Does Environmental Information Transparency Lead to More Collaborative Governance in China?

An analysis of the IPE information database's function in boundary spanning

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Abstract

To promote more collaborative sustainable governance processes, environmental information transparency is required at all stages. As an authoritarian country with rapid economic growth, China has faced serious environmental degradations that threaten citizens' daily life. Over the last two decades, China has witnessed a trend to integrate third parties into environmental governance and an increasing environmental information transparency. The Institute of Public & Environmental Affairs (IPE), as a third party institution in China, is building up a database by collecting public environmental information throughout China, and it uses a pressure mechanism through the application of that information. As the only institution that conducts this work in China, IPE is a good example to showcase the impacts of information transparency different social sectors. The focus of this thesis is to analyze how environmental information transparency challenges previous physical, cognitive and social boundaries, and hence constructs a more collaborative governing model in China. By including and excluding social sectors in collaborative governance, information manifests power relation differences among all sectors. Therefore, this thesis further analyzes the power relations and dominant discourse behind this collaborative governance facilitated by information sharing. Official documents, academic research and interviews to IPE employees have been applied for the research of this thesis. It finds that information transparency functions well in terms of integrating companies and citizens in the governance and building trust in the government. However, this collaborative governance is not equal for each sector, and the government is still remaining in a dominant position compared with other sectors. Newly rising economic rationality in environmental governance is accepted as an influential way to tackle environmental pollution from growth. A critical reflection of how increasing information is applied to promote an economic-driven rationality solution, while reducing ranges of citizen involvement, is discussed. A new and alternative public sphere that is constructed by civil societies by digesting environmental information is expected for more equal collaborative governance.

Keywords: Information, Collaborative governance, Power relations, China

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Table of Contents

1 Introduction

1.1 Research background

Information technology development and transparency have deeply influenced contemporary society. In this modern age, information shapes principles and norms of society (Castells, 2011). Information processing, transmission and display have varied significantly. Individuals use visual online networks to establish and maintain connections with each other. Information technology reshapes career search methods, sentimental relations, friendship maintenance, hobby sharing, value sharing, social movement mobilization etc. The social network spectrum has been expanded, regardless of the strength of this kind of social tie (Ellison, Steinfield, & Lampe, 2007). The business sector uses information technology, in advanced operations and management that can be seen in lean supply chain management, Internet-enabled human resources information systems, and accounting information systems. Beyond business operations, the financial market, sales and marketing channels are all highly dependent on the development of online information systems. Furthermore, information systems constantly disclose governmental affairs and corporate performance, to enhance government's monitoring, citizens' supervision, companies' transformation, and ultimately contributing to collaborative governance.

Governance describes patterns of observed norms, behavior, and institutional forms (Ostrom, 2009). It consists of the whole of institutions and their interactions in the process of governing (Adger & Jordan, 2009). Governance is associated with discussion about formal and informal interactions between public and private people, and the realization empowerment and inclusion (Torfing & Sørensen, 2014). New forms of governance potentially lead to more pluralistic approaches with the involvement of an increasing number of non-governmental actors showing different power relations (Ansell & Gash, 2008; Gollagher & Hartz-Karp, 2013). Traditional strict divisions between government and non-government functions often hinder inter-organizational collaboration. Due to the uncertainty in the outcome of sustainability, scholars have claimed that an interactive and reflexive process is required to cope with struggles and difficulties in the process (Meadowcroft, Farrell, & Spangenberg, 2005). Hence, solving environmental problems and protecting natural resources needs collaboration between different actors.

Collaborative management, or co-management, is treated as a strategy to enhance understanding and problem solving for complex multi-interest sustainability problems (Adger, Brown, & Tompkins, 2005; Cash et al., 2006). It links with fostering innovation, multi way communication and solution integration in different sectors (Feldman, 2012). Interests, power and responsibility differences of different actors, require compromises and co-management in the process. Inclusive mechanisms, the plurality of knowledge and values, and accountability of institutions are thought of as three fundamental challenges to the successful integration of actors to achieve sustainability governance (Brown, 2009). Therefore, information sharing among different actors, constituting an intermediation function, is a necessary step to achieve collaborative governance and give suitable accountability for the process.

Information transmission speed has been increased significantly with the development of Internet. The Internet has the advantage of having a broader reach, fast speed and an interactivity characteristic. Moreover, information also constructs a two-way communication model instead of the traditional top-down or one-way model (Marche & McNiven, 2003). Information weakens the hierarchy system if the publication of information allows everyone to get same opportunities for accessing and processing (Banas, 2010). Still, information and knowledge is held, stored, and displayed differently for groups at different levels (Cash et al., 2006). Information generation, transmission and implementation, are sources for productivity or shifting of power, which could lead to institutional transformation in governance (Cash et al., 2006; Soma, Onwezen, Salverda, & Van Dam, 2016). At the initial stage of information transparency, it was state actors who managed environmental information collection and handling, becoming a powerful data monopoly (Arts et al., 2015). Later, private sectors actively participate in environmental monitoring and information collection. To challenge the information monopoly of political or strong economic actors, NGOs began to work in information gathering (Mol, 2008). Through sharing parts of information controlling and decision making capacity, top-down authorities are also supplemented with a facilitative and participatory consensus building process.

Current literature relevant to information governance for sustainability is focused on empirical analyses. Much research covers the effects of information and communication technologies (ICTs) on public services, such as government trust building through two way communication (Myeong, Kwon, & Seo, 2014), and citizens' engagement improvement (García-Sánchez et al., 2013). The business sector's use of information to communicate ecological interests and reconstruct ecological rationality in products, production processes and consumption are widely discussed (Blackburn, 2011; Jeffers, 2010; Mol, 2008). Research in this domain includes discussions about how information technology systems influence different actors on the value chain (Gopalakrishnan, Kessler, & Scillitoe, 2010), and

increase integration of customer values, such as environmental stewardship, into marketing process (Jeffers, 2010). This perspective is consistent with the global neoliberal discourses, which supports institutionalization of ecological value and stress on using private authority to govern the environment (Soma, Termeer, & Opdam, 2015). Due to the rapid development in ICTs, it becomes easy for citizens to have access to environmental information and take part in solving public problems. IT infrastructure, enabling large-scale citizen participation in monitoring campaigns, is expected to effectively produce a change (Sîrbu et al., 2015).

In terms of environmental information used for citizens' needs, some research discusses the process of social learning from information access in communities to increase citizens' capacity to become involved in the governance of complicated issues related to future transformation (Asokhia, 2009; Delaune, 2012; Krätzig & Warren-Kretzschmar, 2014). When discussing social empowerment for citizens to use information, digital information instruments could give a chance for better access to information, hence transforming society to become more equal (Banas, 2010). Omobowale (2013) doubts this statement, claiming that for disadvantaged groups, the development of ICTs would even worsen inequalities. Increasing transparency is relevant to powerful actors, which control the major markets and products. It raises doubts of the role of information in advancing empowerment and sustainability goals. Gupta and Mason (2016) claim that the institutionalization of a disclosure system would diverge from the initial goal of transparency, which is for consideration of public good and sustainability. The democratization perspective about environmental information transparency is that it links state-organized systems that facilitate the right to know about pollution, accountability and participation for citizens (Gupta & Mason, 2016; Mol, 2013). Transparency could also be used by citizens to scrutinize available data against substantive criteria in environmental governance by companies and governments (Mol, 2013). This research mainly analyzes information transparency with one social sector, public agency, or market, or citizens and civil society. Some papers discuss collaborative management with the application of information transparency, including common resource management on local communities (Hall, Moore, Knight, & Hankey, 2009), while some are focused on international governance arrangements for global issues, such as coastal zone governance (Mizuo, 2008).

The previous empirical studies about information transparency in China include environmental information transparency, such as legislation and policy and implementation (Zhang et al., 2015), and the assessment of disclosure decrees (Zhang et al., 2010). Li and Li (2012) analyzed the social learning functions from environmental transparency for green growth, while Tan (2014) analyze the authoritarian political structure in China, and claimed that environmental transparency doesn't translate to stronger accountability. Environmental information only turns to be more socially

influential when different actors positively receive information (Opdam et al., 2016). This thesis focuses on analyzing how environmental information, playing an intermediation role, challenges or spans boundaries of different social actors, so as to reach the collaborative governance towards environmental protection and sustainability, with context in China. The process of collecting, processing and applying environmental information draws the line by which some social actors are included or excluded. Through the analysis of collaborative governance formed by information transparency, the discourse used and power relations embedded behind the process will be discussed. In a broader sustainability science perspective, this thesis goes with cross-disciplinary and collaborative sustainable governance, or governance beyond the state (Swyngedouw, 2004). Information and database should be included into discussion to evaluate how it facilitates the governance. But a critical perspective should be taken to understand whether the promise of empowerment and democracy from information sharing, is settled within a broader neo-liberal political-economic order or not.

1.2 Research aim

More specifically, the aim of this research is to assess the impacts and limits of practical applications of environmental information transparency towards collaborative environmental protection and sustainability within the Chinese context. Based on a case study of the Chinese environmental information database NGO, IPE, the research questions are the following:

1. How does information disclosure work for building collaborative governance? (What are information roles in crossing physical, cognitive and social boundaries that hinder the collaboration in government, companies and citizens)
2. What power relations among different social sectors are manifested behind this collaborative governance structure?

Firstly, the background of Chinese legislations and policies about environmental information transparency will be presented and discussed, and then why choosing the IPE database as case study is relevant to answer the research questions will be explained. Using the boundaries framework, it will be shown that boundaries that hinder collaboration are basically divided into three dimensions: physical, cognitive and social. Based on understanding boundary dimensions, through collecting interviews from IPE and analyzing official documents and other academic researches, this research will provide insights on how current Chinese environmental information transparency works to change boundaries. Analyzing other studies, the discussion will focus on power relations, inclusion and exclusion among the government, companies and civil society, and the limitations in this collaborative mode of governance.

2 Study context

2.1 Legislation and policy of information transparency in China

Rapid economic growth in China has resulted in serious environmental degradation. China is the biggest emitter of green house gas globally; 70 percent of China's lakes and rivers were polluted to some extent, mostly by industrial pollution (Yong & Wang, 2003; Zhou, 2013). The Chinese Academy For Environmental Planning (CAEP) estimated that the cost of environmental degradation has reached 230 billion US dollar in 2010, constituting 3.5 percent of gross domestic production (Wong, 2013). China has been labeled as an "authoritarian" state, where the central government plays a main role in information transmitting (Mol, 2006), and China has also been considered as one of the most "information poor" countries. Newspaper, television, and the Internet have been under strong state control (Zhang et al., 2015). Over the last two decades, there has been a change in information transparency, especially in relation to the environment. It was treated to overcome inherent weakness of high management cost in a command and control governance structure (Shi & Zhang, 2006). The allowance of environmental disclosure and media discussion have been analyzed as the Chinese central government's idea to gain political creditability and to build a countervailing power against local state-owned powerful polluters (Zhang et al., 2010; Zhang et al., 2015).

Whilst, the law formally accepts environmental information transparency, it functions better in governance (Mol, 2008). The progress of environmental transparency from legislation and regulations has been obvious during recent years. Environmental Protection Law (EPL), launched in 1989, gave a legal basis for the disclosure of environment-related reports. Through time, substantive environmental information is inserted into various laws and policies. In 2008, the Open Government Information Regulation (OGIR) opened the access to government information, and Environmental Information Disclosure Measure (EIDM) became the first sectional operation of general OGIR regulations. These regulations are used to force government at all levels, and heavy corporate polluters, to make environmental information transparent (Tan, 2014; Zhang et al., 2010). Since July 2013, National Key Polluting Companies Volunteering Monitoring and Information Transparency Measure have been applied to require heavy polluters to construct pollution monitoring infrastructures which record on-site real-time pollution data. In 2012, the Ministry of Environmental Protection (MEP) announced 496 air quality-monitoring stations in 71 cities (Lin et al., 2016). In 2014, China's environmental information reached a new legal progress: a whole new chapter of environment information disclosure and public participation in environmental governance. The examples above show the standards, laws, regulations and permits, imposed by authorities. Law

exists to guarantee the transparency of environmental information, but the implementation of environmental law is under doubt (Tan, 2014). Different explanations and interpretations of vague laws could be used by powerful sectors to meet their own needs (Ma & Ortolano, 2000).

2.2 Studying scope

The content of environmental information transparency - comes mainly from two sources and is discussed in this thesis. Measures on Open Environmental Information released in 2008 require local Environmental Protection Bureaus (EPBs) to disclose information on: (1) Environmental Laws, regulations and standards; (2) the allocation of emissions quotes and permits; (3) pollution fees and penalties collected; (4) exemptions, reductions, or postponements granted; (5) the outcomes of the investigations into public complaints; (6) lists of violators of environmental regulation (Measures on Open Environmental Information (for Trial Implementation), 2008). Also, to check whether companies have been in compliance with environmental regulations, enterprise violations of emission standards, violations of total emission control targets, and records of administrative penalties are analyzed (Ker, 2015). Another example of environmental information has been on-site real-time polluting information required by National Key Polluting Companies Volunteering Monitoring and Information Transparency Measure implemented in July 2013 (National Key Polluting Companies Volunteering Monitoring and Information Transparency Measure, 2013). The measure requires provincial EPBs to construct voluntary monitoring of the infrastructure by heavy polluting companies, so that the daily pollution data could be recorded. IPE in China collects all the environmental information from more than 300 municipal EPB websites, and will be the case study of this thesis. Several reasons have been considered to choose this NGO as studying case. First, it has collected information mentioned above in local EPBs; second, there is irregular data input and non-uniform design of governmental websites and data input in different municipalities, while IPE's database overcomes this problem by collecting all pollution information and reunifying it. Lastly, information disclosed on official websites has rarely been used except for publicity, while IPE's database has been put into different usage, reflecting the application of information for diverse social groups.

Therefore, the use of IPE's database could reflect the situation of Chinese environmental information disclosure, and its functions in boundary spanning in collaborative governance by connecting different social sectors. However, a limitation of IPE, and therefore of this research, is that environmental information disclosure in newspapers, NGOs, and on corporate social responsibility reports from companies is not considered in their database; only those of systematic and continuous disclosure as previously explained.

2.3 Case study context: IPE

The Institute of Public & Environmental Affairs (IPE) is an NGO based in Beijing and was established in 2006. IPE is the most well known Chinese non-state institution that is working for environmental information disclosure and public participation. The aim of IPE is to make more environmental information transparent to allow full communication and understanding of all sectors relevant, thus promoting widespread public participation in the environmental governance. IPE, as a non-state environmental disclosure NGO, has built and maintained up-to-date online databases. IPE has the three main departments of information, sustainable supply chain and sustainable financing. The fundamental department is the information transparency department, which mainly works on collecting, sorting and publishing pollution source information disclosure at a municipal level. Environmental information that the IPE collects is mainly from two sources: firstly from more than 300 municipalities in 31 official provincial government environmental bureau disclosures which contain enterprises' violations of air and water pollution legislations and relevant penalties (PITI, 2008); second, the on-site real-time emission data of heavy polluting companies, which is also shown on local EPB websites is also a used source. IPE also works for more transparency by negotiating with local governments and building the Pollution Information Transparency Index (PITI). PITI compares the 120 municipal government environmental disclosures, and gives a rank, aiming to build incentives to municipals for better transparency (PITI, 2015). The environmental information that IPE collects is not only disclosed on websites, but also on the software application "Blue-Sky Map". Through Geographical Information Systems (GIS) visualizing pollution data onto a map, citizens have the chance to spot pollution near where they live, creating a more interesting and interactive way to display environmental information.

In terms of usage of environmental information, IPE's core concept is to build a motivation mechanism. IPE has two departments, working on this: the sustainable supply chain department and sustainable financing department. By checking the IPE pollution database, multinational companies can check their first/second/third tier suppliers' environmental behavior for free, helping them manage their supply chain at a reduced risk. IPE has built Corporate Information Transparency Index (CITI) to rank companies by evaluating how well big brands manage environmental pollutions issues from their suppliers. In 2015, 1607 suppliers to 86 companies have connected with IPE to communicate, respond or amend their environmental behavior (CITI, 2015). The same principle is applied to sustainable finance: IPE intended to influence listed companies' suppliers through giving pressure with those listed companies. The underlining assumption is, instead of influencing small and

medium size companies, it would be more efficient to influence them indirectly through influence actors who have more power in the market. Except for market usage, real-time online environmental quality information is also available for citizens, with easy access by ‘Blue-Sky Map’ to monitor polluting companies’ behavior. Social media, such as ‘WeChat’ and ‘Weibo’, opens opportunities for the public to ‘hash-tag’ and put forward their findings to the local environmental bureau; environmental data offered by IPE works as evidence for them to uphold their rights. Information source and information applications in IPE is shown in **Table 1**. **Figure 1** showcases the relationship of other stakeholders with IPE. The appearance of the IPE database website is shown in **Figure 2** in the Appendix.

Table 1. Information source and usage among social sectors in IPE's database

Information source	Information usage among social sectors
1. Local EPBs disclosed information based on Measures on Open Environmental Information (focusing on companies that have been in compliance with environmental regulations, enterprises' violations of emission standards, violations of total emission control targets, and records of administrative penalties) 2. On-site real-time polluting information required by National Key Polluting Companies Volunteering Monitoring and Information Transparency Measure	1. PITI (building incentives to municipals for better transparency) 2. CITI and green supply chain (helping big brands manage their supply chain and reduce risk) 3. Green finance and security (helping financial sectors to identify environmental risk) 4. '*Blue-Sky Map*' application (user-friendly way to display information source to invite more citizens' involvement)

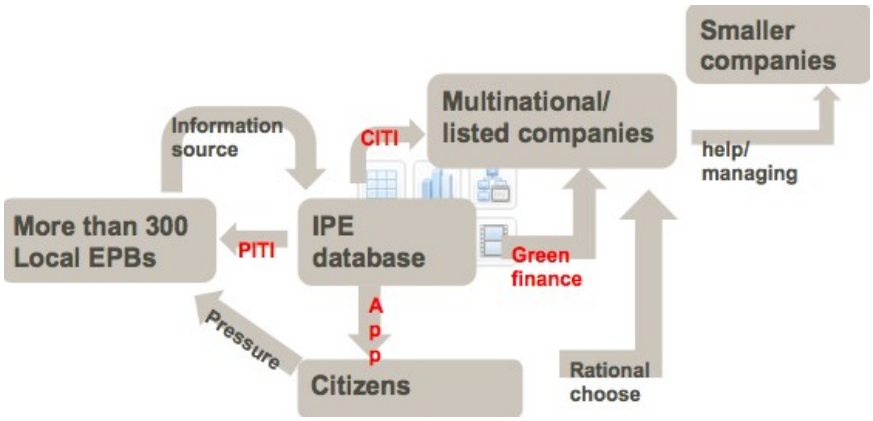

Figure 1: The relationship and interactions of other stakeholders with IPE

3 Framework

3.1 Boundary studies

To pursue common but complex goals, collaboration among stakeholders is expected. Collaborative governance often emerges among different institutions, where conflicts are raised due to fragmentation (Lubell, 2015). Collaboration requires common-pool resource sharing where various institutions take different responsibilities, while differences in interests, views, institutional settings and other social cognitive set boundaries for further cooperation (Kark et al., 2015; van Broekhoven, Boons, Buuren, & Teisman, 2015).

Boundaries are separation lines to distinguish entities and organizations. Borrowing definition from Kerosuo (2006, page 4), boundaries are "distinctions and differences between and within activity systems that are created and agreed on by groups and individual actors over a long period of time while they are involved in those activities." Sturdy, Clark, Fincham, and Handley (2009) claim that boundaries produce differences and increase the sense of self-identity. Barth (2000) names some exited boundaries, such as borderlines drawn on the map to decide scale of territory, abstract lines for separations and distinction in political or social institutions (for instance, non profit or for profit), and conceptualization of ideas or values for distinction (for instance, religion). With this understanding, boundaries could separate and alienate groups (Sturdy et al., 2009; van Broekhoven et al., 2015), set barriers for collaboration, and divide groups as insiders and outsiders (Termeer & Bruinsma, 2016), at the same time, set and keep formal or informal rules that restrain insider actors' behavior (Ostrom, 2009).

Boundaries are formed socially. Through actors' communication and interactions, boundaries become part of social reality (van Broekhoven et al., 2015). They are division lines that are shaped by past experiences and activities. Cowell and Martin (2003) stated that boundaries are embedded in the structure, vested interests of sectors, histories, and other social factors. Analyzing boundaries and boundaries relationship is a mirror to reflect reality. Boundaries are exclusive for certain groups in, but it could also be challenged for integration. While when tackling complicated and dynamic social problems, exited boundaries and boundary relations have to be changed (Sturdy et al., 2009). To deal with complex environmental problems, actors need to cross the established boundaries of organizations and work by coordinating with each other (van Broekhoven et al., 2015). Boundary spanning is understood as the interactions and cooperation between groups or institutions, which have rare collaboration before (Bressers & Lulofs, 2010). Effective boundary spanning not only needs

information transparency, but also information translation to cross-different disciplines and institutional structures (Cash et al., 2006).

Information transparency is important for boundary changing in environmental governance because it can “mediate” communication between different sectors in governance processes, and help sectors to identify tools and mechanism to apply to common problems (Feldman, 2012). Increasing transparency of environmental information results in new governance arrangements, facilitating interactions and implement boundary actions, between public and private sectors (Mol, 2008; Termeer & Bruinsma, 2016). Therefore, it plays a key role in negotiating boundaries, reconfirming organization boundaries (Duncan & Schoor, 2015). A critical perspective should be used: information sharing could lead to another kind of source of conflicting, exclusion some groups and empower certain groups in collaborative governance (Muñoz-Erickson et al., 2010). Understanding the structural relationship and power difference within collaborative governance invisibly behind boundary changing is valuable for analyzing limitation of “fancy” collaborative governance.

3.2 Boundary dimensions

This research applies the analytical boundary framework by Hernes (2004) and van Broekhoven et al. (2015), to understand through environmental information transparency, what kind of boundary dimensions have been changed or spanned. Boundaries have been classified in three different dimensions: physical, cognitive and social (**Table 2**).

- Physical dimensions are material or territorial (Hernes, 2004) barriers, or physical and technological differences that reduce the interactions and constrain cooperation (Sturdy et al., 2009). The use of electronic applications can draw lines that could become involved in governance. Moreover, a Physical Boundary can also be represented by rules in the use of resources (Hernes, 2004). Environmental information that is used for challenge material and territorial barriers in environmental governance will be considered in the discussion

- Cognitive dimensions relate to how differences in knowledge, ideas, identification, language and other cognitive distance hinder the collaboration (Termeer & Bruinsma, 2016). It is about actors’ sense of participation and identities they attach to in one specific issue (Sturdy et al., 2009). By stressing different aspects on one issue, people from different actor groups frame problems and solutions differently. For example, to integrate socio-ecological research, research questions, hypothesis and methodology have to be jointly defined at initial stage to overcome cognitive barriers (Simon & Schiemer, 2015). To understand information

transparency function in changing cognitive distance, the following will be analyzed: how responsibility towards environmental governance has been redefined or extended, how language in environmental discussion gives chance for collaboration, and how identification distance has changed.

- Social dimensions are indicated to barriers to build social capital, social inclusion and belonging among different actors (Hernes, 2004). Social boundaries can be reflected by trust and social norms. Social bond is a crucial factor to move different actors together (Barth, 2000). In this dimension, trust in the government, social learning and social trust building through environmental information transparency and interpretation will be analyzed.

Table 2. Boundary dimensions (Hernes (2004) and van Broekhoven et al. (2015))

Physical dimensions	**Cognitive dimensions**	**Social dimensions**
Material, technological, spatial arrangement	Ideas, interpretation, beliefs, language, identification arrangement	Social bonding, loyalty, trust, social norms arrangements

4 Methodology

4.1 Methodology

The methodology is based on a single case-study research of IPE regarding its applications of environmental information and interactions with different sectors, to understand how environmental information works for changing the boundary process and power relations among different social sectors.

Qualitative methods were used for gathering primary and secondary data. The primary data was collected by in-depth interviews with information processing employees; semi-structured interviews give interviewees more freedom to comment without the interviewer's subjective lead; hence increasing the creditability of results. Six semi-structured interviews are taken with a time variance from 30 minutes to 1 hour. Interviewees who are selected are managers of IPE's functional departments or environmental experts who have involved in the development process of IPE. Those experienced staff members have close connections with the government, corporates, citizens, etc. So they have knowledge about boundaries and boundary actions when interacting with other institutional actors. Secondary data mainly refers to literature review, including institutions' documentary reviews, reports, legislation documents, regulation documents and other similar research papers, to obtain a comprehensive understanding of perspectives about using environmental information from government, companies and civil society. IPE regularly releases research reports about environmental information disclosure, supply chain management and financial usage of their database conditions in China. There are also specific reports about key brands (Apple), or industries (textile) to invite public and media attention to give pressure to pollution issue. Analysis of their reports provides an initial understanding of pressure mechanism and boundaries in forming collaborative environmental governance.

4.2 Ethics and limitations

Ethical issues were considered while carrying out the in-depth interviews such as explaining the aim of the research and the consent to record the interview and use the data. All the participants involved gave their explicit consent of being part of this research. However, there have been some limitations in the collection of data and, therefore, in the analysis of this research. Firstly, the low number of interviews carried out; the reason for this is considering they are the leaders of departments with

enough working experience, hence could have knowledge about interaction with government, companies and citizens. To reach more objective results, it would be better to conduct more interviews with members of government, companies and citizens directly when given enough time permit. Secondly, only information coming from IPE is considered, acknowledging that it does not integrate fragmented environmental information disclosure on newspaper, other NGOs, or on corporate social responsibilities reports from companies. Only that systematic and continuous disclosure as aforesaid explained is applied. Further research will be needed to integrate and compare the results of this research with environmental information disclosure coming from other sources.

5 Results and analysis

5.1 Impacts on physical boundaries

Similar to information usage in other domains, information can overcome the limits of time and space. This section of the thesis will analyze how information transparency functions in crossing physical boundaries, including helping corporates to manage value chain management horizontally and vertically, extending supervision territory with information. Through interviews with IPE, cross-territory of peer pressure in EPBs from information transparency will also be elaborated on.

5.1.1 Crossing physical boundaries in corporates' value chain management

Information transparency could help companies manage their value chain. According to Corporate Information Transparency Index report (CITI, 2014), the environmental information database in IPE provides international brands with a channel to manage their Chinese supply chain partners. According to Boström et al. (2015), in sustainable supply chain management, complicated geographical production networks and distance causes the public to remain uninformed about problems, which results in public ignorance. A lack of reliable, comprehensive, and verified information on the value chain increases the management cost. In the IPE CITI report (2015), the example of Japanese multinational company Hitachi is used. Without information symmetry, Hitachi would have to spend much time on grasping suppliers' environmental performance. With information transparency, instead of physical checking on sites, procurement departments of big brands just need to regularly check the environmental penalties database, to spot if there are punishments or other publicity affecting their suppliers (CITI, 2015). If there are problems, brands apply pressure, facilitate, or help their supplier companies to update the environmental infrastructure. This process breaks geographic and territorial boundaries for companies in supply chain management. Environmental information also helps companies to extend the scale of supply chain management, crossing institutional vertical boundaries. In Johansson and Månsson's (2013) research, it is found that management of suppliers on tier 1 and tier 2 is much more developed than that of more distant tiers. "By using data offered by IPE, brands could easily find out about the environmental behavior of their second-tier or even third-tier suppliers", the supply chain department manager said about that. She used the textile industry to explain why information transparency is important in vertical value chain management: "Multinational companies in the textile industry, with many upper suppliers in China, compared with companies in other industries, are quite familiar with CSR. In their supply chain system, their first tier suppliers are well controlled. However, water pollution, an important topic for

the textile industry, has been rarely mentioned in their CSR reports. Most water pollution in the textile sector comes from the printing and dyeing procedures, which are done by their suppliers located on multiple tiers. It was hard for companies to trace back through the whole process of the value chain, while the environmental information database gives support to cross the physical boundaries." Information transparency, from this perspective, demands for traceability on the whole value chain. Another physical boundary in terms of environmental value chain management is that environmental information sharing could build an alliance in the industry regardless of regions to foster a greater sustainable impact. The IPE supply chain department specialist stated, "To reach a wider influential function of our database, we try to break single institutional management boundaries and influence whole industries." IPE have influenced textile and electronic industries. Multinational companies in the same industry have many shared suppliers in China. Hence, information sharing leads to more sustainable impacts if there is an alliance (CITI, 2014).

5.1.2 Crossing physical boundaries in pollution monitoring and supervision

Environmental information and ICTs can potentially reduce the physical difficulties in pollution monitoring for local EPBs and citizens with easy access to information; in China, however, open resources data has little contribution to expanding monitoring scope. In Li and Li's (2012) research on Chinese environmental information transparency, EPBs were slow in identifying and documenting companies' violations and responding to citizens' complaints. On-site real-time information on heavily polluting companies can reduce local environmental bureaus' inspection costs. As one staff member of the IPE commented, those environmental bureau officers do not need to visit polluted sites to check the pollution. If serious environmental pollution happens, EPBs must publicly announce those companies violators' names, contact details, and discharged pollutions; within 30 days, companies must report their new installation of a pollution prevention mechanism (Ker, 2015; Li & Li, 2012). Disclosing companies' information to the public, puts pressure upon polluting companies to respond in time. Another way to enlarge supervision scope is an open sourced environmental information database, which welcomes more data contributors. In '*Blue-Sky Map*' Application 3.1, citizens can use certain data input methods to participate in collecting information of black and smelly water bodies and send that information to relevant EPBs, though participatory testing is not well developed in China. Participatory testing increases coverage of monitoring areas with individuals in distributed areas (Sîrbu et al., 2015). But IPE staff commented that they are initially more willing to use data that is disclosed by the government. As one employee said: "It consumes time and efforts when spending on validating data offered by citizens". Combining interviews with research by Liu (2015), an

additional reason behind more willingness to use governmental public data is to get rid of pressure created by polluting companies: information is sensitive while NGOs have a weaker stance compared to companies, so information disclosed by the government provides support when negotiating with strong economic powers. A spare explanation of the low degree of development in open source data comes from legislation and regulation settings in China. The Article 8 of OGIR states, "all information transparency from government may not threaten national security, public security, economic security and maintenance of stability" (PITI, 2015). This vague message gives an undefined scope of environmental transparency. Except these vague claims that threaten normal citizens' involvement, public testing still lacks legal support. According to "The Regulations Concerning the Environment Monitoring" opinion-soliciting draft released in 2009, Article 81 writes that: "No organization or individual shall publicize without permission any information related to the monitoring of environmental quality in any form". In fact, since 2011, quite many citizens in big cities began to use monitoring devices to test air quality and water quality (Wangyi News, 2011), however, later they were forbidden to publish their findings on online or offline media.

5.1.3 Crossing physical boundaries through cross-territory peer pressure

Environmental information transparency collected from local EPBs has the possibility in triggering peer pressure in environmental bureaus in different municipalities, forming a cross-territory pressure mechanism for better transparency. Staff in the IPE information department said that, "The intention of PITI ranks is to disclose more information disclosure through evaluating and comparing different municipalities' disclosures." When asked whether there does exist peer pressure among municipalities, the staff of IPE was hesitant. "We are not sure about that, but the Ministry of Environmental Protection thinks highly of our database. We are also pushing forward integration of PITI ranking into EPBs' performance evaluation, which probably puts more pressure upon those local environmental bureaus to improve their transparency". There is no research that directly discusses about this kind of peer pressure, but some researches have relevant findings to this issue. Zhang et al. (2010) stated in their research, on national level, MEP evaluates all provincial EPBs' information disclosures on their websites. On provincial level, there is also a trend of co-learning of transparency. Tan (2014) used a workshop in Shandong Province in 2010 as an example, with 50 governmental officials at municipality level joining to discuss how to improve environmental transparency. Those researches are partly about how the government catalyzes information transparency. However, there is lack of evidence to prove that the disclosure of an uneven transparency performance of municipalities, just as what PITI ranks are aimed at, is creating direct incentives for cross-territory peer pressure comparison.

5.2 Impacts on cognitive boundaries

In conventional environmental governance model, some traditional and deep-rooted beliefs and ideas tend to frame the solutions to environmental problems. This part will analyze cognitive changes from applications of information transparency, including enlarging supervision agents and enhancing supervision power; strengthening local EPBs and cognitively putting environmental governance in a higher place in general public governance; enhancing participation of citizens; integrating ecological costs into business operation. Not only information process has impacts on cognitive boundaries, but also the way to display and explain information. How information is used to redefine questions and solutions is also included in this part.

5.2.1 Crossing cognitive boundaries by enlarging more supervision agents and scale

A public information database has enlarged “supervision agents”, creating a long-term risk of punishment and enhancing the supervision power. A single pollution complaint from a single citizen is shown online, and becomes an issue that every website user can see. One staff member of IPE said: “If the government doesn't take action to punish polluting companies, and if companies don’t change their behavior, the public is watching.” Information transparency in this way gathers public supervision power, unlike previous vulnerable single appealers. Another relevant finding is to increase supervision power from transparency that comes from the implementation of on-site real-time environmental information. Security Times China, a national security magazine, released a report (Security Times China, 2016) about environmental risks of listed companies, evaluating their branches’ on-site real-time environmental behavior. It mentions that environmental pollution is easily accessible for the public to monitor those companies, and constant ignorance of companies could put them into a dangerous position, in respect of ruining their reputation, as well as financial risks like large amounts of fines and losing of investing. Before, the penalties of polluting companies have not been high, giving them less incentives to change their behavior; while the amendments of the EPL that has been put into effect from Jan 2015, remove the cap on fines and introduce a daily penalty system according to on-site real-time information (Ker, 2015).

5.2.2 Crossing cognitive boundaries through strengthening local EPBs

Information is also working for balancing the power relationships in the government system and strengthening the stances of local EPBs. According to Johnson’s (2014) study, China’s Ministry of Environmental Protection advances the participation agenda, with the intention to improve

environmental policy implementation on a local level and increase the MEP's standing before the powerful economic ministry. The local EPB is a comparably weak department in the system since GDP growth takes priority over other social issues (Mol & Carter, 2006; Shi & Zhang, 2006). Although local EPBs are governed by the MEP, respective local governments still control financial funding and personnel decisions (Ker & Logan, 2014; Shi & Zhang, 2006). When facing a higher tax income and GDP performance, the local government has less incentive to set a higher barrier for environmental admission. An information database manager commented that "Many of the heavy polluting companies are state-owned industrial companies. When environmental bureaus give penalties to them or NGOs challenge them, they are indifferent and pay no attention to that." This coincides with Shi and Zhang's (2006) research, which states that in the Chinese political system, many managers of state-owned enterprises, tend to have a higher rank in the political hierarchy compared with officers in environmental bureaus who are supposed to regulate those enterprises. In a country where hierarchy is well-respected (Liu, 2015), local environmental bureaus have limited influence to require a company's transformation. Furthermore, there is a close tie between government and enterprises, with informal connections ("Guanxi") (Tan, 2014), and these close ties undermine the implementation of EPBs. Ker (2015), from a legislative perspective, commented that Measures on Open Environmental Information that was released in May 2008, have less weight compared to the State Secrets Law and Archives Law under the Chinese legal framework. Similar to that, Li and Li (2012), after analyzing policies about information transparency released by MEP, stated that due to the exemption of non-disclosure in trade secrets and lack of implementation policies, there is still some grey area allowing polluting companies to conceal the truth. "The environmental bureau is in a passive position, while when facing big pollution events, it is always the local environmental bureaus that are being criticized", said by Ma Jun, the leader of IPE. Information transparency, when making information available to citizens, could create collective invisible pressure of public opinions, and enhance local EPBs' stance when facing strong economic departments. To what extent environmental transparency helps enhancing EPBs' power is embedded in the legislation system. The new EPL requires considering environmental performance as a criteria for evaluating local government officials, creating a greater accountability of environmental information (Ker, 2015). A daily penalty system comes into effect in the new EPL, which gives more negotiation power to local EPBs when facing heavy polluting state-owned companies regardless of political hierarchy.

5.2.3 Crossing cognitive boundaries through enhancing participation of citizens

Information transparency could reduce placing emphasis on only elites' and specialists' knowledge and increase the participation of citizen groups. Citizens are encouraged to use information for two

reasons: to monitor and pressurize local EPBs to enforce environmental regulations, and to supervise polluting companies' environmental compliance. In the IPE software application design, environmental data is translated into easy-understood data. On-site real-time emission levels are compared with regulated emission levels for citizens' acknowledgement. With GIS technology, environmental information is visualized in the Blue-Sky APP, making it easy for citizens to understand without aid of "environmental specialists". However, there is still a knowledge gap between 'specialists' and 'normal citizens' in terms of data details; for example, the categories of water quality, or the criteria for establishing a standard of evaluating pollution. Furthermore, IPE is an institution that focuses on using information to form a pressure mechanism: environmental information can potentially penetrate the supply chain, financial market, and consumer choices (Li & Li, 2012; CITI, 2015; IPE Security, 2014). From this standpoint, the scope of environmental discussion that current information transparency gives to citizens is confined to companies' environmental compliance, with a pressure mechanism from economically based instruments. When asked other meanings for citizens in using information, one employee answered that it could enhance citizens' awareness in protecting rights as freedom of speech, the right to know, etc. This sense of awareness could be valuable in facing other kinds of public conflicts and supervising public sectors' work. However, this claim needs the justification with extra investigation to citizens who are using environmental information. In terms of mobility of social movement prompted by sharing information, citizens have opportunities to seek environmental information and mobilize collective actions to fight against polluting companies (Li, Liu, & Li, 2012). However, Liu's (2011) research finds that environmental information in China is adopted with a gentle style to raise environmental awareness and encourage participation, instead of using negative information for radical social movements to challenge the current political system or confront companies.

5.2.4 Crossing cognitive boundaries through integrating ecological costs in business

Information is valuable in accelerating the integration of environmental costs into management costs for companies, raising ecological responsibility in the industry. As Mol (2008) claimed, spreading environmental information on causes, consequences and solutions help polluters to rearrange their production. There are many cases of embedding environmental information in business management and operations in China. The MEP published "Guidelines on Environmental Information Disclosure of Listed Companies" (draft for comments)" in 2010, which is aimed to promote more transparency and use financial instruments to change corporations' behaviors (IPE Security, 2014). Cooperating with banks, IPE abstracts environmental information from their database and offers it to bank fund managers, turning the environmental factor into one of the fund risk management variables. Security

Times China, an official magazine to disclose information of listed companies in China, has published weekly “Real-time emission data of listed companies ranks” since 2015 (Security Times China, 2016). The aim of the ranking is to offer investors a tool to identify environmental risks of those listed companies through information transparency. The ranking covers 1365 pollution controlled companies and 519 listed companies. The multinational companies with a high rank in CITI, are in industries close to consumers’ daily lives, such as IT, textile, food and beverage and automotive. That means those multinational companies who have the determination to push forward their suppliers to change their behavior are companies that think highly of branding. Combining all those practices in business applications of environmental information, it is visible that information usage with market rationality is growing fast.

5.2.5 Crossing cognitive boundaries through reframing and retelling stories

Another cognitive boundary that environmental information spans is dependent on how to use information to redefine and reframe problems. IPE’s visualized companies’ pollution data was called “pollution map”; nowadays, the “blue sky map”. “Information that is being publicized is to build a mechanism for positive change. Changing the negative information into a positive future improvement, gives more incentives to companies to make a shift”, staff members of IPE commented. From their answers, it shows that initially pollution information was published to make citizens’ aware of the consequences of pollution; renaming the database is to bring people to fix the pollution. “Companies are not our enemies, but pollution is”, Ma Jun, the founder of IPE, commented. Both finance and supply chain management department employees said that they have no interest in conflicting with companies or governments. “We collaborate with the government, and we also think conflicts with the government will limit our working spectrum.” When asked about the relationship with the government, almost all employees commented in a similar way. This also goes well with Ho and Edmonds’ (2007) research. Chinese environmental NGOs have close or personal ties with the government, which makes Chinese environmental activism “embedded” with the state. This collaborative relationship can offer environmental NGOs more access to public resources and influential power in the public policy decision-making process. The supply chain employee showed the thesis researcher the first emails that they send to big brands. “First, we will introduce our database, and thank for economic contributions from those big brands to China, then we will show them their potentially problematic suppliers in our database. We will ask for their understanding about those problems and what actions they are going to take.” A more positive image about government and market is raised up in the process of using information. IPE staff explains that a

positive image is encouraging them to take action. Another explanation could be that information transparency is inherently correlated to interests of these two sectors.

5.3 Impacts on social boundaries

Social boundaries are reflected on social trust and social capacity building, as social settings to support and facilitate collaborative governance. How transparency works for building trust to government, promoting social learning and helping build social trust to environmental auditing will be discussed in this part. However, the results based on interviews to IPE and referring other researches, are just offering possible scenery. To reach a more accurate relationship between trust to government, social learning, social trust and information transparency, interviews or surveys to citizens themselves need to be done.

5.3.1 Crossing social boundaries by increasing trust to government

Lack of public trust in the government sets barriers for collaborative governance. Ker (2016) makes a case example based on that, in 2011, social outrage came from the lack of air pollution information transparency when haze and smog influenced China for a long period. To face public criticism, transparency of PM 2.5 began to collect by EPBs since 2012, gradually spreading to whole China. Public Opinion Research Center in Shanghai Jiaotong University has conducted a survey (Wang, 2013) with 3400 residents among 34 cities in 2013, finding that only 37.4 percent of respondents said that they are satisfied with information revealed about environmental protection by the government; and 78 percent said they will join in protests if pollution facilities are to be built near their living communities. In 2015, a warehouse storing hazardous chemicals exploded in Tianjin's port; after the tragedy, Tianjin government was under great doubts due to the lack of information transparency of hazardous substances (BBC News, 2015 Aug 20). Another recent tragedy is, 493 students suffering from a range of illnesses due to the school they go to is located in a heavily toxic site. Public outrage comes from the question why information about the chemical contamination of the soil was not disclosed in the beginning (Phillips, 2016). Li et al. (2012) commented that trust in the government is losing if threats and harms are not notified to citizens repetitively. Similar to that, Siau and Long (2006) argue that digital information helps the government have better external communications. Combining those findings, it can be inferred that there is fear in the government about social unrest from environmental degradation; environmental information transparency is considered to improve public trust and reduce risks when facing big pollution events. Government trust may also be ruined when public opinions are not heard. Yang and Calhoun (2007) concluded that Chinese government officials are often under doubt in taking public opinions. The staff in the information department of

IPE commented that, “Transparency of citizens’ complaints and opinions online is a way to apply pressure on local EPBs to respond in time, and in return, to help build government trust.” “The degree of citizens’ participation in social supervision increases through getting quicker responses from environmental bureaus and polluting companies, as a result of information convenience through ICTs.” This coincides with other research which states that incentives for citizens’ participation depend on their expectation of meaningful results from the collaborative process (Warner, 2006). With experience in dealing with the government for the last 10 years, Ma Jun commented, “in the beginning of IPE’s existence, the central government has worried about possibilities of undermining social stability through information transparency.” Chinese officials are very concerned about rising social unrest (Minzner, 2006). This could be a reason to explain why the government intends to create transparency to build trust while staying worried about unexpected results from transparency. However, those statements are built on the assumption that, through treating the government as transparent, responsible, efficient and participative, citizens gradually build their trust in the government. Some other research challenges this assumption if a culture of secrecy has been rooted deeply in citizens’ minds. The Freedom of Information (FOI) Act in 2000, introduced by the UK, which increased transparency and government accountability, has not increased public trust in the government since the network of secretive rules has been assumed in the culture of British politics (Worthy, 2010). A feedback loop with participants’ involvement instead of one-way information transparency works for building trust. Hence, further interviews or surveys targeting information using citizens should be applied to understand their trust views to the government.

5.3.2 Crossing social boundaries by increasing social learning

Social learning is another outcome of information transparency in bridging social boundaries for collaborative governance. In terms of social learning and environmental education for citizens by knowing the companies’ violations of emission standards, scholars (Ker, 2015; Shi & Zhang, 2006; Zhang, Mol, & He, 2016) think that there is a positive relationship between that. While this result is not obvious according to interviews; interviewees from IPE do not think that environmental education is not the result of pollution information transparency. “We have less focus on environmental knowledge teaching for citizens.” The employee, who is working in communication with “internet citizens” on online forums or social media, said that there is an increasing number of citizens who are using their Blue-Sky APP data to pressurize companies and governments. Those citizens are actively using their data and are interested in environmental issues. “But they just connect with me (IPE), I’m not sure whether they have a close tie among each other or not. I’m also not sure, if they become more interested in other environmental topics because they get to know

about cases of environmental pollution from us." In other similar research on analyzing IPE (Tan, 2014), there is still little evidence whether citizens change their behavior as a direct consequence of information disclosure by means of the IPE database. Li and Li (2012) are not critical about social learning from Chinese information transparency, and think that the environmental awareness building and education comes from an indirect aspect of information transparency: environmental information will penetrate the market, capital, products and government, and citizens will reinforce environmental consciousness when encountering those institutions in their daily life. Social collaborative learning could be enhanced with engagement of social media (Al-Rahmi, Othman, & Yusuf, 2015). Social media and new visualization approaches to display information contribute to awareness building and social learning in sustainability issues (Krätzig & Warren-Kretzschmar, 2014). This can be seen in the Blue-Sky APP 3.0, where more social sharing functions are built in: the "Sharing Wall" allows environmentally related photos to be posted by every application user; under each photo, "Like" and "Comment" functions are integrated in order to develop an online community; the "Participation" column contains "recent environment-related events" and "environmental news". IPE, as an environmental NGO rather than environmental information database producer, opens social boundaries to engage citizens in an alternative environmental debate.

5.3.3 Crossing social boundaries by increasing social trust

Information transparency provides the same entry point for third parties in civil societies, and hence increases social trust. Information, accessibility and transparency are basic principles to encourage public participation in environmental impact assessment and other environmental auditing processes (Moorman & Ge, 2006; Yang, 2008). Information disclosure to the public breaks the governing boundary, gives a chance for cooperation between private and citizens' groups, enhancing the trust in the whole auditing process considering that there is a lack of trust in environmental impact assessments (EIA) in society (Chen & Liu, 2006; Lin, 2005; Zhang & Ma, 2005). In 2008, IPE built "The Green Choice Alliance" (GCA) with 50 other NGOs, aiming at facilitating public-private collaboration on supply chain management. The solution for polluting suppliers to wipe out data is to fix polluting problems and ask for a third party professional auditing company to prove. The whole process should be observed by local NGOs in GCA. This kind of co-auditing with the involvement of a third party from the civil society by sharing information has possibilities in increasing the general social trust of the auditing.

6 Discussion

Users of information, including citizens, EPBs' officers, supply chain managers, and financial companies reduce information asymmetrically and take relevant actions. It is the character of ICT development and information transparency, to decrease the significance of physical boundaries such as place presence in social interactions. Boundaries among different sectors in governance are shaped by reflection on past experience and social reality. While boundaries are also developed socially, dis/empowerment is happening when boundaries are move to exclude or include certain groups in governance (Sturdy et al., 2009; Yang & Calhoun, 2007). Free and open environmental information is expected to reduce the hierarchy in social classes, shifting power to users who are not experts in technology or policy. Interpretation of those exited data needs to be displayed in simple language to involve more actors (Thompson, Ravindran, & Nicosia, 2015). Making information understandable and accessible for as many social groups as possible is important for equity in environmental governance. This has been shown in IPE's work according to analysis. While even with very symmetrical information to each sector, new inequalities are raised up in terms of invisible inclusion or exclusion in information networks (Mol, 2008). Inclusive groups in governance are those who have access to the core resources, or powerful and wealthy groups (Ansell & Gash, 2008; Brown, 2009; Warner, 2006). The owners of information, the processor of information, the explanation and translation institutions of information are significant factors to form powers (Mol, 2008; Soma et al., 2016).

Through results, information transparency in China reflects the government's central role in governance. The environmental pollution data source is almost all from the Chinese government (government here refers to general state system that includes central government, EPBs and local government). As an environmental NGO, IPE assumes that information collected by the government is authorized, and has no flaws. Environmental information that is required to disclose EPBs includes penalties or over-polluted data of polluting companies, while the explanation right of emissions that are identified as over pollution belongs to government. "Scientific information" collected by authorized governments (Swyngedouw, 2005), is probably subjected to other kinds of problem definitions. According to the analysis, when environmental information is made available to citizens, and citizens' opinions are reached to government through information transparency, the trust in government could be enhanced. It breaks the social boundary in constructing collaborative governance, while the initial intention of transparency could serve for collecting central power for government. Analysis from this thesis shows that the government uses information transparency as a

tool to deal with social unrest while staying careful about unexpected results of information transparency. Similar findings from Pieke (2012) claimed that the greater pluralism that the Chinese Communist Party is facilitating is aimed to strengthen its leading role through conducting growing social unrest and depoliticizing civil society when facing societal diversification in the reform era. With the worries that environmental degradation threatens stability in society, the analysis shows that transparency is used as a tool to build trust to government, and there is a ceiling of transparency that controlling information transparency not to result in radical social movement and threaten "social stability". In the analysis, a strong focus about central role of economic development causes local EPBs to stay in weaker bureaus compared to other economic bureaus, and information transparency helps changing cognitive boundaries that undermine participation of local EPBs in collaborative governance. It shows that information transparency is applied for EPBs to increase their enforcement authority and balance power with local economic departments and polluting state owned companies. Johnson (2014) stated that, public participation and information transparency is not aimed to give citizens unlimited allowance in environmental governance in China; instead, it is a mechanism that allows the public to help MEP and local EPBs to balance with local strong economic power.

Information transparency also helps to cross physical institutional boundaries, helping brands to manage their value chain or form industrial level green growth alliance. Information transparency could also be used for assessing risk, integrating ecological costs into economic cost with financial or market instruments, hence increasing participation of companies in collaborative governance. The instruments to solve environmental problems reflect economic rationality to make pressure mechanism on relevant companies. Involving industry factors into collaborative governance is a tendency to complement a state-dominated command and control governance model. The market is thought of as a more favorable solution to environmental problems in China. When framing environmental degradation, it is considered as challenges on the social and economic reform, instead of necessary result of industrialization and capitalism (Buttel, 2000; Mol, 2013; Zhang, Mol, & Sonnenfeld, 2007). As shown in the results, the underlining assumption of Chinese environmental information transparency is that all environmental problems will be solved if information is well processed and companies reach environmental compliance. Besides, companies that manage the supply chain through analyzing CITI ranks are all famous brands. This indirectly reflects globalization, rapid economic growth and fast information systems development, because transparency is increasingly relevant to power and importance that is directly driven by the market (Feldman, 2012). Undeniably, information transparency could help increase environmental compliance of those multi-national companies and their suppliers, while the neutrality of compliance rules and the intrinsic profit chasing goal need to be noticed. Current Chinese information transparency is used to help

citizens understand pollution information and obtain relevant knowledge about environmental problems. It also offers the public a way of supervising large polluting companies to hopefully solve environmental problems resulting from economic growth, without criticizing the growth mode (Swyngedouw, 2005).

In the dominant market-driven information disclosure, system tensions appear when following the "logic of empowerment" in the process in democratic empowerment, or following the "logic of efficiency" related to market based environmental information transparency (Swyngedouw, 2005). After analyzing the data, the market and monetary logic behind public transparency seems to become stronger than civil society development rationality, when considering limited spectrum for social mobilization and little discussion about citizens' right to know. Integrating more stakeholders in the environmental governance has been discussed frequently, while the form of involvement is often passive and pre-defined (Brown, 2009). Not only the institutionalization of environmental problems should be required, but also human development. Citizens' involvement in environmental governance in China is limited and there is little participation in designing the database process. They are expected to participate at late phase of environmental governance; only get access to information after pollution has happened; and use environmental information to "improve" business sectors without picturing out market power. In China, the application of information is rarely used for radial changes of economic system instead, the government is cautious that an over flow of information and data collected by civil society will threaten social stability, through analysis. Another factor needs to be careful is transparency under the assumption of market rationality, has possibility of exclude out local knowledge and solution to problems (Birchall, 2011; Marlor, 2010). Citizens are only thought to be powerful if they have the trustful and comprehensive information capital, while it is much more than "know result" after everything has happened

My analysis has shown that by getting access to environmental information, citizens learn the impacts of pollution and become familiar with how to protect their own rights and fight against polluting companies. It is also likely that individuals could obtain more environmental education through information transparency that also contributes to building a better social setting for collaborative governance. In a country where hierarchy and personal social ties are considered very important, information transparency contributes to shortening the cognitive difference between elites and citizens and realizing comparably egalitarian. Local environmental NGOs are also making efforts to build alternative discourses and enhance social trust by aligning themselves. The new function of environmental social media sharing in IPE's 'Blue-Sky APP 3.0' and involving environmental NGOs in auditing are the examples of this. But when comparing government and marketing sectors, citizens themselves still work as the weak sector in building collaborative environmental governance in China.

If some stakeholders don't have the equal capacity, negotiation status, or a participatory degree with other stakeholders, they will become prone to manipulation from strong actors (Ansell & Gash, 2008; Echeverria, 2000). Although some researchers defend that individuals' responding to one issue is due to their own personal norms and moral obligation (Rohan, 2000; Schwartz, 1977), in many cases, citizens' value shaping decision-making process and behavior are considered as being influenced by diverse but interconnected external factors (Stern, 2000). Even only considering ethical choosing, citizen and consumers' ethical value to sustainability and environmental protection is framed according to information provided by media and other sources (Berglund & Matti, 2006). Poor environmental behavior does not imply a lack of morality, but it could be a reflection to ignorance about pollution by the public. Mol (2008) welcomes the information disclosure and monitoring schemes as a way of inviting the citizens' and consumers' to sustainability impact companies' managements. While reframing "sustainable consumption" and "sustainable choice" for citizens in the shape of improving health and environment issues, this could also be a way to rebuild the outside environment by intrinsic monetary motivation.

Transparency is far from an innocent tool. Transparency is socially contracted and hence it matters how transparency and transparency infrastructures are constructed (Birchall, 2011). In China's case, citizens are expected to choose products and invest in companies according to environmental information disclosure about pollution. There are many ways for corporations and financial institutions to appear transparent whilst keeping certain information incomprehensible to citizens or consumers (Gupta & Mason, 2016). Shenk (1998) stated that, whilst volume of information has been increased rapidly with rationality, "data smog" is also accumulating, impairing visibility as much as secrecy. Some environmental information is easy to explain to citizens, such as names of pollution companies and punishments to those companies, while other professionalization and specialization environmental terms presented as "public" are rendered to outsiders (Gupta & Mason, 2016). There are also many ways for companies to look "transparent" whilst keeping secrets, such as creative accounting (Birchall, 2011).

Newly risen environmental information disclosure for monitoring the behavior of big corporations is potentially another discourse battlefield: when there is less of a market competition for quality, price and innovation, environmentally friendly moves can increase market capacity (Gupta & Mason, 2016; Swyngedouw, 2005). Citizens' environmental awareness from volunteer information disclosure is an "advertisement" for those big companies whilst crowding out competitors. In my findings, collaborative governance, which is constructed on the "responsible companies" and "rational citizens", has to be a reconsidered discourse. "Green products" can build good public image of the country or companies, while keeping the initial aim to attract investments and establish new kinds of

markets (Birchall, 2011; Feldman, 2012). It is sure that, in the collaborative governance, stakeholders must share a similar understanding so that they can collectively work together (Roussos & Fawcett, 2000; Waage, 2001). However, a caucious mind is needed to identify the dominance power that gives the “common missions”. Powerful sectors would have the right to decide which information and news should reach citizens (Mol, 2008). The state is always creating new and higher types of civilization by adapting the ‘civilization’ and the morality of the broadest popular masses to necessitates, while keep economic apparatus of production, from Gramsci (1971). Cultural hegemony is pointed to as a way of manipulating the culture, such as beliefs, explanations, values, etc., whilst trying to satisfy the ruling classes’ needs (Callinicos, 2007). Information transparency reframes environmental problems and solutions, reshapes citizens’ role in supervising companies and government, it could be possible to enhance ruling classes stances.

From another perspective, sustainability requires daily realization and excavation from citizens as their participation in return shapes sustainability itself (Dobson, 2009). A citizen’s own reflection on the information that they digest under market hegemony, may lead to a more progressive and independent discourse for themselves. The construction of future transparency mechanism could also promote local ecological knowledge sharing to reach equity. Buttel (2000) claimed that, through offering alternative vocabularies and “frames”, which are ignored by mainstream governance sectors, a deeper and more influential ecological development processes should be push forward. Environmental NGOs are the main discourse-producing publics, while current Chinese NGOs tend to take a more practical and cooperative attitude because states control social organizations’ license (Yang & Calhoun, 2007). However, building new public sphere is not within reach of this thesis.

The main contribution of this thesis to sustainability science is with discussing the role of information transparency instrument in adaption with complicated and multi-sector involved environmental protection. Government, companies, civil societies have been shown to participate in formulating strategies through sharing information. A critical reflection of power relations that determine the rules of transparency, gives a call for noticing unequal entry of each sector in sustainable governance.

7 Conclusion

With rapid increases in information and public transparency, collaborative governance based on connecting governments, corporations and civil society has been developed. In a traditional governance model, spatial and physical factors, cognitive and social factors are all barriers that hinder diverse sectors' collaboration. Through analyzing environmental transparency of official penalties and monitoring data from Chinese EPBs on polluting companies, and interactions among different social actors, this thesis has provided insights to how information functions in spanning different dimensions of boundaries in collaborative governance, it also has critically discussed the power relations behind them.

The scenario of collaborative governance facilitated by environmental information transparency, shows an involvement of different social sectors. It is distinctive compared with conventional Chinese authorized top-down governance. After analyzing boundaries spanning in three dimensions, it still shows that the government is in the dominant position in this governance model, with an increased participation of economic sectors, while still keeping citizens in a comparably weak stance in governance. Transparency, at first sight, seems to offer the same entry point in governance for every sector, while the reality is that ownership of sources and the way to process information gives the involved sectors unequal power. Government's willing to build trust, balance power between central and local authorities, and a make-up of states' governmental failures, are all incentives for environmental transparency for collaborative governance. As an alternative-governing model to replace conventional governance, environmental market and economic rationality takes priority over equality and social empowerment rationality. Environmental information is applied to regulate companies' behavior, to "clean" the value chain and to make for a "greener" finance. Increasing participation of citizens is under the assumption that they can be rational sustainable consumers and investors, benefiting market rationality. That could be one reason they can only obtain access to environmental pollution information after the pollution took place. This thesis focuses on understanding collaborative governance through environmental information, to further grasp power relations and social interactions under the veil of transparency. To what extent environmental information can be used, as a lever for pollution reduction is not within reach of this thesis. In China, as a country with an authoritarian regime and experiencing rapid economic development, information application that is for regulating companies' behavior may be more efficient and enforceable than giving weight to improving equity and equality in civil society. Besides, to increase environmental awareness, empower civil society and reach a more equal involvement of citizens, is

largely dependent on how citizens and civil society digest the information they receive. It is possible that information transparency enhances ties between citizens with Mother Nature, and could lead to a transformation to a more radical environmentalism movement.

Rather than analyzing the official environmental transparency on EPBs' websites, this thesis has focused on a database institution that collects and processes official information, which leads to the limitation of the paper. According to interviews with staff of the IPE who has connections with local EPBs, companies and citizens, may not be representatives of those sectors themselves. The direction that the application of information leads to is dependent on the arrangement of the NGO. Although IPE belongs to the Chinese main social sector that is integrating environmental information to create a pressure mechanism, it could lead to an analysis bias without justifying results from a perspective of government, EPBs, citizens or companies. A future research question could be targeted at sector analysis to yield a more comprehensive picture. In different countries, the information transparency structure, social structure, sectors that obtain access to information and applications may be different. Using boundary theory to analyze the inclusion and exclusion in collaborative governance, with specific context analysis, is helpful in understanding the function of information in developing collaborative governance. This thesis focuses on analyzing social power and structure behind collaborative governance facilitated by information transparency, while the governance boundaries are being reformed constantly through the integration or preclusion of actors. Consequently, future studies can be done on analyzing these dynamics. In this thesis, power relations in different sectors and society mainstream discourse is thought to influence information transparency and hence to change the governance model. It could be interesting to understand power differences forming through dealing with environmental information, by analyzing each sectors' interactions: What is the structure of environmental information; which sectors use this information and when; what is the degree of participation of each sector in applying the information; what is their motivation to use that information; how much benefit do they gain and how much cost is incurred from environmental information.

8 Appendix

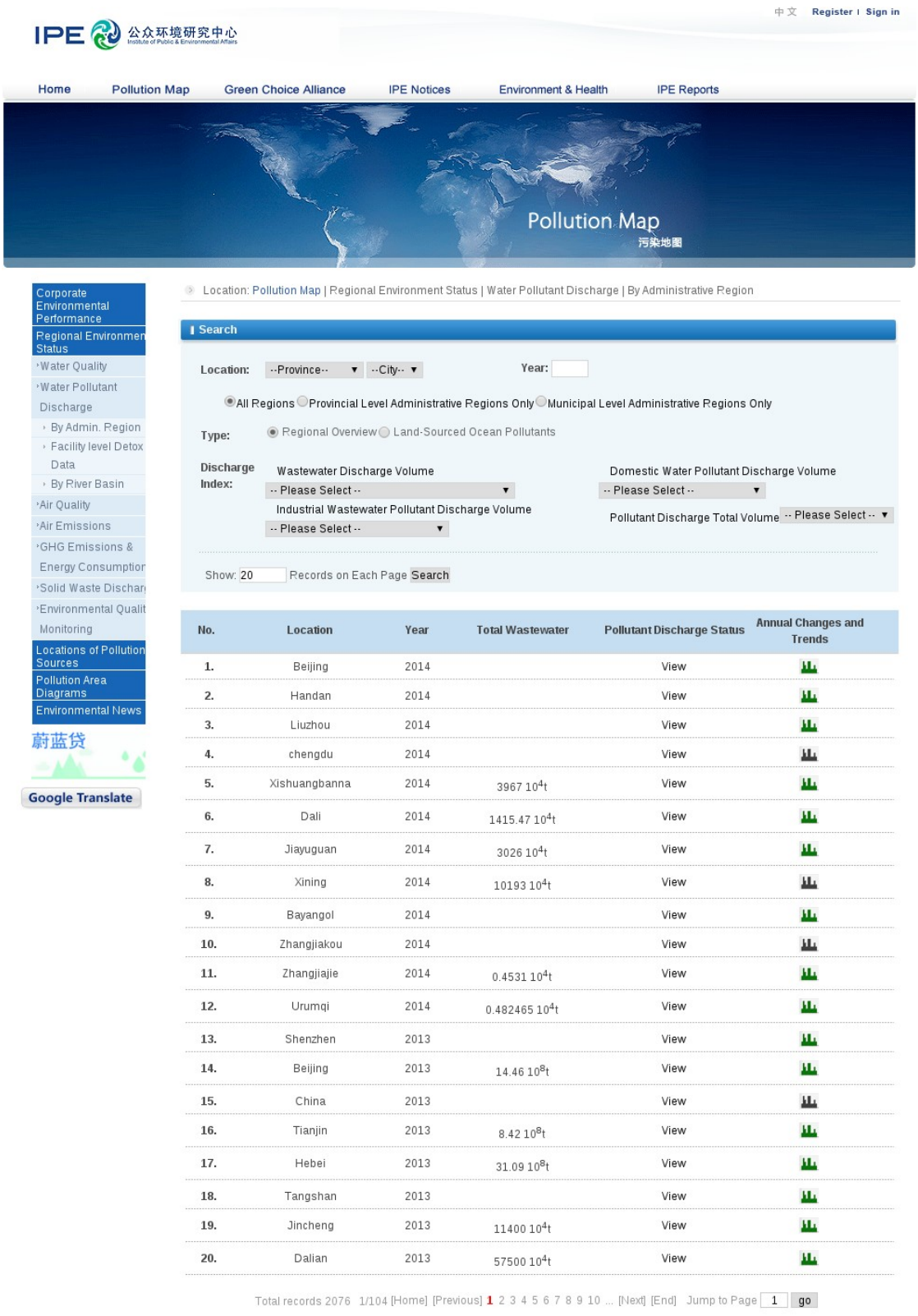

Figure 2: IPE database website appearance

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