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Digital Environmental Governance in China: Information Disclosure, Pollution Control, and Environmental Activism in the Yellow River Delta

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ABSTRACT: The Chinese water bureaucracy increasingly utilises information and communications technology (ICT) in order to strengthen interaction with the population, which is severely affected by industrial pollution. Government webpages, mailboxes, and online interviews with officers have become prevalent tools for environmental governance, including information disclosure, and a virtual communication forum between the state and its citizens. The present study employs a mixed methods approach with a qualitative emphasis to explore the process of communication and interaction between government agencies and local residents in Dongying, Shandong Province. The results show that information disclosure of pollution data remains far from being transparent, despite the fact that the local government has implemented digital environmental governance, as encouraged by the central Chinese state. Internet technologies empower resource-poor environmental activists in Dongying to strengthen their social network and build communication with the authorities. The application of bureaucratic techniques, however, is key for them to enter the communication interface with government agencies in order to influence political decisions. Results suggest that local cadres tend to send mixed signals to activists and display wariness towards them. They also tend to take preventive measures to keep the situation under control when environmental disputes arise. The proposed communication interface approach sheds a clearer light on the complexity among the emergent ICTs, environmental activism, and digital governance.

KEYWORDS: Water pollution, NGO, information disclosure, ICT, Yellow River Delta, China

INTRODUCTION

Since the beginning of political reform in 1978, China has undergone a rapid transition from an agriculture-based economy to industrial production on a massive scale. China's emergence as an economic power, with its rapid process of industrialization and urbanization, has been accompanied by its citizens' growing concerns over environmental effects, particularly in terms of pollution (Lora-Wainwright, 2014). Widespread, persistent and routine air quality issues, drinking water quality scandals, and poisonous gas leaks feature regularly in the media. Current pollution levels in many of China's water bodies are believed to be the highest in human history (Ebenstein, 2012), and have been attributed to bad governance in the environmental sector, low technology levels in wastewater treatment among rural industries, and the strong support for intensive industrialization by local authorities (He et al., 2014; Wang et al., 2008). Industrial water pollution in China has become a matter of increasing public concern, especially because environmental awareness is growing among Chinese citizens. According to a survey published by *China Youth Daily*, 71.8% of Chinese people feel threatened

by water pollution (Miao et al., 2015). The newly emergent middle class has begun to articulate its environmental interests in anti-pollution protests. They have expressed their concerns loudly on multiple occasions, such as during environmental campaigns and in meetings with government agencies and industrial enterprises (Yang and Calhoun, 2007). Mertha (2008) argues that whilst China has become increasingly decentralized and politically heterogeneous since 2000s, the control and management of water has been transformed into a lightning rod of bureaucratic infighting, social opposition, and even open protest.

In China, the organizational structure of water resources management is a complex system. The chief organ of China's water administration is the Ministry of Water Resources but the Ministry of Environmental Protection is the primary body in charge of water pollution control nowadays. Local environmental protection bureaus are responsible to implement local and national environmental regulations and deal with local polluters every day (Lee, 2006). As every ministry has numerous bureaus under its authority, the national plans and ideas of water pollution control meet challenges in their local implementation due to the existing organizational structure in China (He et al., 2012).

Given that water and air pollution were debated heatedly in public, scholars expected that a politically and economically liberalizing China would be increasingly susceptible to public voices and that government agencies would find it increasingly difficult not to respond effectively to queries about environmental pollution (Lo and Leung, 2000). Indeed, the widely perceived inability of the Chinese government to deal with pollution has contributed to an increased lack of trust in and credibility among environmental authorities (He et al., 2012). At the same time, the uptake of information and communications technology (ICT) has contributed to the development of environmental activism and the construction of a green public sphere in China, which is based on the increasing environmental awareness of the middle class (Sima, 2011).¹ Furthermore, the exercise of state power and online activism by citizens have both become more technically sophisticated and now drive each other in a reciprocal process (Yang, 2009).

In the global context, ICT's ability to redraw the dynamics of power and political representation in relation to the use of and access to natural resources has never been more compelling (SIWI, 2015). The extent to which ICT has already altered existing power structures and transformed the decision-making process and expressions of urban citizenship in some countries is now the centre of debate (Hernández-Mora et al., 2015). Focusing on water governance, emergent ICTs have been discussed in relation to the increasing public insistence on transparency and open data and to new information needs for water resources management (Pedregal et al., 2015). From a political ecology perspective, Mancilla-García (2015) has discussed whether and how ICTs consolidate the dominant water discourse and provide new avenues for alternative discourses. These lines of research explore the interplay between the uptake of ICTs, governance frameworks and environmental activism in general. Little remains known, however, about how governments perceive the role of ICTs and whether, how, and why social media has affected environmental governance in China. The present study proposes a communication interface lens through which to explore dynamic interaction and communication between government agencies and local people confronted by the hazards of pollution in Dongying Municipality, the Yellow River Delta. It produces a nuanced portrayal of state-society relations in contemporary China.

In Shandong Province, where the Yellow River Delta (YRD) is located, the top leader of the Provincial Department of Environmental Protection has been devoted to promoting information disclosure, transparency, and participation in environmental governance (*Southern Weekend*, 2015). Under his strong political leadership, Shandong Province has been steadily enhancing its environmental informational governance, playing a leading role in China in this regard. The research question is as

¹ Sima argues that the Internet has contributed to the formation of China's green public sphere by fostering a discourse that counterbalances rapid economic development.

follows: How and why do ICT interfaces between water authorities and residents of highly polluted areas change environmental governance, trigger environmental activism, and impact actual decision making to fight pollution?

The next section illustrates the methods of data collection in this research. The background section introduces China's YRD before addressing theoretical considerations. We then present two cases – one in the Dongying Port and one in the Hekou District of Dongying Municipality – to investigate the status quo of pollution control and public response. It is followed by an elaboration on local environmental activism and the promotion of environmental information disclosure in Shandong Province. We end with a discussion and conclusion on digital environmental governance in China.

METHODS

The present study employs a mixed methods approach, with an emphasis on qualitative data. The approach followed Latour's strategy (2007) of deploying the content with all its connections – focusing on people's ways of building communication, social networks, and interactions – and then letting the *context* manifest itself.² In total, 85 in-depth interviews were conducted and transcribed. The interviewees were 20 local residents from Hekou District and Dongying's port, 34 respondents from the industrial sector, 13 environmental activists, and 18 government officials. Mostly, the interviewees were selected through snowball sampling. A chronology³ of local environmental mass events helped to identify the key environmental activists from Hekou District. Officials were selected from relevant government agencies (e.g. Environmental Protection Bureau, Water Resources Bureau) at municipality, district, and township levels; they held positions such as deputy director, department head, and section chief. A survey was also conducted among 110 inhabitants around Dongying's port regarding their access to information, their interests and demands, and their perception of local pollution severity.

In order to document daily routines in Dongying, speeches on public occasions, environmental campaigns, and other public events, observations were part of the methodology. Jiaxin Tan visited local wetland and wastewater treatment plants twice in 2015. These visits were particularly important for understanding the pollution control measures promoted by the local government. Documents on policies, laws, and local planning were collected and reviewed to gain a more sophisticated understanding of the YRD's history of industrial development.

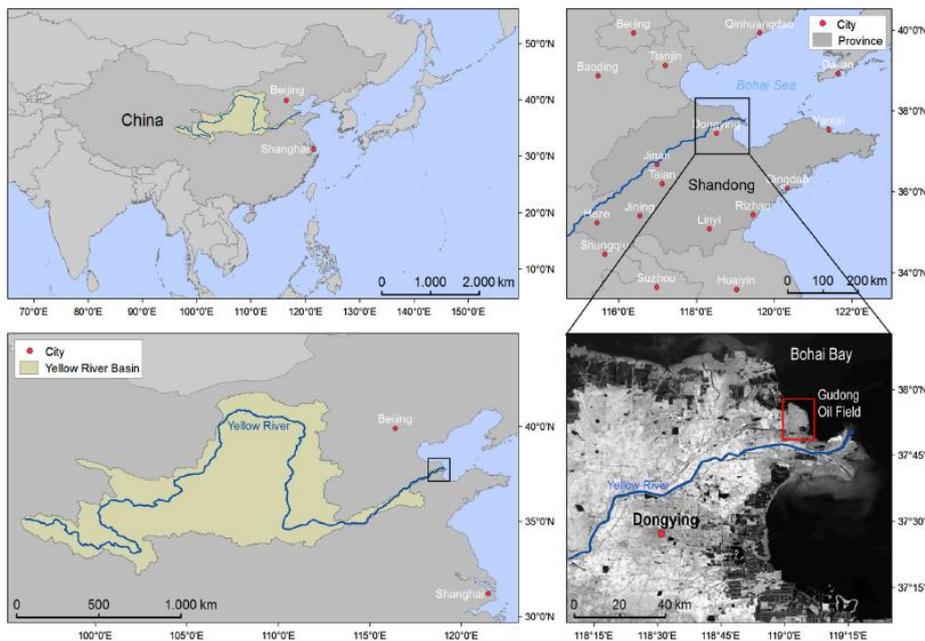
BACKGROUND: WATER POLLUTION IN THE YELLOW RIVER DELTA

The Yellow River meets the Bohai Sea in the YRD in north-eastern China (see Figure 1). The YRD covers an area of approximately 10,000 km² and boasts a population exceeding 6 million people (Li et al., 1999). The delta hosts the most complete and extensive intact wetland ecosystems, rich biodiversity, and abundant natural resources (Wang et al., 2012). According to Pietz (2015), the forces of demographic growth, agricultural intensification, industrialisation, and urban expansion have pressured the ecological carrying capacity of the North China Plain, where the YRD is located. Water abstraction now exceeds available water resources, groundwater levels are falling, and there are continuing reports of ecological and environmental damage in the greater northern China region (GWP, 2015).

² Latour (2007: 147) put it very succinctly: "Deploy the content with all its connections and you will have the context in addition".

³ Before setting out to the field, a chronology of local environmental mass events since 2010 was summarised based on information obtained from media reports.

Figure 1. Location of the Yellow River Delta in China.



Source: Kuenzer et al., 2014.

China’s second largest oil field, the Shengli Oil Field, is also located in the YRD. Revenues from oil and gas exploitation have increased investments directed to infrastructure, such as for agriculture, artificial aquaculture, and urban agglomerations. These projects have resulted in rapid urbanisation, industrial pollution, oil spillage, and subsidence (i.e. the motions of a land surface as it shifts downward; see Figure 2). Much of the vegetation is degraded and biodiversity has been lost. The rapid industrialisation and urbanisation have affected the ecological, social, and economic dynamics of the YRD. Threats and processes triggering these dynamics stem both from within the YRD and from beyond its boundaries (Wolters and Kuenzer, 2015).

Figure 2. A conceptual frame of environmental challenges in the YRD.



Legend: (1) River canalisation; (2) wetland ecosystem threatened by anthropogenic processes; (3) water diversion for irrigation; (4) aquacultural-related ground water pumping and subsidence; (5) oil pumping, spillage, and subsidence; (6) urban agglomeration, (7) industries causing pollution and subsidence (Kuenzer et al., 2014).

Historically, agriculture in the YRD was based on crop and cattle farming. People who first arrived in this isolated place opened up new settlements and reclaimed land for agriculture. The agriculture was classified as 'grain-cotton model', but difficult to maintain due to unfavourable physical conditions and harsh natural conditions, such as salinity, hail and storm surges (Li et al., 1999). Due to the harsh environment, the whole area used to be sparsely populated. Industrial activities in the YRD commenced after the discovery of the Shengli Oil Field in the 1960s (Kuenzer et al., 2014). In 2009 and 2010, two national plans – the *Shandong Peninsula Blue Economic Zone Development Plan* and the *Yellow River Delta High-efficiency Ecological Economic Zone Development Plan* – were implemented, officially marking the beginning of rapid industrialisation in the YRD (see Tan, 2016 for a full discussion). These government initiatives resulted in upgraded road infrastructure, new residential buildings, and a seawall, as construction programmes became the vehicle to nurture economically vibrant areas (Kuenzer et al., 2014).

Economic growth in the YRD centres around urban industries enhanced by increasing inputs from rural areas. The environmental cost of Chinese industrial expansion is enormous, resulting in a large volume of untreated wastewater discharge that adds nitrogen, phosphates, phenols, cyanide, lead, cadmium, mercury, and other pollutants to local water bodies (Wang et al., 2008). Zhang et al. (2012) reported that oil and cadmium were major pollutants in YRD water bodies, exceeding pollution standards by 100% and 40% respectively. Due to the extraction of oil and the existence of large geochemical factories, local inhabitants perceived that groundwater was unhealthy for human consumption (Wolters et al., 2016). Furthermore, industrial water pollution directly affected the quality of life among local residents and posed a significant threat to the environment of the YRD (Zhang et al., 2012). This situation has begun to constrain local economic development as the state has established stricter standards for pollution control.

Much of the YRD area is under the jurisdiction of Dongying Municipality, Shandong Province. Established in 1983 as a home base for oil-related companies and workers (Kuenzer et al., 2014), Dongying has grown since the establishment of the Shengli Oil Company. To implement the national planning and provincial programme for the chemical industry boom, Dongying gradually established nationally important bases for the petrochemical and marine-chemical industries (PCIPI, 2012). In 2013, its leading mainstay petrochemical industry produced a gross annual output reaching nearly 500 billion Renminbi (RMB) (CAS, 2015).⁴ More than 50 industrial parks – including one initiated by the central state and seven initiated by the province – were operating in Dongying by 2014 (ibid). Some industrial parks were located in close proximity to residential areas. Chemical accidents and pollution hazards were reported with increased frequency by people living in those areas (*21st Century Business Herald*, 2012). Since 2010, serious accidents involving the leaking of poisonous gas from such parks have occurred from time to time in Dongying's Hekou District, provoking local people's anxiety about and anger towards the industries responsible. In addition, water pollution affects local agriculture, drinking water quality, and piscine resources in Dongying's port. On an everyday basis, pollution hazards large and small have further triggered public discontent.

According to a survey on environmental awareness in Dongying, local people were very concerned about pollution and the adversity caused by living in close proximity to industrial areas (Wolters et al., 2016). Inhabitants around Dongying's port believed that the quality of local drinking water was problematic due to the rapid expansion of industries, as the survey data revealed (see Tan, 2016). Without government-generated water pollution data, that presentation of the situation cannot be considered comprehensive. However, field research revealed that access to state-generated water

⁴ The field research was conducted between May 2014 and April 2015. An average rate of 1 Euro = 8.09 RMB was used for all calculations.

pollution data was constrained due to the reticence and confidentiality of China's environmental governance system.

The phenomenon of 'industrial siege', or the high concentration of industrial parks near residential places, has been identified as a significant hindrance to the promotion of sustainable development in Dongying (CAS, 2015). Following the central government's approach to developing wastewater treatment facilities, the local government of Dongying relies on 'hardware power' and has implemented technological measures for the control of water pollution. In China, the infrastructural intervention approach to pollution control was initiated through the state's promulgation of the *Urban Drainage and Wastewater Disposal Ordinance* (China's State Council, 2013), which emphasises the construction and maintenance of wastewater disposal facilities while assigning different responsibilities to specific government agencies. In Dongying, however, this national plan and the idea of water pollution control face challenges of local implementation (see Tan, 2016 for a discussion). More often than not, interference from local bureaucrats, particularly their interwoven relations with local enterprises, hinders effective environmental supervision in China (see Miao et al., 2015).⁵ The very limited financial support⁶ from local government has driven local environmental protection bureaus to become increasingly keen on generating income from pollution discharge fees and other outsourcing projects, such as environmental impact assessment projects (Lee, 2006).

While engineering has emerged as a key tool for water pollution control, the local water bureaucracy of Dongying strives to develop 'software power' by cultivating ICT channels to inform the public about environmental protection measures. With the rapid development of ICTs, digital enablers – social media and open data – have brought significant changes to China's environmental governance. In particular, the *Open Government Information Regulations and the Environmental Information Disclosure Measures* from 2008 have widely been applied (Zhang et al., 2016). This implementation has advanced the diversification and plurality of environmental information suppliers and consumers, as well as the number of methods available for transparency and information disclosure (ibid). Nonetheless, implementation is still far from being sufficiently effective. China's political system and its water bureaucracy maintain their longstanding reticence, assertions of confidentiality, and monopoly on information about environmental issues (Mol et al., 2011).

Software power development in Dongying prompted the emergence of different ICT channels promoted by the local government, including official online interviews, complaint channels, government websites, emergency telephones lines, etc. Our study of these communication channels suggests that the local Dongying government does stress the ecological perspective of development at a theoretical or rhetorical level, but in practice implements technical engineering tools to facilitate the growth of rubber processing and petrochemical industries (see Tan, 2016). These industries generate vital government revenues, contribute to the local branding of Dongying, and to the overall economic development of the area. The authorities thus face the dilemma of both providing environmental protection and supporting economic development; they must respond to anxious and angry residents who demand a healthy Dongying but also depend heavily on the jobs provided by these polluting industries.

⁵ Industrial enterprises play a significant role in pollution control; however, they are not the focus of the communication interface discussed in this paper.

⁶ The late 1980's administrative reform in tune with market principles pushed local environmental protection bureaus to finance themselves without any financial support from the central government. Local governments only pay the basic salary for administrative staff (Ma and Ortolano, 2000 cited in Lee, 2006: 81).

DIGITAL COMMUNICATION INTERFACES IN ENVIRONMENTAL GOVERNANCE

The concept of 'communication interface' was inspired by a combination of interface studies and the currents of communication. The Dutch sociologist Norman Long proposed a methodological device or 'interface' for studying the types and sources of social discontinuity in rural development. The prism of interface, as Long (1989: 232) argued, "tends to convey the image of some kind of two-sided articulation or confrontation, interface situations are generally much more complex and multiple in nature, containing within them many different interests, relationships and modes of rationality and power".

Long's perspective is adopted in the present study to explore China's environmental management, a situation wherein government agencies and local societies are meeting at critical points of *linkage* or *confrontation* in negotiating solutions to the environmental crisis of industrial water pollution. To capture the intricacy of the interface between government agencies and lay actors, Ho and Edmonds' work on the embeddedness of social action provides some important insights. The general point of embeddedness of social action was adopted by Ho and Edmonds (2008: 220) in their study of environmental activism in China:

Embedded environmentalism is a resourceful and negotiated strategy employed by activists to gain maximum political and social influence, at least in name, by professing to uphold the principles of the Chinese Communist Party and state. This is the contradictory essence of the embeddedness of Chinese activism: limiting while enabling.

The characteristics of limiting and enabling reflect the state's differentials in tolerance levels of bottom-up advocates. Stern and O'Brien (2011: 175) propose the concept of "mixed signals" when studying China's politics at the boundary and support seeing the state "from the perspective of people who make choices based on their reading of what power-holders will put up with". In light of the concept of mixed signals, the state's ambiguous and cross-cutting signals embody an "[un]stable equilibrium of expectation" (Spence, 1973 cited in Stern and O'Brien, 2011: 178). Furthermore, the state's bottom line and institutional practices regarding environmental activism remain unclear, rather than a fixed rule (Helmke and Levitsky, 2006 cited in Stern and O'Brien, 2011: 178).

To construct a perspective on communication in interface situations, this study draws heavily on Gregory Bateson's (1951) work on communication. Bateson (1959: 208) speaks of the "communication about communication", indicating that "each participant [is made] aware of the perceptions of the other" and that "this *mutual awareness* [our emphasis] becomes a part determinant of all our action and interaction". The perspective of mutual awareness has also been addressed by scholars writing on risk governance. For example, inspired by Beck's reflexive modernity approach, Mol (2008) argues that government agencies should move from their concern about sensitive data to appreciating the value of research that explores people's knowledge, perceptions and life experience of environmental issues.

Discussing informational governance of the environment, Mol claims that the digitalization of life, the acceleration of information flows, and the enhanced potential of monitoring, tracking, and tracing combine to shed a new light on framing environmental issues in our society (ibid). Emerging from the increasing information flows in the environmental sector, the centrality of informational quality and transparency moves to the fore (ibid). In this context, scholars must deal with fundamental issues of surveillance and monitoring in digital environmental governance – the relations of power in the processes of the production, distribution, and control of information.

COMMUNICATION INTERFACES BETWEEN BUREAUCRACY, RESIDENTS, AND ENVIRONMENTAL ACTIVISTS

Water pollution in Dongying's port: Evidence from observations

Following the central state's approach to upgrading industrial development in coastal cities (*China Business Newspaper*, 2013), Dongying has gradually moved industrial enterprises from the city centre to coastal areas since 2011. This pinpoints the political context in which the Dongying Port Economic Development Area (DYEDA) was established. According to data obtained from the Shenxian Ditch Sea Outfalls Monitoring Station,⁷ apart from the ammonia and phosphorus, the indicators of chemical oxygen demand (COD) and cyanide were most concerning (Table 1). The overall evaluation of pollution was graded at the 'D' level, suggesting that the monitored pollutants posed a minor threat to the marine environment (DYOFB, 2014). This contradicted our own observations and interview data obtained from local inhabitants near the port. However, it was the only official data that could be obtained from a local government agency.⁸

Table 1 Shenxian Ditch sea outfalls overall evaluation 2013

Overall evaluation ⁹	COD pollution index				Excessive discharged pollutant	Type of outfall	Sea Outfalls
	March	May	August	October			
D	1.4	8.0	25.0	23.7	COD, Cyanide	Industries	Shenxian Ditch

Source: DYOFB, 2014.

To raise public concern about the protection of the Bohai Bay, in which the port is located, a series of newspaper articles criticised the negative environmental impacts of industrial enterprises established along the bay. According to *Time Weekly* (2011), there were 38 large-scale petrochemical enterprises located along the Bohai coastline. Some Chinese regional planning experts argued that the Bohai Sea, of which Bohai Bay is one of three bays, could absorb up to five billion tons in annual industrial discharge water, that the heavy metal content would exceed marine standards by about 2,000 times, and that almost no fish would live within a radius of a few miles from the outfalls (*China Industry Newspaper*, 2010). According to our literature review, antibiotics from river discharge and aquaculture, intense fishing, and water pollution posed significant threats to the ecology of the Bohai Bay (Jin, 2004; Zou et al., 2011). Severe pollution also became evident from the interviews with residents near the port. Most respondents assumed, based on their own experiences, that the rapid emergence of industrial enterprises had accelerated environmental degradation and the decline of fish resources and human health. Table 2 offers an outline of these perceptions as articulated in our interviews.

Feeling confused and helpless, most interview subjects were frustrated by their inability to obtain better information that would actually prove that effluent was being discharged by the industrial enterprises, as the following response, given in 2014 by one fisherman demonstrates:

⁷ The only such facility in close proximity to the Dongying Port Economic Development Area.

⁸ For a discussion on the accessibility of government-generated water pollution data see below.

⁹ The scale of evaluation is A to D, with A indicating the most serious impact.

Table 2. Perception of industrial water pollution in the Dongying Port

Description	Observation
"Wounds soaked in seawater recovered quickly when I had a skin disease 20 years ago. But today wounds discharge pus when they are soaked in the water. People allergic to seawater get pimples on their body if they work too long in the sea".	Skin disease
"...a colourful float, not very big, difficult to tell what it is... Sometimes the seawater looks red, something like a crude oil substance floating on the surface of water. It is worse in the summer".	Colourful substances on the surface of water
"[The fish] used to be very big and fat, but now they are much smaller. The number is also decreasing dramatically. We had at least 10 more times yield 10 years ago".	Size and abundance of aquatic life
"I saw a large pit near the port and guessed it was for covering drainage pipes, but I don't know the specific location of the wastewater outfalls. It looks mysterious. I guess [the industrial enterprises] don't dispose of wastewater but discharge it directly into the Bohai Bay".	A large pit near the port

Source: Interview transcriptions, 2014.

I guess the decrease in fish stocks has something to do with the emergence of industrial enterprises. Imagine where they would discharge the wastewater if they wanted to do it in a most convenient and cheap way. It must be there [the ocean]. But I haven't got any clue or evidence for this. To be specific as to which outfall, I have no idea at all. *No evidence*. I haven't seen a large area of water turning red or black. If [the industrial enterprises] illegally discharge, you would only see the colour change in a small area. When the water flows to the sea, it would become diluted in a short time.

During several field visits to the DYEDA, it was observed that the effluent regularly changed in texture and colour (see Figure 3). According to one local environmental activist who had followed the DYEDA industrial water pollution issue for a long time:

The colour gives a clue as to whether and to what extent the effluent is treated. Sometimes the liquid looks extremely black or red and smells awful, but it can become diluted very quickly in the water, especially during the rainy season. If you come just after it was discharged you can observe that. More often than not, [the industrial enterprises] prefer to discharge the toxic effluent at night.

Providing evidence for pollution in the port was difficult. The research findings suggest that a lack of official data on industrial pollution hindered local people from having a better understanding of the pollution that they had observed and reported anecdotally. While the provincial authority has promoted digital environmental governance for increasing residents' data accessibility, its implementation often meets local challenge. Furthermore, people's attempts to seek redress from the local government often fail due to a lack of 'scientific' evidence. A natural scientist who had more than 10 years of research experience in the YRD told us: "It is not easy to describe the status quo of industrial pollution with specific data because of the lack of real and transparent quantitative data on industrial enterprises' wastewater discharge" (*Nandu Wang, 2014*).

Figure 3. Polluted water discharge in the Dongying Port Economic Development Area.



Source: Photograph by Tan, 2014.

According to information on the official public website of the Dongying Ocean and Fish Resources Bureau, there were more than 20 monitoring sites near the port. In an attempt to obtain an objective picture of the current industrial water pollution, we submitted an information disclosure application to access the pollution data from the Dongying Ocean and Fish Resources Bureau. According to the official response, data monitored in the Shenxian Ditch Sea Outfall was accessible and published in the *Dongying Marine Environment Bulletin* (compare Table 1) while other data is not accessible to the public.¹⁰ Our experience in communicating with the Dongying Ocean and Fish Resources Bureau confirms Tilt's (2013) argument that when researchers attempt to drill down beyond nationally and regionally aggregated figures, information about local environmental quality can be extremely hard to unearth. Despite that challenge, interviews with relevant stakeholders from the DYEDA provided valuable insight into data disclosure, as well as the implementation of digital environmental governance in the local context. We wanted to know how the general public would be able to know about the quality of wastewater after treatment processes and were advised as follows:

We will set up a big indicator screen soon outside our factory, as well as a biological indicator pool [with fish inside]. COD and ammonia in the disposed water will be shown on the screen, and we welcome any people or media agencies to come and check the water quality (Deputy Manager, DYEDA Wastewater Treatment Company, 2014).

We also inquired as to whether the monitoring data of the industrial wastewater would be treated as open access material:

Currently, only those industrial enterprises subject to provincial control would upload wastewater quality data to government agencies. These industrial enterprises only have the annual *accumulated* data, not

¹⁰ The government officer suggested that we hold an official meeting jointly with the local research partners of the DELIGHT project, which might offer the chance to discuss further the issue of data sharing between the Dongying Ocean and Fish Resources Bureau and the DELIGHT research team.

real-time data [He then showed the author a brochure published by the Heike Company,¹¹ pointing to the data on their annual amounts of wastewater discharge]. We are now building an Environmental Monitoring Emergency Support Centre at a total investment of 21 billion RMB. The purpose is to have 24-hour, real-time monitoring of industrial wastewater discharge. The data would be uploaded to the Dongying Environmental Protection Bureau; then, the public would also have access to the data (Deputy Director, Environmental Protection Bureau of the Management Board of the DYEDA, 2014).

From the point of view quoted above, investments were made to allow both monitoring and disclosure of real-time data to the public. Bureaucrats used this technique of shifting the discussion of pollution control towards engineering and infrastructure, which only reinforced their technocratic interventions. Furthermore, the official rhetoric of a technology fix has not reflected how public discussion on pollution control could be facilitated, even as local residents' dissatisfaction with and distrust in environmental management was prominent in Dongying.

The Hekou gas leaks: Responding to public accusations

The implementation of the *Yellow River Delta High-efficiency Ecological Economic Zone Development Plan* of 2009 triggered rapid industrialisation in Hekou District, which has faced poisonous gas leaks from industrial enterprises with increasing frequency since 2013. This section focuses on environmental activism in Hekou. Here, we explore how the daily experiences of working and living in a polluted environment facilitated the mobilisation of residents to take collective action against environmental pollution; and how ICTs facilitated residents to address their discontent with local environmental issues.

According to our observations and data, the national industrialisation initiative has caused substantial devastation to the local environment and people's living conditions. Many industrial parks were established very close to residential areas. Residents suffered from repulsive smells – described as something coming from dead fish or rotten cabbage – especially when chemical accidents occurred.¹² In the worst situation, staff working in the Shengli Oil Field near the DYEDA had to be hospitalised with respiratory problems. Workers complained that they had never received any official report from the hospital to prove the harmful effects of the poisonous gas accident on their health. Gradually, people's frustration grew because they lacked sufficient evidence to lodge effective complaints with government agencies. Many workers recorded pictures or videos of the polluted scenery, but this visual evidence did not convince the local authorities. Disappointed about the inefficiency of environmental monitoring programs, low access to pollution data, and the dysfunction of those complaint channels, oil workers gradually developed an ongoing grievance about their situation. Most of their anger towards the district government was addressed through digital channels, such as the government website, web forums, online bulletin boards, or *tieba*.¹³ The availability of these digital platforms facilitated communication among the local population, particularly because they could discuss pollution hazards, emergent situations, and coping measures anonymously online without organizing meetings or planning environmental activities. As to the content of the discussions, any messages deemed abusive were tracked by the district government. In this context, the communication interface between government agencies and the local population became *incisive*. The officials felt *innocent* and wrongly abused, as expressed in the following statements:

Look at the Xianhe *tieba*, there is so much abuse against us. Whatever we say, they don't trust us. I think it is an issue of personal understanding [个人理解]. If people think the official information is not true, they

¹¹ One of the top three industrial enterprises in the DYEDA in terms of investment and business scale.

¹² Chemical accidents occurred irregularly based on the observation data. Local inhabitants assumed chemical accidents occurred when they smell something sensitive (e.g. repulsive smell) from the industrial park.

¹³ 贴吧: An online forum that has become popular among the residents of Xianhe Town for public discussion of local environmental issues.

could ask experts or consult the professionals... We are actually under great pressure now. Even if people abuse us, we have to keep working. Sometimes we have to continue to work at night, several days in a row, to track down the pollution sources. While the most exhausting work comes to us, the greater suffering happens among the people. So actually we, the Environmental Protection Bureau, and the public are in this together (Deputy Director, Environmental Protection Bureau of the DYEDA Management Board, 2014).

Abuse [by the residents] reflects their low levels of stress tolerance. If they have issues, they could discuss them with us, but not by cursing and writing those abusive messages online. Then they disappear and leave us with a very bad reputation. I think they are not against the government, but [the abuse] reflects the dark side of their personalities [阴暗面]. Some people just ignore you, no matter what you do and how many efforts you have made. And they think what we do is only to fool them... In fact, we have cultivated many channels for people to make complaints. On our website, we just established an online chat forum, but it seems that people are reluctant to talk and interact with us (Head of Legal Publicity Office, Hekou District Environmental Protection Bureau, 2015).

The above account sheds light on the *communication barrier* between laypeople and government officials on the issue of industrial wastewater management. In August 2014, two serious poisonous gas leak accidents occurred, leading to further political tension between the district government and the local population. Abuse and cursing against the local government agencies were initiated on a local *tieba*, rather than through the official complaint channels promoted by the Environmental Protection Bureau. Government officers read those abusive messages, tracked the discussion on the *tieba*, and observed what was going on there. Most people complained that they were not informed about the situation and that useful information about the chemicals and coping methods was lacking. This sheds light on the deficiencies of information disclosure at the level of local implementation. This problem increases people's discontent and tendency to cast blame when they live in a situation in which pollution has posed a risk to their lives. In particular, people have to take matters into their own hands when local authorities fail to respond to their demands for pollution remediation.

Keeping environmental activism under political control

As a local environmental activist, Liu Hong¹⁴ assisted more than 100 national news agencies in reporting on local environmental issues in Dongying (interview, 2014). In an article published in *China Environment* (2011), Hong claimed that she was opposed to the *confrontational* approach to environmental protection, advocating a more *rational* and *peaceful* way to promote local wetland conservation. Still, she was perceived by government authorities as a 'high-profile figure' due to her extensive networking with the media (interview, 2014). Between 2012 and 2013, Hong had a few opportunities to meet with top officers of the Dongying Environmental Protection Bureau, both officially and informally. Her *non-confrontational* approach to environmental protection appeared to be gradually recognised by Dongying Municipality. She was assigned to work for the Provincial Department of Environmental Protection in 2014 and currently works on the promotion of public environmental education.

The effects of environmental awareness building by NGOs and the media on improving environmental protection in Dongying have often proven short-lived, and there are rarely follow-up measures. This has resulted in isolated activism (Van Rooij, 2010), which means that local activists operate without support from either the relevant government authorities or from NGOs. The situation in Dongying led to almost no interaction or communication interfaces between the authorities and local environmental activists. Under these conditions, the strategies adopted by activists became crucial for building dialogue with government agencies, as a discussion with some activists revealed:

¹⁴ This name has been changed to protect the anonymity of the respondent.

If we want to have a conversation with the government, we should try to expand our social influence. It is important to let the government know our value, our strengths, and the advantages of collaboration [otherwise, they will not show interest in mutual dialogue] (Focus Group Discussion, 2014).

While Hong was assigned to work for the Provincial Department of Environmental Protection, other local activists continued to organize different activities in Dongying. They networked with each other and communicated through public chat platforms and web forums. Their main purpose was to advocate the establishment of a local environmental association. In China, environmental associations and NGOs are required to register with the Bureau for Administration of NGOs, a subordinate agency of the Ministry of Civil Affairs (Zhu, 2013). Since 2007, Hong has worked on the establishment of an environmental association to the Dongying Environmental Protection Bureau, but the authorities claimed that there were already many associations in Dongying, such as for bird watching, technical innovation, hairy crabs, and aquatic products. They argued against the need for an additional environmental association. Negotiation has become more difficult for local environmental activists since the 2014 Hekou accident. Turning down requests to establish a new environmental association reflected increasing political tensions and pressure on government officers, who feared the growing political and social influence of activists on Hekou residents.

Although the network of local environmental activists was expanding, activists adopted notably different approaches to environmental protection. Some followed non-confrontational strategies – keeping their environmental activities low-profile and depoliticising their actions – in order to highlight the *environmental* aspects of their initiatives, rather than portraying the issue as a deeper political conflict between the government and local residents (see also Zhu and Ho, 2008). In this context, digital platforms such as the local *tieba* were crucial for people to update one another and to discuss measures to cope with the situation. Importantly, they helped to strengthen the activists' network and to consolidate their self-representation. Other activists pursued a more confrontational approach to exposing the inefficiencies of environmental management in the District Environmental Protection Bureau. This group reported misbehaviour and unresponsiveness among government officers to the public media. They also uploaded visual documentations of industrial pollution on local *tieba* to express public concern and raise awareness. They expected the local government to respond promptly and take actions against pollution. During their negotiations with the bureaucracy, activists often referred to environmental laws or regulations, such as the Environmental Information Disclosure Clause. In response to the emerging environmental activism in Dongying, government officers deemed that conditions were not ripe for a new organisation of activists:

[Establishing a local environmental association] is only a time issue. Its establishment is a gradual process, which needs more people to increase their environmental awareness. In some places there is an active civil society because people are more advanced, but in some places people don't know how to operate [i.e. by establishing an environmental association]. If they only ask those extreme activists to join, it doesn't create positive impacts but rather negative ones. If you just let them do it [establish an association] when it is still premature, then it would be a monster and it would be difficult to stop later (Head of Legal Publicity Office, Hekou District Environmental Protection Bureau, 2015).

By the end of our fieldwork in 2015, official permission for the association was still pending. Here, the key question is how and why government officers make decisions about local environmental activists. The following response by one officer explained their strategy:

If people come to us and raise their issues, it doesn't mean we can help them to solve problems. It is a question about how the policy-makers make *overall* arrangements [emphasis in the original]. For instance, they may need to consider whether this issue bothers many people [but this doesn't mean the issue could be solved if many people are affected], whether the issue is important or not, or whether the person who is reporting the issue is professional or not. The governments have limited budgets but they have to solve

so many issues. The question of determining *priority* is important, and it involves so many *complex* interests and *intricate* relations (Officer, Hekou District Water Resources Bureau, 2015).

This response makes clear that local officers do not have substantial experience in handling local environmental activism and seem overwhelmed with their new role. To respond to people's e-complaints, tendency to blame, and curse on various digital channels, officers tend to adopt *proactive* and *preventive* measures to keep the situation under political control, rather than responding to requests, disclosing data, or taking effective action against pollution. In this context of interfacing between government agencies and local activists, the judgment about whether the officials are tacking toward openness (放) or tightening (收) (Baum, 1994 cited in Stern and O'Brien, 2011: 177), and about which initiatives or actions are permissible, rests on activists' skilful interpretation of incomplete information (Stern and O'Brien, 2011).

Green Land: Promotion of information disclosure in Shandong Province

Established in the capital city of Shandong Province, the local environmental NGO Green Land has been leading the work of promoting disclosure of water pollution data and public participation in environmental management.¹⁵ Since 2014, Green Land has also been involved in environmental protection activities in Dongying. Supported by a national institute called the Institute for Public and Environment,¹⁶ Green Land has been engaged to promote pollution information transparency¹⁷ and digital tools for environmental management in Shandong Province. In 2014, the Institute for Public and Environment and Green Land visited the Education Centre of the Shandong Provincial Department of Environmental Protection, where they had an exchange of opinions about access to environmental information and the future development of an online environmental information disclosure platform. This platform includes information on the concentration and volume of pollutants discharged by enterprises subject to intensive monitoring under control of the province (SDDEP, 2015). The main goal of constructing such a platform was to involve new actors in environmental governance, such as private enterprises, NGOs, and the media (Zhang et al., 2016).

In April 2015, Green Land was a co-organiser of a public campaign intended to conduct monitoring in the mother river of the Yellow River in Dongying, using local activists and volunteers (Figure 4). Due to the lack of access to government-generated water pollution data, this bottom-up initiative aimed to increase public awareness about water pollution and knowledge of pollutants by teaching residents how to use simple monitoring tools (Figure 4 ; for a comparison with a top-down campaign initiated by the water bureaucracy itself, see Tan, in preparation). Green Land's primary goal was to establish and cultivate a scientific information channel among Dongying's local activists.

¹⁵ See the Green Land website: www.greenqilu.org/Item/list.asp?id=21 (accessed 24 March 2017).

¹⁶ Established in 2006 in Beijing, the Institute for Pubic and Environment is a public environmental research institute that develops and operates China's Pollution Map database, promotes environmental information disclosure, and public participation, all devoted to improving the mechanisms of China's environmental governance. www.ipe.org.cn/about/about.aspx (accessed 24 March 2017).

¹⁷ See the 2013-2014 Annual Pollution Information Transparency Index Assessment of Shandong Province published by Green Land (2014).

Figure 4. Environmental campaigns (left)¹⁸ and water quality tests (right) in Dongying

Source: Photographs by Tan, 2015.

Following the initiative of developing an online platform to disclose self-monitored pollution data released by enterprises subject to intensive monitoring under control of Shandong Province, a water sampling point and a standardized sign with pollution level indicators should be located near all wastewater outfalls (SDDEP, 2015). Green Land suggested local people to test this sort of wastewater discharged by enterprises subject to intensive monitoring via those monitoring tools. Green Land assumed that the water quality data drawn from the samples would be uploaded regularly to the people's own database, in order to enable activists to compare those results with the official data generated in the online environmental information disclosure platform hosted by the Provincial Department of Environmental Protection. From the perspective of Green Land, they believed that residents would typically access information through everyday talks and rumours, rather than relying on data as evidence (interview, 2015). A scientific information channel could activate people's interest, and increase their awareness and knowledge on environmental pollution. Importantly, the water quality data generated by the local residents could facilitate the monitoring of wastewater discharge, complement the official data in accelerating China's pollution control (ibid).

Local activists in Dongying were concerned that residents were not very interested in digital information, due to their relatively low awareness of their right to know (ibid). The use of digital tools for accessing – let alone producing – environmental data was rare, even among local environmental activists. Despite this, local activists from Dongying believed that ICT and digital governance still provided a good learning opportunity to work with Green Land before the creation of their own environmental association.

DISCUSSION AND CONCLUSION

Since two national plans were implemented in the YRD in 2009 and 2011 to deal with the industrialization boom, Dongying has witnessed large-scale expansion of industrial areas and a tremendous rise in salt farming and industrial fish production. While core industries such as petroleum and chemicals contributed significantly to the economic growth of Dongying, their effects on the environment and human health were extremely negative. These undesirable consequences triggered

¹⁸ "We don't want the polluted water from the upstream Yellow River" is written on the banner.

anxiety among local people, particularly those living in close proximity to industrial areas. The authorities in Dongying face the dilemma of economic growth that relies on highly polluting industries and increasing demands among both activists and the general public for accelerated pollution prevention and abatement efforts. This prompted local authorities to develop both hardware power and software power.

In this research context, software power development was initiated by the relevant authorities of Dongying through the promotion of digital channels in environmental governance; examples include official online interviews, official websites available to the public, and emergency telephone lines. Inspired by Bateson's work on communication, the study shows that the software power development was supposed to fulfil a complementary role, providing a discursive arena for informing the public about governmental efforts aimed at pollution abatement. This discursive space – created through the cultivation of different communication channels – did not, however, make any room for mutual communication. As such, mutual awareness was not achieved on discussing environmental issues between government agencies and the local residents. Last but not least, information disclosure of pollution data in Dongying remained far from transparent, despite the fact that the local government had implemented the kind of digital environmental governance promoted by the central Chinese state.

Setting out with Long's (1989) thesis of interface in mind, the present study has explored how discrepancies in social interest, knowledge, and power between government agencies and the local population in Dongying were mediated, perpetuated, or transformed. By focusing on those interfaces between government agencies and the local residents, this study's findings show that local cadres sent mixed signals to activists and displayed wariness towards them. As the case of Hekou District shows, local bureaucrats did not have much experience interacting with environmental activists. When disputes arose and a group of people tried to have their demands addressed, local cadres perceived them as 'trouble-makers' and deployed technocratic interventions to keep the situation under control. Moreover, local cadres tend to take *preventive* measures that seek to avoid being blamed by higher authorities and keep themselves in the comfort zones.

With the uptake of ICTs, internet technologies empower resource-poor environmental activists in Dongying to start up their platform, strengthen their social networks, and build communication channels with the authorities. Whereas local bureaucrats strived to keep difficult situations under control, the environmental activists' social influence was a significant way for impacting actual decision making. In this process, the activists' use of digital platforms to expand the scope of communication with local authorities could affect the degree of bargaining power that had to be taken into account by local authorities. This sheds light on the embeddedness of China's activism, making clear that it is limiting while enabling (Ho and Edmonds, 2008).

Beyond local environmental activism in Dongying, this study has explored the initiative of environmental information disclosure in Shandong Province. The empirical findings suggest that the information disclosure approach did not appear to be an accountable measure to ensure that people's access to environmental information actually increased. For Green Land – the only legally established environmental association active in Dongying – the key was to focus more on giving the public direct advice on processing official information, rather than bridging people's perception, interests and life experience in the official agenda of environmental management. To reflect on Mol's argument on informational governance, practitioners should address fundamental issues of surveillance and monitoring in digital environmental governance, promoting transparency, accountability in the process of production, distribution, and control of environmental information.

In summary, ICT has created opportunities for environmental activists to build dialogue with government agencies. The application of bureaucratic techniques, however, was key for environmental activists to enter the communication interface with government agencies as genuine partners in the hope of influencing China's environmental governance. With regard to the strategies of government

officials, the findings of this study show that local bureaucrats' awareness and experience of environmental activism affected the bargaining power exerted by environmental activists. While local cadres were uncertain about the motivation of activists and concerned about the public influence of environmental activities, the cadres tend to keep the situation under control and to send mixed signals to activists. This finding provides a significant source of understanding on how local bureaucrats perceive and respond to environmental activism. We assume that future research exploring how different levels of the bureaucracy react to grassroots activism would be meaningful. By applying the analytical tool of communication interface, this study contributes to Long's thesis of interface by shedding a new light on the dynamic, fluid, and multi-layered character of state-society relation. It enriches the debate of China's environmental governance and provides a better understanding of the complexity among the emergent ICTs, activism, and digital governance.

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