycle**
Breadth	Broad domains that criteria considers; including policy effectiveness, environmental characterstics, transparency etc.	Clearly depicts key processes within transparency interventions, whilst acknowledging the potential for unanticipated external influences
Depth	Incorporation of criteria within action cycle phases increases the depth of understanding the transparency process	Focuses broad environmental policy evaluation framework on 'transparency' specific interventions

This merger entails the selection of criteria most relevant for each stage of the action cycle. Criteria determined as 'most relevant' can vary, and is subject to the influence of the research context. For example, table 2-7 below shows criteria most relevant for 'data collection' is broad, and can include relevance, enforceability, compatibility, impact, effectiveness, persistence, flexibility, predictability, legitimacy, transparency and equity. The researcher could choose to exclude comprehensibility and feedback, on the basis that comprehensibility is already considered within the previous stage of 'scope and method of data collection', and because flexibility not a pertinent criterion within data collection.

Table 2-7: Inclusion and exclusion of criteria for data collection (Source: Created by author)

'Action Cycle' stage	**Criteria considered**	**Criteria excluded**
Data collection	Relevance Enforcability Compatibility Impact Effectiveness Persistence Flexibility Predictability Legitimacy Transparency Equity	Comprehensibility Feedback

It is necessary for the researcher to consider a broad range of criteria to ensure essential and multiple aspects are considered. However, as not all criteria will be significant for the

research, the researcher may choose to present only emergent findings that are deemed most relevant.

2.5 Rationale & Background: Tool and concepts applied

This section providesrationale for,and background on, the selection of tools and concepts used to create the Integrated Transparency Evaluation Framework. The environmental policy evaluation framework is first presented, this will follow by the targeted transparency framework, the field-findings and finally, the transparency system action cycle concept.

2.5.1 Environmental policy evaluation framework

The environmental policy evaluation framework was selected for its explicit support towards democracy, which was encompassed by the criteria of *transparency*, *legitimacy* and *equity*. These themes are relevant to the context of this research, and are supported by China's 2002 *Cleaner Production Promotion Law*, 2008 *Measures on Open Environmental Information* (OEI) and most recently the 2012 *Measures for the Registration of Hazardous Chemicals for Environmental Management*. This necessitates all heavily polluting enterprises and local governments to actively publish environmental reports to the public(Lorentzen, Landry, and Yasuda 2010; Tan 2012). In addition, the underlying democratic assumptions of the evaluation framework are also in line with PRTR, which is a public catalogue of pollutants released by enterprises. Finally, the prominence of these concepts have been facilitated by the advent of 'new media'(H. Wang et al. 2004; Castells 2011; Grumbach 2013; Guo et al. 2013).

Following these justifications, background is provided on the robustness of this concept, with regards to the comprehensiveness of policy and environmental criteria it embodies. This is presented in the following two sections.

2.5.2 Holistic policy evaluation

The environmental policy evaluation framework was developed to address gaps within existing evaluation policies. It fills the gaps of weaknesses within the "goal-achievement model,"and the "goal-free evaluation model,"(Scriven 1973; Gollwitzer 1993)which were the initial frameworks used in policy evaluation. The goal-achievement model evaluates policy outcomes based on initial goals developed. The weakness of this is that it disregards consideration for *relevance* of goals and does not consider costs(Mickwitz 2003).This fails to fundamentally question actions of decision-makers (*legitimacy)*, and negates considering the role of cost for the *persistence*, *economic efficiency and economic effectivenss* of a policy.

The environmental policy evaluation framework also addresses weaknesses of the "goal-free evaluation model." This model requires the researcher to study the resultant effects of a policy, without first knowing the policy goals developed, and thereafter conducting a comparative analysis to examine what goals were met, and which effects were unintended. Although this bridged some of the gaps within the 'goal-achievement model,' it continued to neglect the elements of *cost*, and negated *transparency* of the policy process(Scriven 1991; Mickwitz 2003). These criteria that were not addressedare considered within the environmental policy evaluation framework.

2.5.3 Consideration for the Environment

The framework was designed with a particular focus on increasing the suitability of policy evaluation tools to the environment.It therefore considers the unique characteristics of environmental problems, which are 'high uncertainty,' 'long-term orientation' and 'inequity;'

*High uncertainty:*Environmental problems are complex to model because of the multiple stakeholders, environmental factors and their embedded relationships(Cash et al. 2003). Uncertainty varies within the study within and between these elements, and is characterized

by 'risk,' 'uncertainty,' 'ignorance' and 'indeterminacy;' this is described in table 2-8 below.To represent this environmental characteristic of high uncertainty, the criteria of relevance, effectivenss, flexibility and predictability were included in the framework.

Table 2-8: Defining different types of uncertainty and providing examples from research

	Definitions	*Selected examples within research*
Risk	When objectives are clear, and the probabilities of meeting outcomes can be measured with some certainty	Pollutant quantity emissions for common pollutants i.e.: SO_2, CO_2
Uncertainty	When objectives are clear and outcomes are uncertain	(a) Public reaction and escalation of dissent (b) methods of measurement have not been developed for pollutants unique to China
Ignorance	When what is unknown is unknown	Poorly understood toxicity effects of chemicals that can occur from exposure to toxic sites that have not been discovered yet
Indeterminacy	When the system is large and highly complex, and there is poor knowledge about the systemic boundaries and networks within them, such that the root causes of the problems are not understood, making the effectiveness of solution development uncertain	Diverse interactions in different local governments within China. These interact with social, economic and environmental uncertainties such as transboundary pollution, making it difficult to determine source of pollution or accurately evaluate policy intervention.

*Long-term orientation:*Environmental problems such as climate change and impacts of pollution often exist within long time frames(Lomborg 2001). Toxic pollutants for example, mercury and other heavy metals are stable elements that can pervade within the environment. Air pollutants such as methane can persist for up to 12 years(Khalil and Rasmussen 1990), and carbon dioxide persist within the environment for up to 200 years(Odenbaugh 2011). Thus both mitigation (present), and adaptation (dealing with impacts of the past) are necessary to consider.Long-term orientation for the environment thus extends to governance and social histories. "Persistence" is a criteria included within the framework to represent this environmental characteristic.

Inequity: Environmental impacts are unevenly distributed, and most severely impact on demograhpics with the least capacity to adapt(Foster 1998; Walker 2012). This is because

environmental impacts have regional and/or global implications (i.e: transboundary air and water pollution, and sea level rise). This has been exacerbated by globalization, where decentralization of manufacturing facilities in contexts with poor regulation, have resulted in environmental degradation and destruction. It is estimated that seven per cent of the world's richest population, accounts for 50 per cent of the world's carbon dioxide emissions(Maguire and Sheriff 2011). As the demographic of marginalized peoples have little power to influence political decisions despite being disproportionately affected, the criteria of 'legitimacy, transparency and equity' were included in the frameworkto reflect this environmental characteristic.

Despite the normative slant of the environmental policy evaluation framework to democracy, the framework does not fully consider the theme of 'transparency.' The inclusion of criteria unique to transparency is therefore added from the 'targeted transparency framework' to the criteria catalogue.

2.6 Targeted transparency framework

A prominent framework (cited 237 times) that exists within the academic literature to evaluate transparencyinterventions is the targeted transparency framework by Fung, Graham and Weil (2007). The authors propose that there are five key conditions necessary for effective transparency, these are "value, compatibility, comprehensibility, cost-benefit and feedback," of these, the criteriaof compatibility, comprehensibility, and feedback are not explicit within Mickwtiz's (2003) framework, and thus were added to enrich the criteria catalogue.

Although the criteria in the 'targeted transparency framework' are pertinent for evaluation, there are three key gaps within this framework. Firstly, the criteria considered to evaluate transparency are not comprehensive. The absence of 'enforcability,' 'legitimacy,' and 'equity,'

are not considered for transparency evaluation despite their emphasis within the literature on transparency evaluation.

For example, in the literature depicting elements used to evaluate transparency,thatGupta places emphasis on 'power relations and motivations' within the disclosure process(Gupta 2010). Lindstedt and Naurin similarly focus on the relationship between power and the legitimacy of information(Lindstedt and Naurin 2010), and Wang et al. focus on the levels of regulation(H. Wang et al. 2004). This is depicted within table 2-9 below.

Table 2-9: Categorization of disclosers – outlining of implicit assumptions (sources: Depicted in table)

Author	**Classification of disclosers**
'Power relations and motivation' Gupta (2010)	(a) 'Who is pushing for disclosure?' (b) 'What will be disclosed?' (c) 'Who will disclose this information?' (d) 'What are the motivations for disclosure?'
'Power and legitimacy of information' Lindstedt and Naurin (2010)	(a) Transparency which is controlled by the agent (b) Transparency not under the agents immediate control
'Levels of regulation' Wang et al. (2004)	(a) Informal regulation – direct pressure from the community (b) Formal regulation – legislation and enforcement (c) Absent regulation – Utilizes informal nongovernmental channels to pressure polluters into compliance (d) Direct regulation – where factories negotiate directly with local actors and face political, social or physical sanctions if they fail to compensate or comply

The second gap within the transparency framework is it focuses solely on transparency and does not encompass criteria for 'policy' and 'the environment,' which are pertinent themes for the context of this research; and finally, like the environmental evaluation policy framework(Mickwitz 2003), the lack of attention to the *process* of transparency is absent.

Each of these gaps is addressed by the integration of transparency tools and concepts. The first and second gaps are supplemented by criteria within the environmental policy evaluation framework, and the third gap is addressed by the integration of the criteria catalogue, into the transparency system action cycle; which is presented as follows.

2.7 Transparency system 'Action Cycle'

The action cycle is a key concept that contributes to the Integrated Transparency Evaluation Framework by providing increased insight into the key processes of a transparency policy. This structure is necessary to frame the evaluation, and contributes to the final framework, as it is absent in both the targeted transparency framework and the environmental policy evaluation framework. Thus far, the staged process of the action cycle has coincided with the development process of the pilot-PRTR, as well as the implementation of China's Open Environmental Information measures, thus making it a relevant tool to utilize within the framework.

2.7.1 Background of the Action Cycle

This concept was developed by Fung et al (2004) to demonstrate the core procedures integral to all transparency-based initiatives (i.e.: governance-by-disclosure, corporate labelling etc.)(Bratt et al. 2011; Kohli et al. 2012).The stages presented have thus been derived from a study of multiple transparency-based initiatives, and can therefore be commonly applicable to government-by-disclosure initiatives.

The authors indicate that theprocess of the transparency system is fragile, and make explicit the assumption that the overall effectiveness of any transparency initiative iscontingent on the individual success at multiple phases. The action cycle thus highlights the multiple phases at which a transparency initiative can fail.

Within each of these stages, are unique assumptions that can deepen the understandings of fragility within the information system. The action cycle however, does not make these detailed assumptions explicit, and therefore fails to present the depth and breadth of gaps present within the system, which the transparency initiative is situated. This is a key limitation that was addressed in the modification of the action cycle, and integration of the cycle with the criteria catalogue, to produce the resultant framework in table 2-10 below.

Table 2-10: Integrated environmental transparency policy evaluation framework (Source: Compiled by author)

'Action Cycle' stages (modified)	**Criteria description**
Goal development for intervention	**Relevance**: is the intervention suited to the context? Are the suitable human, financial and knowledge resources available? Are there programs to increase its appropriateness?
Scope and method of data collection	**Enforceability:** What is the degree of success? Is it mandatory, how will it be enforced? Who will enforce? What types of reporting is required? What are the consequences of non-participation?
Data collection	**Compatibility:** The compatibility of information with the existing decision-making structures of users i.e.: strategic planning cycles of governments, production cycles of companies
New information publicly available	**Comprehensibility:** To what extent is the information understandable for decision-makers? Is it technical? Does it require expert knowledge?
User perception/ calculation	**Impact:** Is it possible to identify impacts that are clearly due to policy instruments and their implementation? All impacts may be considered in the light of this criterion, irrespective of their occurrence inside or outside the target area.
User action	**Effectiveness:** To what degree do the achieved outcomes correspond to the intended goals of the policy instrument? Similarly, the effectiveness of reaching other public goals can also be assessed as long as these are first identified.
Discloser perception/ calculation	**Persistence:** Is the effect of this intervention long-term? Are there incentive structures in place to facilitate continuity? What are the drivers of change?
	Flexibility: Can the intervention cope with changing conditions?
Discloser response	**Predictability:** Is it possible to foresee the administration, outputs and outcomes of the policy instrument? Is it thus possible for those regulated, as well as others, to prepare and take into account the policy instrument and its implications?
	Feedback: Are there channels to communicate user decisions, communications and actions back to disclosers?
	Legitimacy: To what extent is it designed to be accepted by stakeholders? Who is designing it? How comprehensible is it?
	Transparency: How transparent is its development? Who is involved? What outcomes of the process will be shared?
	Equity: How are the outcomes and costs of the environmental policy instrument distributed? Do all participants have equal opportunities to take part in, and influence the processes used by the administration?

3 Research limitations and scope

Scope: This research focuses primarily on the governance and social context in China, and excludes economic evaluation. This is because economic evaluation requires a different skill set, normative discussion and access to appropriate data. The integration of economic understandings into this evaluation may result in different conclusions.

Framework: Dependant on the discipline or focus of an evaluator, the criteria listed may not be fully comprehensive. The framework is however flexible in this regard, and is open to the inclusion of additional criteria relevant to the context.

Language: Although the spoken language was manageable during the research, access to written information was limited. This however, was overcome with the aid of a translator.

3.1 Audience

This research is considered relevant for the following stakeholders, the pilot-PRTR project partners, including TEDA, IPE and IIIEE, the EU-China Environmental Governance Program, which funds the pilot-PRTR project, and for academics, policy makers and policy evaluators with an interest in:

(a) Methodology for environmental transparency policy evaluation

(b) Transparency policy development in China

(c) Local government and corporate environmental information disclosure

(d) Conditions necessary for effective governance-by-disclosure

(e) The role of new media in environmental governance

(f) The fit of a Pollution Release and Transfer Register (PRTR) in China

4 Governance-by-Disclosure

Thus far, governance-by-disclosure has been put forth as an unchallenged process. It is critical however, not to overlook the key assumptions that must be made for effective governance-by-disclosure. This section will first explore in detail what governance-by-disclosure is and the avenues where governance-by-disclosure has been supported. It will then proceed to explore the assumptions and limitations embedded within this concept. Through this review, fundamental norms for adopting transparency policies can be assessed. This will be useful in the discussion section to evaluate the context in which PRTR was developed.

4.1 What is governance-by-disclosure?

Environmental governance-by-disclosure, refers to the deed of making timely, accurate and accessible information available, to allow empowered actors to act upon their knowledge and improve (environmental) outcomes(Gupta 2008). Within this process, the public may be involved in the process of information generation, decision-making, and the provision of feedback.This concept is also referred to as 'third-wave governance' (Huntington 1991), 'regulation-by-revelation' (Florini 2009)and 'informational governance' (Mol 2006).The Pollution Release and Transfer Register (PRTR) is a key initiative that has emerged under 'governance-by-disclosure.' It has been a key system that has been advocated in international conferences that promote governance-by-disclosure.

4.2 Avenues of support for governance-by-disclosure

Disclosure initiatives have been supported by a host of international conferences including the Principle 10 of the 1992 Rio Declaration, the 1997 Aarhus Convention and the 2003 Kiev Protocol, and the number of countries incorporating access to information legislation has increased significantly, from 44 to over 90 from 2000 to 2012(Janssen 2012). Supporting

organizations have also been developed to maintain the continuity of this discourse globally. These organizations include the Access Initiative, Partership for Principle 10, and the OECD training workshops for environmental disclosure (Mol 2006; L. Zhang et al. 2010).

The growing support for disclosure initiatives is underpinned by different rationales from various stakeholders. From a *governance perspective*, motivations for subscribing to such policy initiatives include

(1) Improved environmental outcomes, as evidenced by the success of disclosure initiatives like the PRTR in Australia, the Netherlands, the United Kingdom, the USA and in some European countries(Kerret and Gray 2007)

(2) Increasing the legitimacy of government policies through the consideration of multiple perspectives within policy making. For example the incorporation of indigenous knowledge, or the use of qualitative community consensus to decide whether a polluting factory should be established in a vicinity(Nyong, Adesina, and Elasha 2007)

(3) Perception that transparency is a low-cost extension of governance, as information empowers non-governmental actors to assume the role of monitoring agents. This is in turn facilitated by the rise of 'new media,' which increases the accessibility ofreal-time monitoring and independent information generation (Bellver and Kaufmann 2005)

From the perspective of *nongovernmental organizations and citizens*, the rationales for supporting disclosure initiatives are based upon the rationale of improved personal and community well being, thisinclude the ability to:

(1) Assess whether basic needs are met

(2) Monitor the effectiveness of environmental policies

(3) Use evidence to reclaim justice where human rights are violated

(4) Incorporate local contextual knowledge to create policy that is adapted to local needs

The engagement of citizens for issues related to *scientific* policy-making is a relatively new phenomenon.Prior to the advent of transparency governance, the development of information to direct policy was influenced largely by natural science, which was believed to be neutral (Khun 2012). Natural science techniques were largely unquestioned when employed to develop policy.

Mol (2006)attributes the rise of public demand for transparency to a series of events that "awoke the consciousness" of the general public. These events included discrepancies within topics regardinggenetically modified organisms, climate change and nanotechnology, which marked the inclusion of the public via discussions on measurement, ideology, and abatement-strategies. The normativity imbued within decisions made by natural scientists were highlighted within Lomborg's 1998 influential writing of 'The Skeptical Environmentalist.' These have been attributed towards arise in the prominence of governance-by-transparency(Lomborg 2001; Mol 2006).

From the *corporate perspective,* motivations for disclosure differ widely and have been influenced by public demand and government regulations of varying stringencies. Motivations of corporations therefore can differ, and include:

(1) Compliance to national legislation, for example pollution disclosure under the U.S 'Right-to-Know' Act, as well as prior consent treaties for hazardous waste, pesticides and genetically modified organisms(Johnson 2013; Weibust 2012)
(2) Fulfillment of environmental management system requirements i.e.: ISO14001
(3) Capitalization on new market opportunities, where a niche market exists for responsible products. These include, eco-labels for forestry, fisheries and organic food(Polonsky, Bhaskaran, and Cary 2012)

(4) The practice of Corporate Social Responsibility. Some corporations for example follow guidelines such as the Global Reporting Initiative (GRI), which encourage private companies to publish sustainability reports according to guidelines that ensure the consistency of CSR reports(Marimon et al. 2012)

4.3 Governance-by-disclosure assumptions: An example using PRTR

This section will use the modified action cycle as a visual referenceto highlight explicit and implicit assumptions within governance-by-disclosure. These assumptions are found within the sentiment of support, as outlined in the section above.The diagram will complement the 'criteria' section of the new framework developed (see Table 2-10, p38), where assumptions implicit to the action cycle are embedded.

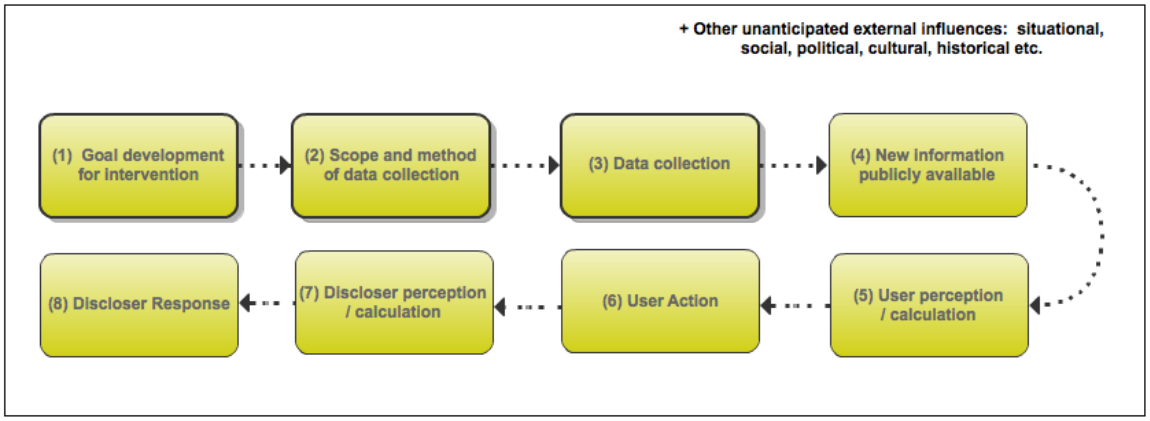


Figure 4-1: Modified transparency system 'action cycle'

(Modified by author, Source: Fung et al. 2004)

An **explicit**assumption is depicted within the process of the action-cycle. The assumption is that the process must elucidate responses from 'users' and 'disclosers' at all stages to be effective. This means that a 'break' in the response chain, will not result in anticipated outcomes.

In addition to this, there are also other assumptions **implicit** within these individual stages that are critical to flesh out. A demonstration of the 'implicit assumptions' embedded within each stage, is featured using selected criteria from the new framework. A graphic representation of implicit assumptions is depicted as followsusing the example of 'data collection' in figure 4-2 below.

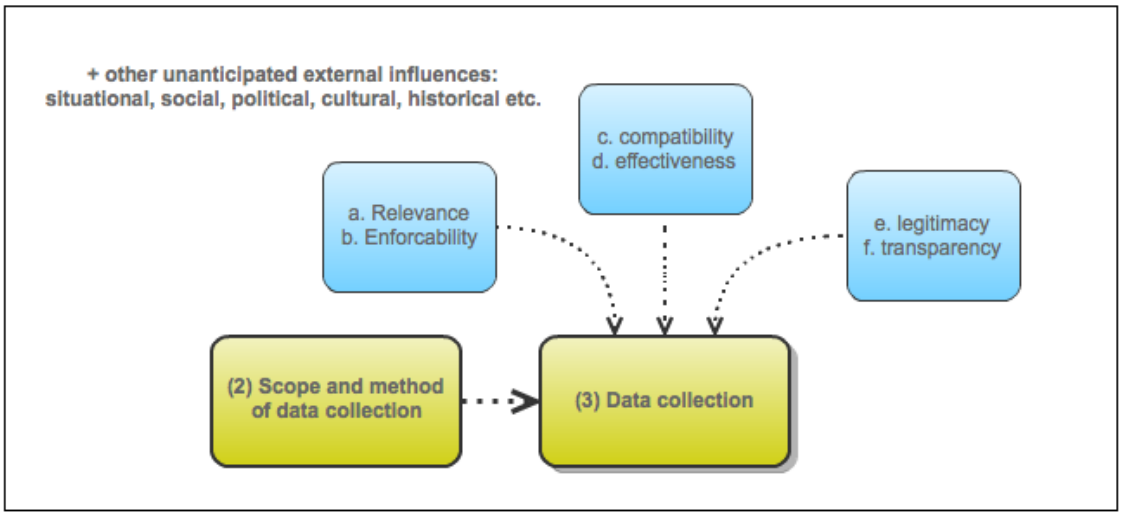


Figure 4-2: Conditions for effective data collection (Source: Created by author)

Implicit assumptions are determined by both*linear factors*,f*actors directly related to the specific stage*, as well as *unanticipated external influences*. For example, within the process of the action cycle,the linear factor influencing data collection is 'scope and method of data collection.' The influencing factors directly related to the specific stage include critiera of enforceability, compatibility, effectiveness, legitimacy, transparency (a-f)as well as other unanticipated external influences.

Assumptions and sub-assumptions implicit within the success ofdata collection are:

(i) Assumption 1: The pollution data collected is *relevant*to the context of the locality

1a. Data collected can address environmental problems faced by an area

1b. *Compatible* knowledge, technical capacity and manpower exist within the given area for data collection

(ii) Assumption 2: The pollution data collected is of high quality and accuracy

2a. Relevant institutions or drivers exist to *enforce* the accuracy and quality of data collection

2b. The practice of *transparency* to make data collection methods explicit is present

2c. System supports *legitimacy* of processes, for example, with the presence of avenues for data to be verified. For example, via third-party verificationor tests conducted by a institutions with high public legitimacy

'Data collection' is one of the eight stages within the modified action cycle. There are a myriad of other assumptions unique to each of the other seven stages, as outlined within the methodological framework in table 4-2 above. (Fung et al. 2004)postulate that for any transparency initiative to work effectively, each of the key stages must be effective, and their relevant assumptions must hold true.

4.4 Limitations of governance-by-disclosure

The examination of transparency systems conducted in the literature review has identified a number of areas where the system can fail. This underlines that transparency systems are expected to be inherently fragile.This section classifies areas where the potential for weakness within governance-by-disclosure can prevail most dominantly.

Institutions

The assumptions above show that central assumptions within governance-by-disclosure systems are not based solely on'information,' but are also dependent on institutions to enforce compliance and ensure the accuracy of data(L. Liu, Zhang, and Bi 2012). This implies thatif the existing institutional context is weak, the weaknesses can continue to pervade. This is because the act of information disclosure does not necessitate an institutional reform.

For example, verification is necessary to ensure the accuracy of a mandatory disclosure initiative. The absence of adequate staff to verify the accuracy and quality of data disclosed can allow false or incomplete information reporting to remain unchecked. An inadequate support system for transparency initiatives can therefore allow malpractice to pervade. Along this vein, it is also useful to understand that despite these inherent weaknesses, information disclosure creates new pathways, which can result in the development of nongovernmental organizations, which can act as alternative drivers for improved environmental outcomes, allowing pockets of change to prevail.

Power-relations

There are multiple actors involved within the governance-by-disclosure system. These relevant stakeholders can be broadly categorized under disclosers, governments, nongovernmental organizations and the broader public.As with institutional barriers above, existing power relations between the multiple actors can prevail,and act as a barrier to intended outcomes(Gupta 2008). For example, corporations can disclose highly technical information that can only be comprehended by expert interpretation, and not the general public. Another example is the use of information tools such as eco-labels, where corporations disclose only favourableinformation that does not provide the consumer a full picture of environmental impacts(Mol 2009).

The degree to which these power relations can pervade to corrupt information is dependent on the type of reporting; for example, if disclosure is for the purpose of legislative compliance, or to prevent legislation, or voluntary, or to exploit commercial markets(Mol 2006). These purposes are more clearly outlined in the section on "avenues of support for governance-by-disclosure".

Finally, as there are multiple architects and promoters of environmental disclosure, multiple rationales for what to disclose and how to disclose have pervaded(Gupta 2008). These recommendations are imbued with normativity, and the decision of "whose normative knowledge prevails" highlights the power relationships nested within the concept of transparency. Power relationships thus continue to exist at the core of this intervention. Select philosphies will prevail, and others will continue to be marginalized.

Implementation context of governance-by-disclosure

Contrary to the examples of pollution reduction successcited by proponents of governance-by-disclosure initiatives, findings within the literature are permeated with mixed sentiment. (Kaufmann 2005)who has conducted thorough research on information governance claims that transparency has had limited effects on improved governance outcomes. Instead, his findings show that improved outcomes have been attained largely by traditional means of enforcement such as legislation and effective enforcement. Kerret and Gray's (2007)research demonstrates that the use of a mixed package of pollution reduction interventions, whichallow other parameters to affect outcomes of a system, make it challenging to evaluate the effectiveness of transparency initiatives.

Nature of knowledge and understanding

Public access to environmental information allows for the incorporation of multiple perspectives. The risk of multiple decision makers is what (Mol 2006)terms, 'regressive uncertainty'. This depicts situations were increased knowledge is accompanied by increased uncertainties, aptly stated as "*the more you know, the more you know there is to know*". This is an embedded function, as governance-by-disclosure promotes the discovery of new knowledge gaps.

The use of information within governance elucidates another topic worthy of discussion, which is, "*to what extent should the public be responsible for taking action upon all the information that is*

available?" The overload of information into the public domain can result in 'information fatigue,' which may cause actors to neglect information(Riege and Lindsay 2006; Farina et al. 2012). The lack of 'action by users' breaks an action fundamental for the effectiveness of the action cycle, limiting the effectiveness of information interventions.

5 PRTR: A governance-by-disclosure intervention

The Pollutant Release and Transfer Register (PRTR) is a key initiative within governance-by-disclosure. As a disclosure initiative, it embodies the same motivations and assumptions as those outlined above. This section will focus on the PRTR, describe its characteristics,processes, history of development and finally, outline the organizations that support its continuity in the global discourse of governance-by-disclosure initiatives.

5.1 What is a PRTR?

The Organization for Economic Co-operation and Development (OECD) defines the Pollutant Release and Transfer Register (PRTR) as a catalogue containing a selection of polluting substances released by the industries and other facilities to land, air and water, as well as substances that are transferred externally to treatment and disposal sites. In comparison to the broad categories of data, such volatile organic compounds and greenhouse gases, PRTRs contain releases of specific pollutants such as arsenic, mercury, and cyanide(Sullivan and Gouldson 2007). Specific releases are of particular interest because of their potential threat to human health and the environment(Walker 2012). Such data is also necessary within legal procedures to redress human rights violations.

Defining characteristics of PRTR

The scope and components of the chemicals reportedis unique within each country largelybecause of the nature of the industries located there. For example, a pulp and paper factory produces significantly different pollutants compared to a hazardous chemical company. Despite these differences, PRTR's have several defining characteristics. In a PRTR,(i) individual chemicals are reported (ii) by specified polluting factities. The U.S Toxic

Release Inventory, for example, publishes over 600 chemicals, the Netherlands, 180 and Mexico, 191(Thomas and Fannin 2011). (iii) Reports on pollutant release and transfers to land, air and water are published at consistent timeframes (iv) with data presented in a consistent format (v) and published within a databasethat is available and accessible by the public. (vi) As the PRTR aims to maximize transparency data withheld as industry secrets should be minimal. (vii) All PRTRs should be established with the aims of improving the state of environment, and promoting cleaner production methods.

The PRTR will serve a range of stakeholders including the government, industry and the public. The freedom to information opens a range of avenues for stakeholder action. At the government level, it allows for the government to monitor trends and develop accurate policy. At the NGO level it allows the development of accurate campaigns and education material, and finally, at the citizen level, access to information may allow individuals and communities to negotiate their rights.

5.2 History of PRTR development

The first PRTR was developed in The Netherlands in 1974 with an initial focus on air, which later expanded to soil and water. The U.S PRTR (U.S Toxic Release Inventory) was initiated in 1986 in the state of New Jersey as a result of high cancer mortality rates. In 1990, England and Wales begun to report on releases within industrial sites, and Canada developed its National Pollutant Release Inventory (NPRI) in 1992 incorporating a multi-stakeholder dialogue process for its design(Hogner; Thomas and Fannin 2011).

Globally, PRTR has since been adopted by at least 50 countries around the world(Fenerol 2000). The 1992 United Nations Conference on Environment and Development in Rio de Janerio, which 150 countries attended, initiated the broader development and adoption of PRTR via chapter 19 of Agenda 21. The adoption of this register was driven by macro-

political developments such as the 1984 Bhopal disaster in India, where methyl isocyanate gas and other chemicals injured more than half a million people and left permanent disabling impacts for more than 8000(M. J. Lee 2000).

This incident played a key role in shaping international and national policies in the realms of information transparency, public right to knowledge and the lifecycle management of chemical products. The establishment of PRTR systems have also been reinforced by the Aarhus Convention, an extension of Principle 10 of the Rio declaration, which stresses the right for citizen participation in environmental issues, and for their access to information on the environment held by public authorities(Morgera 2005; Bünger 2012).

Supporting organizations

At present, key policy organizations that support the development of PRTRs include

(i) The Intergovernmental Forum for Chemical Safety (IFCS), which provides governments policy support in developing PRTR

(ii) The International PRTR Coordinating Group (previously IOMC), which aims to improve communication amongst governments and international organizations for the development and implementation of PRTR systems,

(iii) The Organisation for Economic Cooperation and Development (OECD), which has conducted training workshops and developeda suite of guidiance material for the practice of PRTR

(iv) The United Nations Institute for Training and Research (UNITAR), which provides guidance materials and training, assists interested developing and indsutrializing countries, and aims to promote a PRTR design system that is stakeholder inclusive and

(v) The World Health Organization (WHO), which has also developed guides to estimating pollutant releases and transfers.

6 Environmental Governance in China

This chapter is aimed at providing contextual understanding ofenvironmental governance within China. It will focus on two main aspects, firstly, the governmental structure, and secondly, environmental legislation in China. The key output of this focus is an understanding of the achievements and limitations of environmental governance. The environmental policy evaluation tool (methodological tool 1) will be used within this section.

6.1 Environmental Governance Structure

The Ministry of Environmental Protection (MEP) is the governing authority of the environment in China. It is a cabinet level ministry,which receives key directions from the central government via China's Five-Year Plans (FYP) as shown in figure 6-1 below. As a ministry, the MEP has a strategic governance, co-ordination, and supervisory role over key environmental problems and oversees the implementation and management of monitoring, statistics and information(Schreifels, Fu, and Wilson 2012).

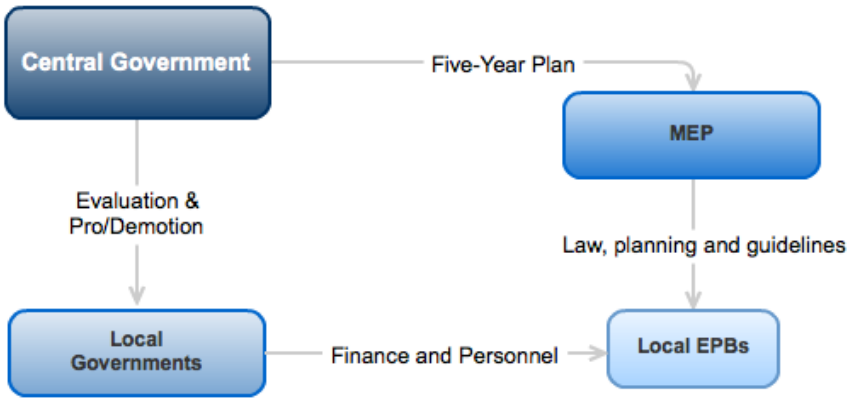


Figure 6-1: Relationships within China's environmental governance (Source: Modified from Liu et al. 2012)

Environmental Protection Bureaus' (EPB) are enforcement bodies developed to administer environmental policy at the local level. EPBs are required to report to *both* the MEP, and their respective local governments however, they are funded *only* by local governments(L.

Liu, Zhang, and Bi 2012).EPBs operate within the levels of centrally administrated municipalities, provinces, prefectures, districts, counties, county-level cities, townships and at the village level.

6.2 Limitations of Environmental Governance Structure

The environmental governance structure as depicted in figure 6-1 above has been widely citedwithin academic literature as a fundamental challenge to better environmental outcomes. These findings were reinforced during interviews with stakeholders in the field.Several conflicts of interest are incubated within this structure. To understand these conflicts of interst, it is first essential to develop an understanding of the broader structures of governance in China.

A reform integral to the speed of China's economic development has been the decentralization of governance, from authoritarian to 'fragmented authoritarian' in the late 1970s(Lieberthal and Oksenberg 1988). This system shifts power from the central government to local governments, who now have (i) the autonomy of formulating local development strategies (ii) close relationships with state-owned enterprises (SoE) (iii) control over local resources and (iv) power over the local judiciary. This will be elaborated on below.

The 'fragmented authoritarian' governance structure, has presented a challenge to implementing environmental policy in China. The key conflicts of interest riddled within governance pathways include those between (i) central and local governments (ii) local governments and EPBs and (iii) local governments and state-owned enterprises (SoE).

(i) Central to local government relationships

Local development strategies are directly influenced by the central government's five-year plans (FYP's). These plans are similar to 'European Commission' directives, which provide

goals each local government is expected to meet within the five-year time frame. Meeting FYP directives have been designed within an incentive structure of political power, prestige and economic reward(Price et al. 2011). The"Key Performance Index" (KPI) from which government officials are evaluated serves to enhance competition between local governments, and has led to local governmentsprioritizingeconomic growth and consumption to meet the KPI goals. Failure to meet these goals often results in demotions(Chan and Gao 2009; Schreifels, Fu, and Wilson 2012).

Five-Year Plans: Where does the environment fit?

At present, China is currently operating within the 12th FYP (2011-2015). Historically, FYPs have been biased towards economic growth, and marginalized environmental outcomes. Increasingly however, the environment has begun to gain prominence(Liu, Zhang, and Bi 2012; Harrison and Kostka 2012). This is marked by the introduction of quantitative targets for the reduction of specific pollutants(table 6-1) within the 10th (2001-2005), 11th (2006-2010) and 12th FYPs.

Environmental domains considered within the FYP have been increasingly broadened since the 10th FYP. This focus has expanded to include energy intensity, water consumption in industry and pollution emissions – each with quantitative targets(Li and Wang 2012). Further, for the first time in the 11th FYP, environmental targets were linked to the "Key Performance Index," under which local government officials are evaluated. In 12th FYP, environmental targets were also made legally binding(Hsu, de Sherbinin, and Shi 2012).

Five-Year Plans: Outcomes on the ground

The incorporation of environmental targets into the KPI evaluation of officials has increased local government efforts to improve environmental outcomes. Although the achievement of FYP targets is significant, other factors to consider are the 'means' through which these

targets were achieved, and the comprehensiveness of these targets. Using the"20 per cent reduction of energy intensity per unit of GDP"as an example, the findings show that although a 19.1 per cent reduction was achieved(K. Lo and Wang 2013), aspects of 'means' through which the goals were achieved, and 'comprehensiveness' raise fundamental questions about FYP targets. This is elaborated on below.

'Means' to achieve quantitative 'Ends'

The decentralized style of governance, together with the flexibility of the FYP directives, resulted in diverse approaches developed to achieve energy intensity reduction targets. Whilstareas such as Zhenjiang in Jiangsu province, and Hothot in Inner Mongolia developed long-term oriented action-plans(Wang et al. 2004), other provinces utilized short-term oriented approaches, and tooklast-minute emergency measures that resulted in the cuttingof power supplies to households, businesses and even hospitals.

The lack of consideration for social-well being within this approach raised public outcry. Fundamentally, although such short-term 'means' may enable governments to achieve environmental targets, this low-quality approach in some provinces failed to create the systemic reform necessary for improved environmental outcomes.

Five-year Plans: A one-size fits all environmental target?

Another challenge is directed at the comprehensiveness of the FYP directives. This questionshow significantly the selected pollutants can contribute to resolving China's pollution problems, given the diverse geographic situations within China. For example, although a 10% reduction in SO_2 and COD, as demanded by the 11^{th} FYP was achieved and even exceeded target expectations, pollution problems continued to pervade within China(L. Liu, Zhang, and Bi 2012).

Liu, et al. (2012)argue that the pollutants considered within the FYP are inadequate indicators for genuine environmental betterment. For example, although the problem of air pollution in many Chinese cities extendsbeyond $SO_2$to particulate matter (PM 2.5), which causes serious health effects(Hsu, et al. 2012), PM 2.5 was not one of the pollutants monitored until the recent 2012-13 winter. There are also a host of other hazardous chemical pollutants that are absent from the FYP. Table 6-1 depicts the five pollutant reduction goals of the 11th FYP. This contrasts greatly with the pollutant list of the U.S, which over 600 pollutants.

Table 6-1: Targets for pollutant reduction in 11th FYP (Source: Weishan et al. 2011)

Index	2005	2010	Reduction goal
COD discharge (10,000 t)	1414	1270	-10%
SO_2 emission (10,000 t)	2549	2295	-10%
Proportion of water quality worse than Grade V in surface water monitored sections (%)	26.1	<22	-4.1 percentage points
Proportion of water quality better than Grade III in main water system monitored sections (%)	41	>43	2 percentage points
Proportion of air quality equal to or above Grade II over 292 days in major cities (%)	69.4	75	5.6 percentage points

(ii) Local government and EPB relationships

Under the jurisdiction of the Ministry of Environmental Protection (MEP), Environmental protection bureaus (EPBs) have the authority to implement, monitor and enforce environmental policy at local levels. The Ministry (MEP) however, does not provide operational funds for EPBs, which are funded instead by local governments(C. W.-H. Lo et al. 2012). This is depicted in figure 6-2 below.*A key implication* of this is that environmental outcomes of an area have to contend with socio-economic and political needs, instead of being managed as an entity requiring overarching protection. Environmental outcomes are thus heavily contingent on the motivation and priorities of local governments(Tan 2012).

As economic growth and consumption have been historically prioritized in the FYP's, resources for the enforcement of environmental law are often insufficient, resulting in an understaffed EPB and the lack of equipment necessary to conduct environmental duties. For example, whilst the US Environmental Protection Agency (EPA) employs close to 6000 people, China's MEP employs only 300 people to oversee environmental protection of the nation(Kostka 2011; Wu 2013).

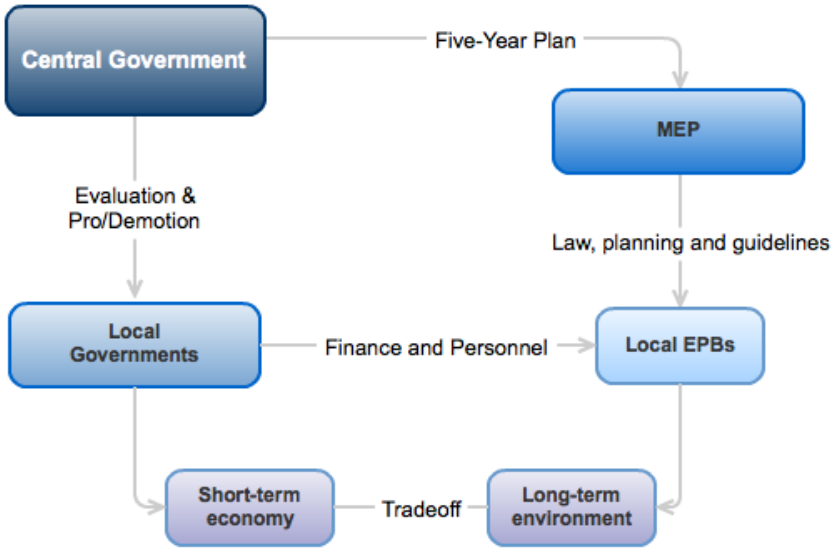


Figure 6-2: Highlighting tensions and conflicting interest in environmental governance

(Source: Liu et al. 2012)

Across China, studies have shown that environmental outcomes differ widely, but are generally poor. In areas where the environment is accorded lower priority, less power is allocated to EPB's, and governments are able to compel the EPB to overlook malpractice or lower fines for companies that have informal ties with them i.e.: '*guanxi'(Kung and Chicheng 2011; L. Liu, Zhang, and Bi 2012)*. The opportunity for environmental neglect is enhanced, as local governments – who are often proponents of economic growth – also yield power over the local judiciary system(Ginsburg 2010).

Another factor that influences a government's attitude towards the enforcement of environmental policy is the fiscal balance of the local government. Poor fiscal balances are correlated with poorer environmental policy outcomes and lower transparency(Kemp 2012). Such outcomes are in accordance with Maslow's hierarchy of needs, which state that the physiological needs of people, such as 'food, water, shelter, etc.' must first be satisfied before the pursuit of other interests. With 179 million Chinese still living below the poverty line of US$1.25 a day(Larus 2012), government policy in parts of China have often prioritized economic growth at the expense of the environment.

(iii) Local government and SoE relationships

State owned enterprises (SoEs) are often large monopolies that drive the local economy, employ a significant proportion of the local population and contribute to the revenue of the local government through tax payments. As economic growth has been one of the key pillars of China's development objectives, SoE relationships with local governments have been closely linked(Kung and Chicheng 2011). Studies conducted in two municipalities have shown that this close relationship has given SoE's more bargaining power. In the payment of fines, 90% of fines on private enterprises are paid on time, compared to 59% of state-owned enterprises(Tan 2012; Lin, Chan, and Cheung 2012). This provides opportunities for SoE's to operate 'business-as-usual' despite violating environmental laws. Table 6-2 below presents a summary of the findings.

Table 6-2: Summary of opportunities and barriers within governance structure (Source: Created by author)

	Opportunities	**Barriers**
Central and local government relationship	• Key performance index • Environmental targets within FYP	• Decentralized governance system • Transparency
Local government and EPB relationship	• KPI, FYP • When local government is supportive	• Tensions between social, economic and environmental development goals of locality • Local government controls judiciary and can overright environmental law at a local level • Transparency, equity
Local government and SoE relationship	• Reputation and solicitation of compliance i.e.: bank fees	• "Guanxi" • "Economic growth imperative" • Transparency, equity

6.3 Environmental Legislation

On paper, the evolution of China's environmental policy has paralleled the development of environmental policy in industrialized nations.Since the first environmental protection law was issued in 1979, more than 30 other environment-related laws have been established in China(Wang 2012). These cover areas of air pollution, water pollution, solid waste pollution, toxic chemicals, ecological degradation, and nuclear radiation(L. Liu, Zhang, and Bi 2012).

Similar to the evolution of environmental policies in industrialized nations, China's environmental legislation has also evolved from a focus on end-of-pipe measures (i.e.: concentration based standards and pollution permits) in the early 1980s, to preventive strategies in the late 1980s (i.e.: Environmental Impact Assessments, and the 'Three simultaneity system') that requires preventive measures to be integrated into the planning process prior to construction(Li, Xu, and He 2012). A brief overview of the policies implemented is shown in the table 6-3.

In addition to the establishment of environmental law, the first decade of reforms (1979-1989) is also marked by the development of environmental institutions, protection of

knowledge, technical capacities and increases in the number of environmental protection staff employed within the EPBs (Mol and Carter 2006). It also saw the elevation of the environment to Ministry Status within the government cabinet.

The presence of these environmental laws and institutions can be perceived as positive achievements within the environmental governance of China. However, relative to the rapid economic and industrial development, the laws and institutions have not been adequate to protect China's environment. Consequently, China has faced extreme pollution, as outlined in the introduction.

Table 6-3: Overview of selected environmental policies in China (Adapted from: A. Wang 2012; W. Li, Xu, and He 2012; Liu, Zhang, and Bi 2012)

Environmental Laws	**Definitions**
Concentration based standards (1979)	Emissions for each polluting facility should meet the minimum standards of emission concentration
Constitution of the People's Republic of China (1982)	Article 26: The state protects and improves the living environment of people and the ecological environment. It prevents and controls pollution.
Law of the PRC on Prevention and Control of Water Pollution (1984)	Article 14: Polluters required to report and register with EPBs regarding their quantities and concentrations of pollutants, and prevention measures in place Use *Total Load Control* to establish targets for a specific area, establish *Discharge Permit System* and distribute *pollutant reduction permits*, supervise discharge (article 25).
Law of the PRC on prevention and control of environmental pollution by solid waste (1995)	EPB to establish monitoring system, and implement a reporting and registration system for industrial solid waste. Industries shall present data concerning the volume of waste produced, methods of storage and disposal. (Non-compliance will result in a fine. Value of fine not stated).
Law of the PRC on prevention and control of atmospheric pollution (2000)	Polluters required to report and register with EPBs regarding pollutant categories, quantities and concentrations. *Total Load Control* for 12 major pollutants: SO_2, soot, industrial dust, COD, cyanide, arsenic, mercury, lead, cadmium, hexavalent, chromium, oil pollutants, industrial solid waste Monitoring system to be set-up by local EPB. For large and medium sized cities, EPBs shall regularly publish reports on the quality of atmospheric environment
Law of the PRC on the promotion of cleaner production (2002)	Article 17: EPB's to publish via principal media, a list of enterprises that cause serious pollution by exceeding the levels specified for pollutant discharge. Article 27: Enterprises which have been publicized are in turn required to publicise information about its environmental protection targets, pollutant dischargers, pollution prevention and control measures and environmental compliance and management data.
Measures on Open Environmental Information (for trial) (2008)	Requires governments to disclose information on environmental laws, regulations and standards, allocation of emissions quotas and permits, pollution fees and penalities collected, exemptions, reductions or postponements granted, outcomes of investigations into public complaints and lists of violators of environmental regulations
Measures for Environmental Registration of Hazardous Chemicals (2012)	Names of hazardous chemicals, volume, uses, operational method, safety data sheet, environmental risk, management measures, transfer of waste and disposal of hazardous waste; result of EIA, emergency response plans, environment monitoring report

The next section will introduce findings from the outcomes of the *Measures on Open Environmental Information.*

7 Findings: Governance-by-disclosure in China

This section aims to provide a broad overview of governance-by-disclosure outcomes in China, since the enactment of the 2008 Measures on Open Environmental Information (OEI) in China. This section will provide an overview of the OEI measure andpresent findings at a local government and enterprise level. The findings will be presented in accordance with the structure of the modified action cycle.

7.1 Overview of Measures on Open Environmental Information

China's Measures on Open Environmental Information (OEI) was developed in 2008 under a broader 'governance-by-disclosure' regulation of the central government, known as Open Government Information Regulations (OGIR)(MEP 2007). The OEI affects both *local governments* and selected *enterprises* that discharge above emission standards. Although two separate actors are targeted, the OEI has common goals of increasing the amout of public environmental information to improve the transparency, effectiveness and legitimacy of environmental governance in China (MEP 2007). Implicit within these goals is the aim of improving environmental outcomes.

In addition to the key goals outlined within the OEI measures, the document also dictates that local governments should reply to any information requests within 15 days, and both local governments and corporations should produce relevant documents within 30 days (MEP 2007). Other elements presented within the document can be categorized within the modified action cycle stages, and will be elaborated on below.

The following findings are thus categorized into two sections, with the firstrepresenting local government outcomes, and the second presenting outcomes from enterprises. The findings were derived using the data of multiple studies within the academic literature, and will

include some findings from the field-research. These will be presented systematically, in accordance with the process of the modified action cycle. Stages for which no data could be collected were omitted.

7.2 OEI Measures: Local government outcomes

Overall, findings show that the impact of OEI measures at the local government level is weak. Poor outcomes are especially prominent in the stages of scope, data collection and discloser responses. However, inspite of these weaknesses, some opportunities have emerged within the 'user action' stage, establishing a channel that contributes to increasing the quality and availability of public information.

7.2.1 OEI Goals: Local Government

Figure 7-1 below depicts the OEI goals at the local government level. The logic underlying these goals are that an increase in the amount of information disclosed will contribute to improved environmental governance, which in turn will lead to improved environmental outcomes.

Figure 7-1: Goals of OEI measures at the local government level

7.2.2 Scope and method for data collection

The scope and method of data collection demonstrates positive outcomes in terms of making explicit key areas where information disclosure should occur.However, there are two key areas it fares poorly in; firstly, in terms of pollutant scope, and secondly in terms of the ease at which information is comprehended. This is elaborated on below.

The OEI document, which lists information that should be reported, is in general relatively explicit. It states that EPBs at the local government level are to disclose data on four main categories, including (a) environmental laws and regulations (b) environmental quality (c) environmental management and supervision and (d) environmental accidents and emergency responses (MEP 2007). These are further broken down into 17 sub-categories, specifically detailing the areas for which documents must be produced. Some examples of these sub-category requirements include:

- No. 6 Information on allocation of total emission quotas of *major pollutants and its implementation, information on issuance of pollutant emission
- No. 8 Information on the acceptance of environmental impact assessment documents
- No. 12 Information on environmental administrative penalties, lawsuits that have been reconsidered and enforcement of compulsory measures

Although the document does well to explicitly state areas for which information should be disclosed, it fails to specify that the information released should be comprehensible to the user. This is an important criterion for the redressing of human rights violations.

In addition, the pollutant scope remains contingent on elements external to the OEI transparency document, and therefore are subject to the existing limitations of environmental law. For example, *'major pollutants' are limited to six forms of pollutants such as chemical oxygen demand (COD), ammonia nitrogen (NH_3-N), sulphur dioxide (SO_2), nitrogen oxdie (NO_x), dust and soot. This is a poorly scoped list, which is inadequate to address context specific problems of pollution in China(Liu, Zhang, and Bi 2012). This is demonstrated in China's polluted Tai River Basin, which requires nutrient control, instead of COD control(Zhang et al. 2011).

7.2.3 Data collection

Data collection is one of the most significant limitations within the transparency system. Central to its limits is the theme of poor enforceability. A brief overview of the methods and key issues are listed below.

EPB officers collect environmental data during environmental impact assessments (EIA), and during routine monitoring of industrial facilities(Che et al. 2011). In some localities, EPBs are able to monitor emissions from polluters via real-time monitoring systems that have been installed.The findings portray a general scenario of poor data collection. Key reasons cited are the lack of manpower, financial and technical capacity.

At the local EPB level, the literature has shown understaffing and poor financial allocation occur due to conflicts of interest, as described in the governance context above. The number of staff in EPBs throughout China range from 29 to 60 people(Kostka 2011). The understaffing of EPBs pervade even in economically developed areas such as TEDA. Although TEDA has had rapid economic growth for 20 years, and attained a GDP of over USD$20 billion, the ratio of EPB inspection officers to companies is seven officers to 14 256 companies (TEDA 2012).

7.2.4 New information publicly available

The amount of information publicly available is generally increasing from nongovernmental sources, and local governments, although for the latter, information remains scarce in some domains. Findings show that in some localities, channels through which the public can request for information do not always work. Studies conducted to support these statements are as follows.

Article 15 of the OEI measures state that EPBs should actively publish environmental information in a timely manner (MEP 2007). This is supported by the Cleaner Production Promotion Law (2004), which mandates the publication of pollution data for companies that violate emission standards(Mol 2009). In some cities, a monthly column in the newspaper has been devoted to publicizing the names of companies that violate the law. These initiatives have increased the amount of environmental information available within newspapers in China and on EPB websites.

EPB websites: A study done by Mol et al. (2011) in 2008 and again in 2010survey31EPB websites, demonstrate that in 2010, 30 websites (except Tibet) have a link to access information, and 27 out of these 30 provide direct access via downloadable PDF copies. The study also shows an improvement in both the convenience of use, and in the types of information covered. This is shown in figure 7-2 below.

Despite this improvement, other sources have demonstrated that information provision continues to be poor in the domains of environmental impact assessments, procedures and approvals, environmental emissions and monitoring data, environmental accidents and emergency responses, and environmental fees and fines(Gu and Sheate 2005; Che et al. 2011).

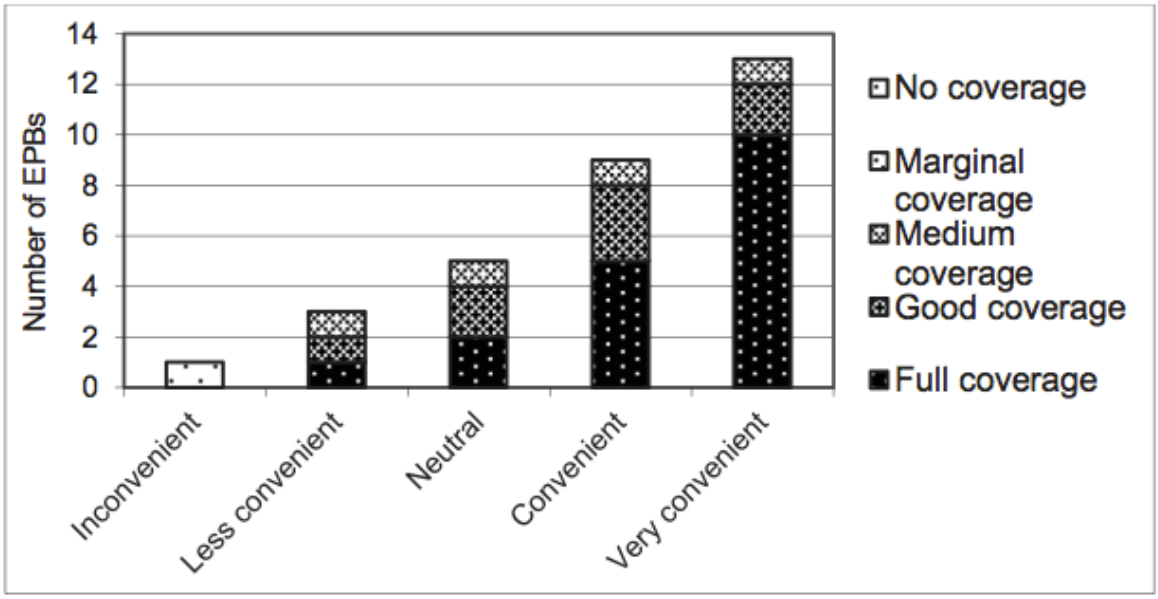


Figure 7-2: Convenience of use and coverage of information on 31 EPB websites (Source: Mol et al. 2011)

Direct contact with EPB: A study conducted to contact the EPB by electronic mail and telephone to attain data where information continues to be poor has shown that of the 32 EPBs contacted, only 16 responded, and 11 provided the requested information(Zhang et al. 2010). This occurred despite the OEI document explicitly stating the potential for legal action by citizens, and action to be taken by supervisors in instances of non-compliance (MEP 2007).

The explanation of the remaining EPBs regarding reasons for non-disclosure included the citing of 'Article 10's' national and economic security, as well as social stability. Further reasons cited included the lack of manpower and technical capacities, the need for further processing of information and the absence of information requested.

7.2.5 User Action

Users can be broadly categorized under nongovernmental organizations, and individual citizens. User action by NGOs has been more significant than individual action by citizens. This is demonstrated within the findings below.

Nongovernmental actors: User action within the NGO domain has emerged strongly, and NGOs have capitalized on this disclosure policy to rank the transparency of local governments. As of 2013, four reports have been produced under the 'Pollution Information Transparency Index' (PITI), ranking 113 cities on their compliance to the OEI, using systematic criteria developed by the Institute of Public and Environmental Affairs (IPE); a nonprofit, independent organization in China (IPE 2013). On topics of transparency within China, the media, academia and other NGOs have since used data from this index. The PITI can therefore be interpreted as a form of 'user action,' as well as a contribution to information available in the public space.

Citizen actors: A study conducted by Mol et al (2011) demonstrate that the number of active calls by citizens to request for environmental information differs from city-to-city, but is generally low, or not recorded administratively, despite recording of requests being an explicit requirement of the OEI. The MEP estimates that it received 40-50 requests, 90 per cent from individuals; Shanghai EPB received 81 requests 70 per cent of which were from individuals, and 30 per cent from organizations; Beijing received 15 requests, mostly from individuals; Gansu received 2 requests from organizations. Social media can be categorized as an indirect way through which citizens have taken action via sharing knowledge on transparency outcomes. It has been suggested that users have been more reluctant to take direct action against the government, as compared to taking action against polluting enterprises due to unbalanced power relations.

7.2.6 Discloser Action

Results from the PITI show that the overall scores for transparency,based on a full score of 100 points,has increased from 31 to 42 from 2008 to 2012 (IPE 2012). Although this demonstrates positive trends in discloser action, the rate of increase is slow, and the average scores do not meet the minimum requirement of 60 points.

Table 7-1: Average PITI scores in 113 cities based on a full score of 100 (Source: IPE 2013)

2008	2009-2010	2011	2012
31.06	36.14	40.14	42.73

Table 7-2: Performance disparities between top 10 and bottom 10 cities in China (Source: IPE 2013)

2012 Average scores of top 10 cities	**73.69**
2012 Average scores of bottom 10 cities	19.6

There are however positive transparency contexts that exist within Chinese cities. This is demonstrated within the 2012 PITI, which showed that the average scores of top 10 performing cities is commendable, at 73.69 points. Conversely, the disparity between top and bottom performers is significant, with the average scores of bottom 10 cities being 19.6 points.

7.3 Open Environmental Information measures: Enterprise disclosure

Overall, the findings show that the outcome of OEI at the enterprise level is poor.There are key weaknesses located within the transparency system, in the scope, data collected, and discloser responses. Despite these weaknesses, opportunities have emerged within the 'user action' stage, establishing a channel that contributes to increasing the quality and availability of public information.

7.3.1 Goals: Enterprise level

Figure 7-3 below depicts the OEI goals at the enterprise level. The logic underlying these goals are that an increase in the amount of information disclosed will contribute to cleaner production practices, which in turn will lead to improved environmental outcomes.

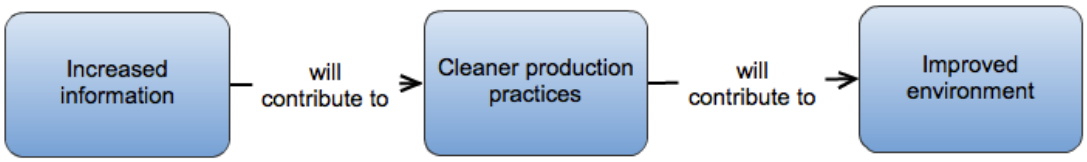


Figure 7-3: Goals of OEI measures at the enterprise level

7.3.2 Scope and method of data collection

The scope and method of data disclosure for enterprises differ from local governments; however,face the same limitations of pollutant scope and the lack of criterion for data comprehensibility. This is noted as a key limitation. Disclosure is mandatory for enterprises that have exceeded the emission limits, and is voluntary but encouraged for all other enterprises. Enterprises for which this measure is mandatory are required to report their emissions within 30 days upon request.

Enterprises should disclosethe (a) name of the organization (b) address and contact of legal person (c) concentration and volume of each pollutant which has surpassed the local limits and the relevant discharge approaches (d) reports on the environmental facility construction and operation and (e) the emergency response plan. The consequences of noncompliance can result in fiscal penalties of up to RMB 100 000 (i.e.: USD$ 30 000) by the local EPB, and publicization of the company within the media under the Clean Production Promotion law (MEP 2007).

As with the situation of pollutant scope in local governments, the type of pollutants that enterprises should be disclosed is unclear. As the relevance and ease of data comprehensibility is an aspect most relevant for actors to reclaim justice on violated human rights, the poor scope and lack of requirements for data comprehensibility to the public is a key limitation.

7.3.3 Data collection

The data is self-declared by companies, and is based on the onus of the company to conduct research and produce the relevant reports.The MEP has also mandated in 2007 that over 6000 companies, which have emitted pollutants above the permitted level, should install automated monitoring systems that will be directly linked to local EPBs(Che et al. 2011). There is however, limited data available to provide evidence of this implementation on a wide-scale.

7.3.4 New information publicly available

At the enterprise level, there is an increasing amount of voluntary environmental and corporate social responsibility reports available. However, mandatory reports for factories violating emission standards are still limited.

Studies of environmental reports by Shang et al. (2007) between 1992 to 2002, Wu et al. (2008), and Liu and Anbumozhi (2009) of 175 listed companies indicate that information disclosed(i) is limited in scope; containing few or no quantitative figures (ii) provides little contribution to redressing environmental justice (iii) biased (iv) not timely and (v) incomplete.

These findings are similarly reflected in the CSR and emission disclosure reports of TEDA, where the scope of pollutants reported is limited to few general categories such as SO_2 and COD.

Despite the limitations of reports from voluntary enterprise disclosure, 'user action' that will be depicted in the section below demonstrates other nongovernmental actors increasing the quality and quantity of publicly available information.

7.3.5 User Action

User action has both contributed to increasing the comprehensibility and availability of publicly information, as well as practical outcomes in positively changing 'discloser responses' outcomes. These include:

- *Greenpeace* (2009)conducted a studyupon the issuance of the OEI measures. The study was conducted on 18 Fortune 500 companies, which manage 25 factories that had violated emissions standards. Upon request for information, the study found that all companies violated the 30-day reporting time frame. Out of the 25, only four provided emissions data, which was suggested by Greenpeace to be limited in scope. No legal action was taken against the non-compliant enterprises.
- The development of*IPE's Green Choice Alliance*, which is a network NGOs that focuses on improving environmental outcomes within the supply chain of large corporations. It has been successful in engaging large corporations, in particular with a focus on textile and garment manufacturing, and electronic industries; successfully engaging brands such as Hewlett-Packard, Apple, Samsung, H&M, Zara etc.
- *IPE's Pollution Map of China* is an online interactive map providing a database of polluting enterprises. At present, it holds records of over 90 000 polluting companies. Companies can remove themselves from the list by using cleaner production methods, and conducting a third-party audit. Governments have used the data to reject project partnerships on grounds of environmental non-compliance.
- *People's bank of China,* which the EPB of Ningbo municipality sends names of environmental violators to. These violations are taken into consideration when companies apply for bank loans. This has been considered an effective driver.
- *Tianjin Economic-Technological Development Area (TEDA)*, the special economic zone where this research was conducted, provides financial incentives of 30 000 yuan (or

USD$ 4900) to companies that report their emissions three years in a row, and writes a letter of commendation to the company's CEO of the company to compliment the company's efforts. Since 2009, the total number of companies which have submitted reports is 31 (out of over 14 000 companies).

7.4 Summaryof OEI findings

The findings show that poor overall performance exists within the implementation of OEI measures at both government and enterprise levels. The key areas where poor performance occurs can be found within all key stages of scope and methods, data collection and in discloser action. The findings also show comparatively positive, but still relatively poor outcomes in the stages of new information publicly available and user action.

8 Findings: Implementation plans for PRTR in Tianjin

This section is aimed at providing an insight into the planned implementation of PRTR in Tianjin-Economic Technological Development Area (TEDA). As depicted in figure 8-1, the process of developing a pilot PRTR in China will involve four key stages. The first two stages, goal development and scope and method of data collection have been implemented, whilst the third and fourth stages are yet to be carried out, and include data collection and the online disclosure of pollution data. These four stages will be described in greater detail in the following sections. Findings from this section will be key to answering the research question of how can PRTR increase the effectiveness of OEI measures.

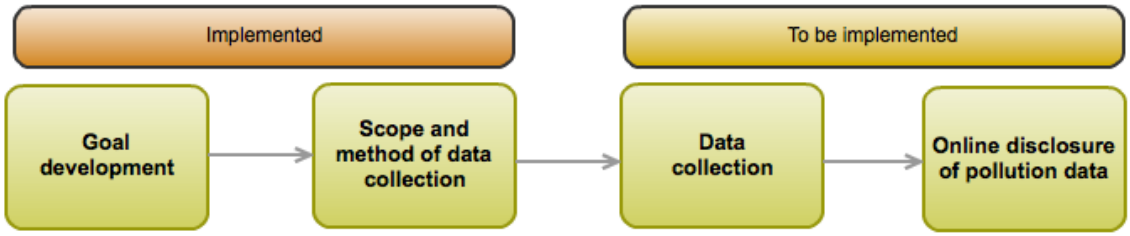


Figure 8-1: Intended process of PRTR development and implementation in Phase I

(Source: Created by Author)

Stage one: Goal development for PRTR

Under the EU-China Environmental Governance Programme (EGP), the pilot-PRTR aims to achieve a participation rate of 80 companies in two years, and develop a list of pollutants relevant for the Chinese context. Further aims will be elaborated within the stages below, include capacity building for relevant TEDA institutions, capacity building for companies reporting and making information publicly accessible on an online pollutant disclosure database.

For phase I of the pilot PRTR program, 50 hazardous and chemical waste producing enterprises within TEDA were engaged. This selection was based on the Hazardous

Chemical Management Law (effective March 1,2013), which mandates that all companies with hazardous waste should report their transfers and releases.

During the early planning stage, a survey was conducted with 100 companies to draw out their motivations and perceptions of PRTR, and identify the key areas of assistance they would require. The implementation process was influenced by these findings.

Stage two: Designing scope and method of data collection

This stage involves building a database by selecting pollutants appropriate and comprehensive within the context of China. It also involves capacity building for relevant environmental institutional bodies (i.e.: official administration and enforcement bodies). Knowledge and capacity building: (1) environmental institutes (2) company training and feedback

Expert knowledge was engaged to assist in the development of the chemical list during this process. A list of 94 new pollutants were selected, and added to the existing selection of what companies are required to report. Table 8-1 shows that companies are at present, required to report on eight pollutants. In addition, it shows pollutants specific to the site of production that was identified during the environmental impact assessment. The team of specialists included chemical and policy experts, from the Institute of Public and Environmental Affairs (IPE), and experts for the transfer of knowledge within the European Union context, from the International Institute of Industrial Environmental Economics (IIIEE), Lund University in Sweden.

Table 8-1: Mandatory and voluntary list of pollutants in China (Source: IPE)

TEDA PRTR Pilot Project - Pollutant list (Mandatory)	**Pollutant list: 8+X**
Regular pollutants	8
Specific pollutants identified by EIA process	Facility Specific
Hazardous Waste	Facility Specific

PRTR Pollutant list as Appendix (Voluntary)	**New pollutants:94**
China List	58+2
POPs	13
Heavy Metals	15
Green House Gases	6

The training workshops and feedback seminars that were conducted included (i) training for 30 Environmental Protection Bureau (EPB) officers and Environmental Protection Agency officers (EPA), who are engaged to develop the reporting capacities of companies. (ii) Two feedback sessions for companies to voice concerns and (iii) one training seminar for 50 companies on how and what pollutants to report.

Consistency of data reported: Companies will report using a consistent format developed by experts within IPE.

Stage three: Planned data collection

Stage three is yet to be implemented, however, it can be still be explored via the lens of the goal development process. It is planned that the EPB and EPA will provide assistance to companies that will report, data will be collected by companies and TEDA will collect and process pollution data from enterprises, prior to data publication. The focus will be on the

incentives for companies to report pollution data, consequences for non-reporting and existing institutional capacity.

Who reports: From March 1, 2013, the new law makes it mandatory for both companies with hazardous waste, as well as companies who have violated the emissions standards, to report their pollution data. Reporting of pollutants remains voluntary for companies that do not fall under this law.

What is reported: As observed from table 8-1, it is mandatory to report only 8 pollutants, and relevant site-specific pollutants identified during the EIA. The 94 new pollutants that have been identified can be disclosed on a voluntary basis.

Incentives for companies to voluntarily report: TEDA has aimed to increase the rate of participation by (i) awarding 30 000 yuan to companies that report for three consecutive years (ii) a letter of commendation to the company CEO's and (iii) via encouragement and pressure from the EPB.

Consequences for non-participation: With regards to enterprises for which the mandatory law applies, the EPB will first send two warnings to the factory manager. This will follow by a letter of notification to the CEO at the company's headquarters. If non-compliance continues to occur, the company can face possible fines for violation of law (amount yet to be defined).

Existing institutional capacity: The manpower within the EPB remains unchanged, inspite of the new requirements of the pilot PRTR. As it is, TEDA EPB monitors 14 256 companies with 35 staff, of which seven have the role of monitoring and inspection officers. The breakdown of this is shown in table 8-2 below.

Table 8-2: Breakdown of EPB staff roles (Source: TEDA TEC 2013)

Functions	**Staff numbers**
Environmental Impact Assessment	7
Environmental Monitoring	16
Environmental Inspection	7
Environmental Office	5

Stage four: Planned online disclosure of data

The fourth and final stage involves making the data available for public access. This stage has also not been implemented as yet, however, the online portal for the release of pollution data has been developed. A target of over 10 000 portal views and information request has been set for this pilot PRTR project.

9 Discussion: Has OEI contributed to Governance?

Using the findings in chapter 7 (outcomes of OEI) and chapter 8 (TEDA findings), this chapter acts as an intermediary step prior to answering the research question "*how can a PRTR contribute to the achievement of China's Open Environmental Information measures?*" This chapter is the first of two stages. It will examine the extent to which OEI measures have contributed to the "pre-OEI" governance and environmental context of China. Within this examination, the effectiveness and gaps of the OEI as applied within Chinawill be fleshed out. This will be useful for the next stage of the discussion, which examines how a PRTR, as will be applied in TEDA, contribute to the achievement of China's OEI measures.

9.1 Discussion of OEI findings

This chapter will analyse the extent to which OEI measures have contributed to environmental governance and environmental outcomes in China, and discuss reasons for its limitations and achievements. It will first present an overview of OEI outcomes at the local government and enterprise level. This will follow by analyzing reasons for the poor OEI outcomes, and the discussion of opportunities that have arisen from OEI. A basic rating system is also introduced within this chapter to provide a clear visual representation of OEI findings; it is presented as follows.

9.2 Rating system: Colour index

The findings will be visually represented within the action cycle by allocating an appropriate colour-index to rate the outcome of each stage. The colour allocated to each stage of the modified action cycle is based on the author's interpretation of the findings. Five indicators ranking the 'risk' present are used here; green indicates low or no risk, yellow indicates medium risk, orange indicates medium-high risk, red indicates high risk and white indicates

no or poor data. The definition of high risk for example, indicates high potential for the occurance of poor outcomes. When used in other contexts, this indicator can be flexibly expanded to accommodate broader outcomes.

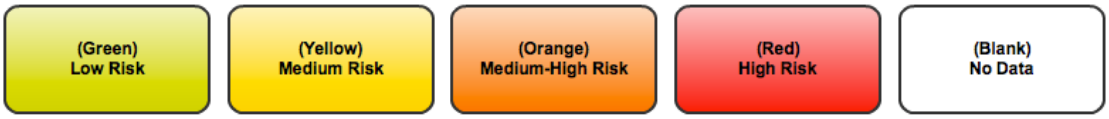


Figure 9-1: Colour indicators to depict level of risk, or potential for poor and positive outcomes

9.3 Overview of OEI: Local government and Enterprise level

The findings demonstrate that OEI measures are in general poor atmeeting the goal of improving the traditional environmental governance, and is reflected both the local government and at the enterprise level. The key areas of high risk are found within stages of scope and method of data collection, data collection, and in discloser responses.

There are two stages where outcomes are comparatively better; these stages are where the quantities of new information publicly available have increased, and where the strength of user action has increased. These findings are visually represented using colour indicators in figure 9-1(local government) and figure 9-2 (enterprise) below.

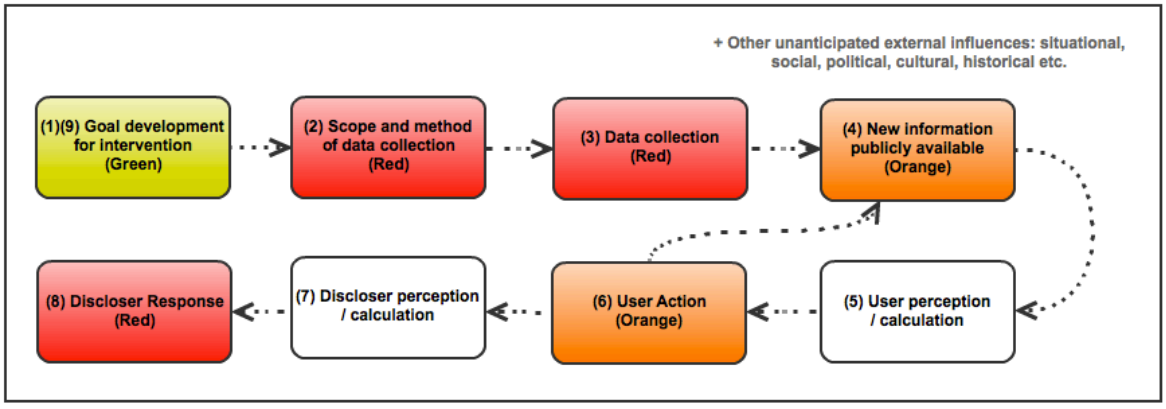


Figure 9-2: Outcomes of OEI at the local government level (red, poor; yellow, moderate; green, good)

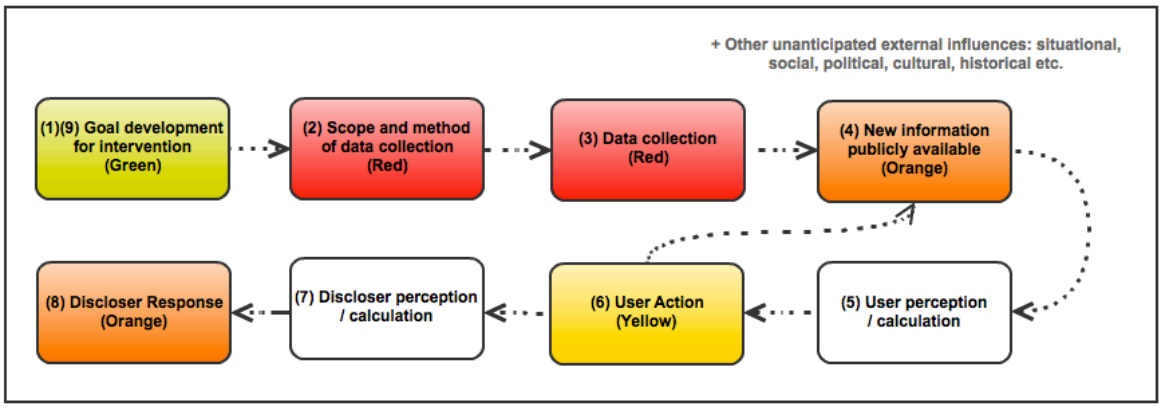


Figure 9-3: Outcomes of OEI at enterprise level (Red, poor; Orange, medium-high risk; Yellow, moderate; Green, good) (Source: created by author)

9.4 Emergence of Opportunities: Nongovernmental actors

Despite the generally poor outcomes in improving traditional governance, the OEI has been effective in facilitating the engagement of other nongovernmental actors to address the problem of pollution. Strong strategies from nongovernmental actors to enact change have emerged. These are found to be most effective at the enterprise level. Although these strategies are still limited to particular areas of focus, such as specific industries, or cities; interviews with IPE, a leading NGO has demonstrated that these strategies are continually being refined and its reach has been expanding. The term "nongovernmental actors" is not limited to NGOs, but also includesthe media, banks, foreign headquarters of companies, and citizens; via the use of new media.

A comparison between outcomes at the local government level and the enterprise level demonstrate that enterprises outperform local governments in the stages of "user action" and "discloser response." The key reasons for these differences can be attributed to the following contextual characteristics at the enterprise level, which include (i) minimal conflict of interest (ii) a more 'direct' pathway to improve environmental outcomes and (iii) multiple drivers of change, these are elaborated in greater detail below:

Lower conflict of interest: Although enterprises have been, and can still belinked closely with local governments, the development of this 'alternative pathway' provides opportunities for a non-bureauracratic channel where change can be driven. These channels directly impact on enterprises interests; for example, when faced with top-down scrutiny from its foreign headquarters, a polluting supply chain is pressured to increase its legitimacy, as its legitimacy is directly challenged by an authoritity it reports to. Similarly, if a business is image sensitive, the publication of its name in the national newspapers can be a key driver for change.

This is contrasted with the more traditional means of governance, where in an information poor environment, enacting changes in enterprise behavior was more constrained to enforcement from the government, which, as explained in the literature review above, is riddled with conflicts of interest at various levels. In this sense, **a more 'direct' pathway**, which bypasses major weaknesses within the environmental governance structure has been created by the issuance of OEI measures.

Nongovernmental actors are diverse; this is also reflected in the various mechanisms that have been used to enact change. The **multiple drivers of change** include,(a) pressure from foreign headquarters (b) pressure to meet import market demands (c) restriction of economic operations from banks (d) 'naming and shaming' in public media, which hinges on image sensitivity of a companyand (e) conditions accorded by some local governments prior to signing contracts with companies;this is carried out by considering whether the company has been compliant to environmental legislation, before deciding whether to award it a contract.

At this juncture,it is significant to note that not all drivers of change have developed 'organically' from increased information. Some pathways have been created through the 'active engagement' of relevant stakeholders. For example, foreign company headquarters such as clotheswear company 'H&M' was not pro-active in acting on the poor environmental

status of its company. 'H&M' headquarters was instead, engaged by IPE (an NGO), to improve of its supply chain. In addition to the 'engagement' of polluting companies, IPE also maintains a public database of key polluting companies. This data base is user-friendly, and rides on the growing popularity of social media in China. From this, it can be deduced that NGOs, and other actors who focus permanently on engaging and developing the capacities of this new system, have a central role in the well functioning of the OEI measures.

Limits of opportunity

This channel, as observed from the action cycle, is still limited by the scope and accuracy of data produced, as they operate on the premise that information released is accurate. Further contraints could include manpower of NGOs and financial support for their existence.

9.5 OEI: Analysis of poor outcomes

Poor OEI outcomes at the local government level can be broadly themed under the fragility of the transparency system. This broad theme underpins reasons of 'interconnected outcomes,' and the embedding of existing structural and legislative weaknesses into the governance-by-disclosure process. These weaknesses are elaborated on below.

9.5.1 Interconnected outcomes& system fragility

Failure and success within a stage have ripple implications on the following stages within the action cycle. This "compoundment effect" is depicted numerically in figure 9-4. An example from the findings shows that the limited pollutant scope is not an independent failure. Poor scoping of pollutants have implications on the adequacy and relevance of data collected, and failures in data collection in turn, ripples adverse effects on the preceeding stage.

This compoundment of limitations is an inherent characteristic of the governance-by-disclosure system, which makes the system fragile. Some pre-requisite for the system to work

include a well-functioning enforcement EPB and comprehensive legislation. The poor outcomes of the OEI measures can thus be understood via this characteristic.

This next section builds upon this understanding by explicitly highlighting the stages where weaknesses within the existing governance and legislation structures have been embedded.

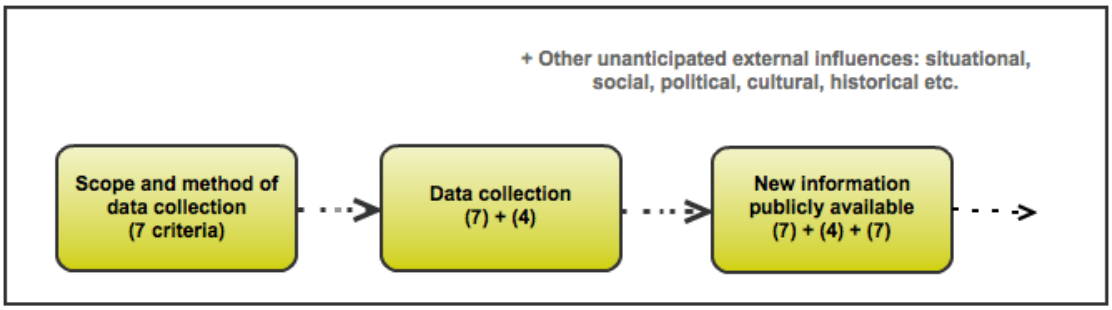


Figure 9-4: Componded outcomes in transparency system (Source: Created by author)

9.5.2 Embedding existing weaknesses into 'governance-by-disclosure'

Although 'goverance-by-disclosure' has been regarded in the literature as the "third-wave" of governance, the connotations of the terminology inaccurately suggest a total transformation of the governance system. In reality, existing structural and legislative weaknesses of China, as described in the literature findings above, are re-embedded into the governance-by-disclosure system. This "re-embeddedness" can be found within "scope and method of data collection," "data collection," "new information publicly available" and "discloser response."

The quantity of material classified as 'environmental information' within China may have increased to a certain extent, however, due to this re-embeddedness of weaknesses into a fragile system, asymmetrical power and information relationships have been entrenched. This has resulted in the quality and scope of much of the information available, to be poor.

Therefore, to a large extent, OEI measures have failed to improve environmental governments at a local government level.

9.6 How has OEI contributed to environmental governance?

From the angle of traditional governance, OEI continues to entrench key weaknesses of the system. This is because power relationships continue to perpetuate without strong enforcement capacities, and the perpetuation of other conflicts of interest within the government structure. From this angle, OEI does not facilitate the key governmental reforms.

The measures however, have facilitated conditions for the development of nongovernmental activity and non-traditional pathways for change. These pathways however, continue to be limited by the 'risks' of poorly scoped information and potentially inaccurate data that has not been verified. The following chapter uses PRTR to examine if it can contribute to the improvement of OEI measures.

10 Discussion: How can a PRTR contribute to OEI?

This chapter builds on the findings above, and uses it to examine "how can a PRTR can contribute to the OEI measures?" It will begin by visually presenting the pilot-PRTR findings using the action cycle. It will then highlight opportunities and flaws that exist within the current implementation plans of the PRTR. This will follow by examining how it contributes to the OEI.

10.1 Pilot-PRTR: Ex-ante findings

Figure 10-1 presents an ex-ante consideration of vulnerabilities and opportunities of the pilot-PRTR, as will be implemented in TEDA. It shows that the pilot-PRTR, has a high potential to increaseavailable pollution information, given the existing infrastructural and organizational capacities that have been developed to facilitate the generation of information. These include:

- TEDA Eco-Center (TEC), an administrative office dedicated to implement pilot-projects such as the pilot-PRTR. In assuming this role, TEC acts as an additional driver of change, and assists with some of the usual tasks that would otherwise be undertaken by the understaffed EPB
- The existing public database that TEDA has had since it began encouraging companies to publish environmental information in 2009
- The prior experience that TEDA has had with publicizing and collecting pollutant reports from enterprises
- The limited scope of companies involved in this project; phase one involves 30 companies, and phase two invovles an additional 50 companies

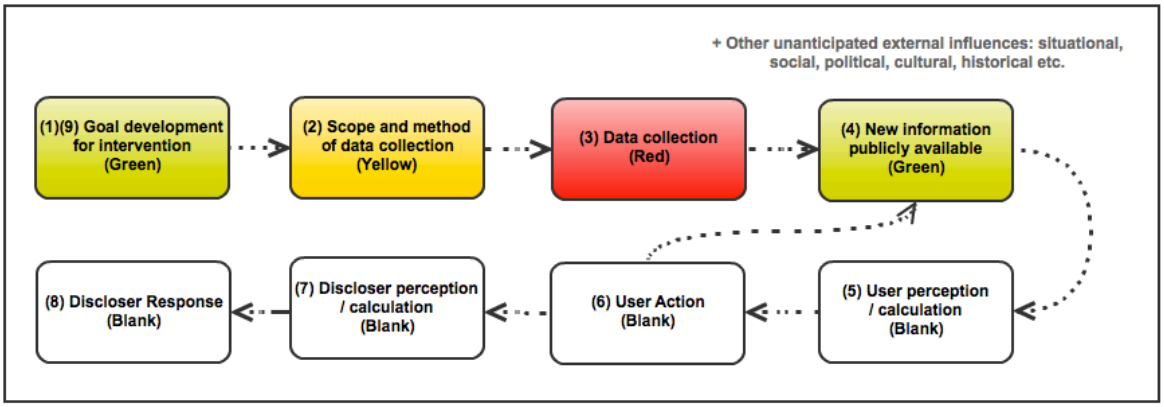


Figure 10-1: Ex-ante consideration of the vulnerabilities and opportunities of pilot-PRTR in TEDA

There are however two key areas where risks still pervade, this includes the scope and method of data collection, and the process of data collection itself. Although IPE has expanded the scope of potential pollutants that could be reported, it is only mandatory for companies to report "8+X" pollutants. This leaves the potential for a host of pollutants to be unreported.

The second area where risks pervade most significantly is in the data collection stage. The data disclosed by companies is mandatory, but not subject to official EPB or third-party verification; although third-party verification is encouraged. This provides the potential for data provided to be tampered with prior to its submission to TEDA. PRTR data collected based on this premise is therefore subject to potential inaccuracies. This contrasts with existing global databases, where it is mandatory for information to be verified by relevant authorities.

10.2 PRTR: Extent of contribution

The lack of need for data verification provides the potential for power relationships to be continually entrenched between disclosers and users of information. The pilot-PRTR thus does not contribute postiviely in this aspect to change power relationships that exist within OEI measurs.

It does however, contribute to improving the potential scope of data that should be reported by companies, and also contributes by empowering TEDA with additional skills and knowledge. The potential contribution of accurate environmental information could contribute to the pathways that would be utilized by nongovernmental actors to better environmental outcomes.

Table 10-1Summary of key areas of contribution and vulnerability (Source: Created by author)

Key areas of contribution
• *Scope and method of data collection:* The PRTR identifies 94 additional pollutants, 60 of which are unique to the context of China, and will also develop methods for collecting data for these pollutants. • *New information publicly available*: The pilot-PRTR states that it is mandatory for information collected to be made available on a public online database • *User action*: The PRTR increases the accountability of local governments, which had previously allocated responsibility of corporate reporting largely to the voluntarism of corporations. • IPE is also going to update their PITI criteria to rate how well governments publish PRTR • The PRTR system creates a channel for feedback to facilitate user action
Areas of vulnerability
• *Data collection*: Although it is mandatory, it is not necessary for the EPB to verify data collected, or for third-party verification to occur. This provides opportunities for data manupulation to occur. • *Scope and method of data collection*: There are 58 new pollutants monitored within the database. This is unique to the context of China, and for some pollutants, methods of data collection has not been developed as yet. In addition, the knowledge, technical and adequacy of capacities to measure the quantities of these pollutants may not be adequate.

11 Conclusions

This research addressed two main problems. The first problem addressed was the absence of a comprehensive methodological tool that was able to evaluate an environmental transparency intervention with adequate structure, breadth and depth. The second problem is a gap within the academic literature examining how a PRTR, can contribute to an existing Open Environmental Information (OEI) measures in China. These problems were examined by asking:

RQ 1: How can transparency and environmental policy tools and concepts be integrated to evaluate information disclosure interventions?

RQ 2: How can a PRTR contribute to the achievement of China's Open Environmental Information measures?

The key contribution that this research makes to methodology is the development of a new framework that structures the understanding of the system, and guides the organization and presentation of research findings. The methodological framework has also provided a catalogue of criteria specific for the evaluation of environmental transparency policy in China, which could be useful for the ex-post evaluation of the pilot-PRTR in TEDA. The framework has enabled the findings to be presented as a visual snapshot showing the key vulnerabilities inherent to, and embedded within the transparency system; as well as the opportunities that have emerged from OEI. This "rich picture" is a contribution that has enabled both the depth and breadth explicit and inherent to the system, to be fleshed out. The depth and breadth of this contextual understanding was an essential pre-requisite for examining the fit of the pilot-PRTR within the environmental governance context of China.

In addressing the second question, the research has found that the OEI measures have not made meaningful contribution to improving traditional means of governance in China,

however, has created alternative non-traditional channels where positive outcomes have emerged with considerable effectiveness.

Poor outcomes pervade traditional governance systems despite the increase in amount of information generated by governments. This is because genuine environmental transparency requires a reform in the structure of governance, to minimize conflict of interest and reduce asymmetrical power-relationships. This however, has not occurred, and poor environmental governance structure and legislation has instead been embedded into the OEI system.

Promising outcomes that have occurred through non-traditional channels involve a myriad of actors including banks, foreign company headquarters, the media, and nongovernmental organizations. This channel is effective, as it bypasses conflict ridden governance structures, and uses actors that hold significant meaning to enterprises to create change. This system however is not without flaws, and is subject to the limitations of scope, data availability and manpower within key actors (such as NGOs), which are necessary to actively engage companies and relevant 'significant actors'.

Within the 'mixed outcomes' of the OEI measure the PRTR contributes to increasing the scope of pollutants relevant to the Chinese context. It also makes contributions at the level of TEDA special economic zone, by increasing the knowledge capacity of staff engaged within the pilot-PRTR project, and the pollution data available. The choice of implementing the PRTR with voluntary verification however, serves to entrench asymmetrical power and information relationships in China, and could potentially affect the accuracy of data provided. Future research could focus on ex-post evaluation of pilot-PRTR outcomes within China, in particular examining the stages of data quality, user action and discloser action.

Bibliography

Barboza, David. 2010. "China Passes Japan as Second-largest Economy." *New York Times* 15.

Bellver, Ana, and Daniel Kaufmann. 2005. "Transparenting Transparency: Initial Empirics and Policy Applications." *World Bank Policy Research Working Paper*.

Bratt, Cecilia, Sophie Hallstedt, K.-H. Robèrt, Göran Broman, and Jonas Oldmark. 2011. "Assessment of Eco-labelling Criteria Development from a Strategic Sustainability Perspective." *Journal of Cleaner Production* 19 (14): 1631–1638.

Breznitz, Dan, and Michael Murphree. 2011. *Run of the Red Queen: Government, Innovation, Globalization, and Economic Growth in China*. Yale University Press.

Bünger, Dirk. 2012. "3 E-PRTR Under EU Environmental Information Laws: The Collection." In *Deficits in EU and US Mandatory Environmental Information Disclosure*, 57–232. Springer.

Cai, Fang, and Yang Lu. 2013. "Population Change and Resulting Slowdown in Potential GDP Growth in China." *China & World Economy* 21 (2): 1–14.

Cao, Jun-Ji, Zhen-Xing Shen, Judith C. Chow, John G. Watson, Shun-Cheng Lee, Xue-Xi Tie, Kin-Fai Ho, Ge-Hui Wang, and Yong-Ming Han. 2012. "Winter and Summer PM2. 5 Chemical Compositions in Fourteen Chinese Cities." *Journal of the Air & Waste Management Association* 62 (10): 1214–1226.

Cao, Shixiong, Guosheng Wang, and Li Chen. 2010. "Questionable Value of Planting Thirsty Trees in Dry Regions." *Nature* 465 (7294): 31–31.

Cash, David W., William C. Clark, Frank Alcock, Nancy M. Dickson, Noelle Eckley, David H. Guston, Jill Jäger, and Ronald B. Mitchell. 2003. "Knowledge Systems for Sustainable Development." *Proceedings of the National Academy of Sciences* 100 (14): 8086–8091.

Castells, Manuel. 2011. *The Rise of the Network Society: The Information Age: Economy, Society, and Culture*. Vol. 1. Wiley-Blackwell.

Chan, Hon S., and Jie Gao. 2009. "Putting the Cart before the Horse: Accountability or Performance?" *Australian Journal of Public Administration* 68 (s1): S51–S61.

Che, Xiuzhen, Alex English, Jia Lu, and Yongqin David Chen. 2011. "Improving the Effectiveness of Planning EIA (PEIA) in China: Integrating Planning and Assessment During the Preparation of Shenzhen's Master Urban Plan." *Environmental Impact Assessment Review* 31 (6): 561–571.

Chen, Daniel. 2013. "Section 13 Professor Lyon April 7, 2013."

Dansie, Grant, Marc Lanteigne, and Indra Overland. 2010. "Reducing Energy Subsidies in China, India and Russia: Dilemmas for Decision Makers." *Sustainability* 2 (2): 475–493.

Dong, Zhengju, Yan Yan, Jing Duan, Xiao Fu, Qingrong Zhou, Xiang Huang, Xiangen Zhu, and Jingzhu Zhao. 2011. "Computing Payment for Ecosystem Services in Watersheds: An Analysis of the Middle Route Project of South-to-North Water Diversion in China." *Journal of Environmental Sciences* 23 (12): 2005–2012.

Economy, Elizabeth. 2010. *The River Runs Black: The Environmental Challenge to China's Future*. Cornell University Press.

Embassy, U. S. 2013. "Air Quality (Feb 1, 2013)."

Fan, Ying. 2000. "A Classification of Chinese Culture." *Cross Cultural Management: An International Journal* 7 (2): 3–10.

Farina, Cynthia, Dmitry Epstein, Josiah Heidt, and Mary Newhart. 2012. "Knowledge in the People: Rethinking'Value'in Public Rulemaking Participation." *Wake Forest Law Review, Forthcoming*: 12–65.

Fenerol, C. 2000. "Background and Implementation by Selected Countries of PRTR." *ENVIRONMENTAL RESEARCH QUARTERLY*: 37–44.

Florini, Ann. 2009. "Business and Global Governance: The Growing Role of Corporate Codes of Conduct."
Foster, Sheila. 1998. "Justice from the Ground up: Distributive Inequities, Grassroots Resistance, and the Transformative Politics of the Environmental Justice Movement." *California Law Review*: 775–841.
Fung, Archon, Mary Graham, and David Weil. 2007. *Full Disclosure: The Perils and Promise of Transparency*. Cambridge University Press.
Fung, Archon, David Weil, Mary Graham, and Fagotto. 2004. "The Political Economy of Transparency: What Makes Disclosure Policies Effective?" *Ash Institute for Democratic Governance and Innovation* 3 (4): 1–44.
Ginsburg, Tom. 2010. "Judicial Independence in East Asia: Implications for China."
Göbel, Christian, and Lynette Ong. 2012. "Social Unrest in China." *Long Briefing, Europe China Research and Academic Network (ECRAN)*.
Gollwitzer, Peter M. 1993. "Goal Achievement: The Role of Intentions." *European Review of Social Psychology* 4 (1): 141–185.
Goron, Coraline. 2012. "European Institute for Asian Studies–EIAS Asbl."
Grumbach, Stephane. 2013. "The Stakes of Big Data in the IT Industry: China as the Next Global Challenger?" In *The 18th International Euro-Asia Research Conference, The Globalisation of Asian Markets: Im-plications for Multinational Investors, Venezia, January 31 and February 1st, 2013*.
Gu, Lixin, and William R. Sheate. 2005. "Institutional Challenges for EIA Implementation in China: a Case Study of Development Versus Environmental Protection." *Environmental Management* 36 (1): 125–142.
Guo, Zhida, Jian Huang, Jian He, Xiaojun Hei, and Di Wu. 2013. "Unveiling the Patterns of Video Tweeting: A Sina Weibo-Based Measurement Study." In *Passive and Active Measurement*, 166–175. Springer.
Gupta, Aarti. 2008. "Transparency Under Scrutiny: Information Disclosure in Global Environmental Governance." *Global Environmental Politics* 8 (2): 1–7.
———. 2010. "Transparency in Global Environmental Governance: a Coming of Age?" *Global Environmental Politics* 10 (3): 1–9.
Hannum, Emily, Jihong Liu, and Edward A. Frongillo. 2012. "Poverty, Food Insecurity and Nutritional Deprivation in Rural China: Implications for Children's Literacy Achievement." *International Journal of Educational Development*.
Harrison, Tom, and Genia Kostka. 2012. "Manoeuvres for a Low Carbon State: The Local Politics of Climate Change in China and India."
He, Canfei, Teng Zhang, and Wang Rui. 2012. "Air Quality in Urban China." *Eurasian Geography and Economics* 53 (6): 750–771.
He, Guizhen, Arthur PJ Mol, Lei Zhang, and Yonglong Lu. 2013. "Public Participation and Trust in Nuclear Power Development in China." *Renewable and Sustainable Energy Reviews* 23: 1–11.
Henry, Laura, Jasper Kim, and Dongho Lee. 2011. "From Smelter Fumes to Silk Road Winds: Exploring Legal Solutions to Transboundary Air Pollution over Korea."
Hogner, Robert H. "THE EVOLUTION OF PRTRs: PUBLIC DISCLOSURE AS ENVIRONMENTAL REGULATION."
Hsu, Angel, Alex de Sherbinin, and Han Shi. 2012. "Seeking Truth from Facts: The Challenge of Environmental Indicator Development in China." *Environmental Development*.
Huang, Xibing, Dingtao Zhao, Colin G. Brown, Yanrui Wu, and Scott A. Waldron. 2010. "Environmental Issues and Policy Priorities in China: a Content Analysis of Government Documents." *China: An International Journal* 8 (02): 220–246.

Huntington, Samuel P. 1991. *The Third Wave: Democratization in the Late Twentieth Century*. Vol. 4. University of Oklahoma Press.
Janssen, Katleen. 2012. "Open Government Data and the Right to Information: Opportunities and Obstacles." *The Journal of Community Informatics* 8 (2).
Jenkins, T. N. 2002. "Chinese Traditional Thought and Practice: Lessons for an Ecological Economics Worldview." *Ecological Economics* 40 (1): 39–52.
Jiao, Jiu J. 2010. "Crescent Moon Spring: A Disappearing Natural Wonder in the Gobi Desert, China." *Ground Water* 48 (1): 159–163.
Johnson, Barry L. 2013. "Risk Perception: When Right-to-Know Runs into Need-to-Know." *Human and Ecological Risk Assessment: An International Journal* 19 (2): 293–295.
Kaufmann, Daniel. 2005. "Myths About Governance and Corruption." *Finance and Development* 42 (3): 41.
Kelly, William W. 2010. "Asia Pride, China Fear, Tokyo Anxiety: Japan Looks Back at Beijing 2008 and Forward to London 2012 and Tokyo 2016." *The International Journal of the History of Sport* 27 (14-15): 2428–2439.
Kemp, Geoffrey. 2012. *The East Moves West: India, China, and Asia's Growing Presence in the Middle East*. Brookings Institution Press.
Kerret, Dorit, and George M. Gray. 2007. "What Do We Learn from Emissions Reporting? Analytical Considerations and Comparison of Pollutant Release and Transfer Registers in the United States, Canada, England, and Australia." *Risk Analysis* 27 (1): 203–223. doi:10.1111/j.1539-6924.2006.00870.x.
Khalil, M. A. K., and R. A. Rasmussen. 1990. "Constraints on the Global Sources of Methane and an Analysis of Recent Budgets." *Tellus B* 42 (3): 229–236.
Khun, Thomas. 2012. *The Structure of Scientific Revolutions*. 50th ed. University of Chicago Press. http://www.google.hu/books?hl=en&lr=&id=3eP5Y_OOuzwC&oi=fnd&pg=PR5&dq=evolution+of+scientific+research+%22neutral%22+%22contested%22&ots=xT1RxdhOrM&sig=OJRylNlANXBHOdiPCLODVFPt5Uw&redir_esc=y#v=onepage&q&f=false.
Kohli, Kanchi, Holly Shrumm, Harry Jonas, Wim Hiemstra, and MARÍA JULIA OLIVA. 2012. "Community Protocols and Free, Prior Informed Consent–overview and Lessons Learnt." *Biodiversity and Culture: Exploring Community Protocols, Rights and Consent*: 25.
Kostka, Genia. 2011. "Environmental Protection Bureau Leadership at the Provincial Level in China: Examining Diverging Career Backgrounds and Appointment Patterns". Working paper series//Frankfurt School of Finance & Management.
Kung, James, and Ma Chicheng. 2011. "Does It Pay to Have 'Friends' in the Government? Insecure Property Rights, Political Connections, and Private Enterprise Growth in Transitional China". Working Paper, Hong Kong University of Science & Technology.
LAGERKVIST, JOHAN. 2012. "Principal-Agent Dilemma in China's Social Media Sector? The Party-State and Industry Real-Name Registration Waltz." *International Journal of Communication* 6: 2628–2646.
Larus, Elizabeth Freund. 2012. *Politics and Society in Contemporary China*. Lynne Rienner Publishers.
Lee, Liming, and Jun Lv. 2009. "Public Health in China: History and Contemporary Challenges." *Global Public Health: A New Era*: 185.
Lee, Mary J. 2000. "Toxics Release Inventory-An Environmental Database." *IASSIST Quarterly*: 5.
Li, Jun, and Xin Wang. 2012. "Energy and Climate Policy in China's Twelfth Five-year Plan: A Paradigm Shift." *Energy Policy* 41: 519–528.

Li, Wanxin, Jintao Xu, and Hui He. 2012. "Has the Centralized Environmental Governance Regime Worked in China?" *Administration & Society*.

Li, Yanbo, Wenjun Li, Chengcheng Zhang, and Mingming Fan. 2013. "Current Status and Recent Trends in Financing China's Nature Reserves." *Biological Conservation* 158: 296–300.

Lieberthal, Kenneth, and Michel Oksenberg. 1988. *Policy Making in China Leaders, Structures, and Processes*. Princeton University Press.

Lin, Feng, Andrew Chan, and Wilson Cheung. 2012. "6 The Political Economy of China's Environmental Law Reforms." *Law and Policy for China's Market Socialism* 80: 101.

Lindstedt, Catharina, and Daniel Naurin. 2010. "Transparency Is Not Enough: Making Transparency Effective in Reducing Corruption." *International Political Science Review* 31 (3) (June 1): 301–322. doi:10.1177/0192512110377602.

Liu, Lingxuan, Bing Zhang, and Jun Bi. 2012. "Reforming China's Multi-level Environmental Governance: Lessons from the 11th Five-Year Plan." *Environmental Science & Policy* 21: 106–111.

Liu, Xianbing, Beibei Liu, Tomohiro Shishime, Qinqin Yu, Jun Bi, and Tetsuro Fujitsuka. 2010. "An Empirical Study on the Driving Mechanism of Proactive Corporate Environmental Management in China." *Journal of Environmental Management* 91 (8): 1707–1717.

Lo, Carlos Wing-Hung, Gerald E. Fryxell, Benjamin van Rooij, Wei Wang, and Pansy Honying Li. 2012. "Explaining the Enforcement Gap in China: Local Government Support and Internal Agency Obstacles as Predictors of Enforcement Actions in Guangzhou." *Journal of Environmental Management* 111: 227–235.

Lo, Kevin, and Mark Y. Wang. 2013. "Energy Conservation in China's Twelfth Five-Year Plan Period: Continuation or Paradigm Shift?" *Renewable and Sustainable Energy Reviews* 18: 499–507.

Lomborg, Bjørn. 2001. "The Skeptical Environmentalist: Measuring the Real State of the World." *Cambridge (UK)*: 165–172.

Lorentzen, Peter L., Pierre F. Landry, and John K. Yasuda. 2010. "Transparent Authoritarianism?: An Analysis of Political and Economic Barriers to Greater Government Transparency in China." In *APSA 2010 Annual Meeting Paper, Washington DC*. Vol. 4.

Maguire, Kelly, and Glenn Sheriff. 2011. "Comparing Distributions of Environmental Outcomes for Regulatory Environmental Justice Analysis." *International Journal of Environmental Research and Public Health* 8 (5): 1707–1726.

Marimon, Frederic, María del Mar Alonso Almeida, Martha del Pilar Rodríguez, and Klender Aimer Cortez Alejandro. 2012. "The Worldwide Diffusion of the Global Reporting Initiative: What Is the Point?" *Journal of Cleaner Production*.

Mickwitz, Per. 2003. "A Framework for Evaluating Environmental Policy Instruments Context and Key Concepts." *Evaluation* 9 (4): 415–436.

Mok, C. C., C. L. Kwok, L. Y. Ho, P. T. Chan, and S. F. Yip. 2011. "Life Expectancy, Standardized Mortality Ratios, and Causes of Death in Six Rheumatic Diseases in Hong Kong, China." *Arthritis & Rheumatism* 63 (5): 1182–1189.

Mol, Arthur PJ. 2006. "Environmental Governance in the Information Age: The Emergence of Informational Governance." *Environment and Planning C* 24 (4): 497.

———. 2009. "Environmental Governance through Information: China and Vietnam." *Singapore Journal of Tropical Geography* 30 (1): 114–129.

Mol, Arthur PJ, and Neil T. Carter. 2006. "China's Environmental Governance in Transition." *Environmental Politics* 15 (02): 149–170.

Mol, Arthur PJ, Guizhen He, and Lei Zhang. 2011. "Information Disclosure in Environmental Risk Management: Developments in China." *Journal of Current Chinese Affairs* 40 (3): 165–6.

Morgera, Elisa. 2005. "An Update on the Aarhus Convention and Its Continued Global Relevance." *Review of European Community & International Environmental Law* 14 (2): 138–147.

Nyong, Anthony, Francis Adesina, and B. Osman Elasha. 2007. "The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel." *Mitigation and Adaptation Strategies for Global Change* 12 (5): 787–797.

Odenbaugh, Jay. 2011. "This American Life." *Ethics, Policy and Environment* 14 (1): 27–29.

Palaniappan, Meena, Peter H. Gleick, Lucy Allen, Michael J. Cohen, Juliet Christian-Smith, and Courtney Smith. 2011. "Water Quality." In *The World's Water*, 45–72. Springer.

Paltsev, Sergey, Jennifer Morris, Yongxia Cai, Valerie Karplus, and Henry Jacoby. 2012. "The Role of China in Mitigating Climate Change." *Energy Economics*.

Piao, Shilong, Philippe Ciais, Yao Huang, Zehao Shen, Shushi Peng, Junsheng Li, Liping Zhou, Hongyan Liu, Yuecun Ma, and Yihui Ding. 2010. "The Impacts of Climate Change on Water Resources and Agriculture in China." *Nature* 467 (7311): 43–51.

Polonsky, Michael, Suku Bhaskaran, and John Cary. 2012. "Exploring the Opportunities for Sustainable Food Labelling: a Supply Chain Perspective." In *ANZMAC 2005: Proceedings of the Australia and New Zealand Marketing Association Conference 2005*, 184–190. ANZMAC.

Price, Lynn, Mark D. Levine, Nan Zhou, David Fridley, Nathaniel Aden, Hongyou Lu, Michael McNeil, Nina Zheng, Yining Qin, and Ping Yowargana. 2011. "Assessment of China's Energy-saving and Emission-reduction Accomplishments and Opportunities During the 11th Five Year Plan." *Energy Policy* 39 (4): 2165–2178.

Ren, Guoyu, Hongbin Liu, Ziying Chu, Li Zhang, Xiang Li, Weijing Li, Yu Chen, Ge Gao, and Yan Zhang. 2011. "Multi-time-scale Climatic Variations over Eastern China and Implications for the South-North Water Diversion Project." *Journal of Hydrometeorology* 12 (4): 600–617.

Riege, Andreas, and Nicholas Lindsay. 2006. "Knowledge Management in the Public Sector: Stakeholder Partnerships in the Public Policy Development." *Journal of Knowledge Management* 10 (3): 24–39.

Schreifels, Jeremy J., Yale Fu, and Elizabeth J. Wilson. 2012. "Sulfur Dioxide Control in China: Policy Evolution During the 10th and 11th Five-year Plans and Lessons for the Future." *Energy Policy*.

Scriven, Michael. 1973. "Goal-free Evaluation." *School Evaluation: The Politics and Process*: 319–328.

———. 1991. "Prose and Cons About Goal-free Evaluation." *American Journal of Evaluation* 12 (1): 55–62.

Shambaugh, David. 2011. "Coping with a Conflicted China." *The Washington Quarterly* 34 (1): 7–27.

Stevens, Randriamalala Jean Luc, Mijitaba Maman Moustapha, Pertiwi Evelyn, and Randriamalala Jean Stevenson. 2013. "Analysis of the Emerging China Green Era and Its Influence on Small and Medium-Sized Enterprises Development: Review and Perspectives." *Journal of Sustainable Development* 6 (4): p86.

Stockmann, Daniela, and Mary E. Gallagher. 2011. "Remote Control: How the Media Sustain Authoritarian Rule in China." *Comparative Political Studies* 44 (4): 436–467.

Sullivan, Rory, and Andy Gouldson. 2007. "Pollutant Release and Transfer Registers: Examining the Value of Government- led Reporting on Corporate Environmental Performance." *Corporate Social Responsibility and Environmental Management* 14 (5): 263–273.

Tan, Yeling. 2012. "Transparency Without Democracy: The Unexpected Effects of China's Environmental Disclosure Policy." *Governance* (December). doi:10.1111/gove.12018. http://doi.wiley.com/10.1111/gove.12018.

Thomas, John K., and Darrell Fannin. 2011. "The Transboundary Trade of Hazardous Wastes, 2000–2006." *Environmental Justice* 4 (1): 55–62.

Walker, Gordon. 2012. *Environmental Justice: Concepts, Evidence and Politics*. Routledge Abingdon,, UK.

Wang, Alex. 2012. "The Search for Sustainable Legitimacy: Environmental Law and Bureaucracy in China." *Available at SSRN 2128167*.

Wang, Hua, Jun Bi, David Wheeler, Jinnan Wang, Dong Cao, Genfa Lu, and Yuan Wang. 2004. "Environmental Performance Rating and Disclosure: China's GreenWatch Program." *Journal of Environmental Management* 71 (2): 123–133.

Wang, Jing. 2010. *Brand New China: Advertising, Media, and Commercial Culture*. Harvard University Press.

Weibust, Inger. 2012. "Global Governance of Hazardous Chemicals: Challenges of Multilevel Management." *Environmental Politics* 21 (3): 536–538.

Wong, Christine. 2009. "Rebuilding Government for the 21st Century: Can China Incrementally Reform the Public Sector?" *The China Quarterly* 200 (1): 929–952.

Wu, Fengshi. 2013. "Environmental Activism in Provincial China." *Journal of Environmental Policy & Planning* 15 (1): 89–108.

Xiong, Wei, Ian Holman, Erda Lin, Declan Conway, Jinhe Jiang, Yinlong Xu, and Yan Li. 2010. "Climate Change, Water Availability and Future Cereal Production in China." *Agriculture, Ecosystems & Environment* 135 (1): 58–69.

Yu, Ignatius Tak Sun, Wilson Wai San Tam, Qing Hua Yan, Wei Wu, Wen Jun Ma, Lin Wei Tian, Lap Ah Tse, and Xiang Qian Lao. 2012. "Effect of Ambient Air Pollution on Daily Mortality Rates in Guangzhou, China." *Atmospheric Environment* 46: 528–535.

Zhang, Juyan. 2013. "A Strategic Issue Management (SIM) Approach to Social Media Use in Public Diplomacy." *American Behavioral Scientist*.

Zhang, Lei, Arthur PJ Mol, Guizhen He, and Yonglong Lu. 2010. "An Implementation Assessment of China's Environmental Information Disclosure Decree." *Journal of Environmental Sciences* 22 (10): 1649–1656.

Zhang, Yongfang, Dexin Guan, Changjie Jin, Anzhi Wang, Jiabing Wu, and Fenghui Yuan. 2011. "Analysis of Impacts of Climate Variability and Human Activity on Streamflow for a River Basin in Northeast China." *Journal of Hydrology* 410 (3): 239–247.

Zhao, Ping, Min Dai, Wanqing Chen, and Ni Li. 2010. "Cancer Trends in China." *Japanese Journal of Clinical Oncology* 40 (4): 281–285.