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Sango Mahanty^a & Trung Dinh Dang^a

^a College of Asia and the Pacific, Australian National University, Canberra, Australia

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Crafting Sustainability? The Potential and Limits of Institutional Design in Managing Water Pollution From Vietnam's Craft Villages

SANGO MAHANTY AND TRUNG DINH DANG

College of Asia and the Pacific, Australian National University,
Canberra, Australia

Despite a raft of government initiatives, Vietnam's rapidly growing craft villages—rural hubs for small-scale industry—produce alarming levels of water pollution that seriously affects human health and the environment. Framing water quality as a commons dilemma creates the scope for appropriately designed, collaborative institutions that better address local conditions and the need for vertical and horizontal coordination. However, institutional and social theorists highlight that broader historical and social relationships can interact recursively with institutions and are not readily manipulated through institutional crafting. Our research in four craft villages of northern Vietnam finds that the challenge for managing water quality in craft villages is thus broader than institutional design, and requires an understanding of how regulations and policies emerge from and interact with broader societal processes.

Keywords complex commons, craft village, design, institutions, scale, Vietnam, water pollution

Institutions—the makeup and performance of formal and informal rules and norms (North 1990)—are a fundamental focus in commons governance (Ostrom 2005; 2009a). By analyzing cases where resource governance institutions have developed organically, commons theorists have distilled several principles for effective institutional design (Ostrom 2005). However, social theorists have shown that designing institutions to achieve instrumental aims is a fraught process, shaped by complex historical, social and political relationships and contingencies (Goodin 1996; Olsen 1997; Pierson 2004). Such factors are often overlooked in instrumentalist processes of problem definition and intervention design (Scott 1998; Mosse 2005; Cleaver 2000). The debate over whether effective and enduring resource management institutions can be designed, given the complexity of the social relationships they seek to

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Address correspondence to Sango Mahanty, Resource Management in Asia-Pacific Program, College of Asia and the Pacific, Australian National University, Canberra, ACT 0200, Australia. E-mail: sango.mahanty@anu.edu.au

influence, has largely escaped studies on pollution, which conceptualize pollution as market failure, whose solution lies in a menu of regulatory and market institutions (Fischendler 2007; van den Bergh 2010).

Our study of water pollution from four craft villages in the Red River Delta of Northern Vietnam examines the inherent tensions in designing institutions for pollution governance. It shows how the current command-and-control regime rests upon flawed assumptions about government capacity and the causes of craft village pollution. We find that commons theory would enable a closer fit between pollution governance institutions and the drivers of craft village pollution. However, both approaches neglect the significant role of historical producer–state conflict and competition in shaping environmental outcomes.

Since the 1980s, when the *Doi Moi*¹ reforms opened up the Vietnamese economy, thousands of small- to medium-scale, often informal, craft manufacturing enterprises have mushroomed in villages across the country (Environmental Police Agency [EPA] 2009). Many of Vietnam's estimated 2,790 craft villages² are situated on major river systems, particularly the Red River Delta region of Northern Vietnam. The government has encouraged this enterprise growth to address rural poverty and to counter rural–urban income gaps and migration. However, regulators have struggled to manage the environmental impacts of these burgeoning industries and some 90% of craft villages have water pollution levels well above the standards set by the national environmental protection law (Ministry of Natural Resources and the Environment [MONRE] 2008; EPA 2009; The World Bank 2008).³ Although pollution from craft production is relatively small compared to large-scale industrial and urban waste, the associated health risks for producers and their immediate neighbours make them a matter of significant government and community concern (MONRE 2006, 2008).

While the government has introduced a range of laws and measures to address industrial pollution, in the craft village case, we demonstrate that its command-and-control approach is failing to meet the instrumental aim of reducing the release of polluted wastewater by craft producers because it fails to address the complex drivers of craft village pollution. Commons theory improves on current approaches by promoting appropriately designed institutions. We start by reviewing the role of institutions in environmental governance, drawing on a variety of traditions of institutional analysis (first section). The research methodology (second section) outlines our qualitative approach to understanding the conditions and perspectives of craft producers as well as those of other village residents and state actors. Two major themes that emerged from our research are discussed. The first (subsection “Designing for Complexity”) discusses the gap between the current institutional framework and operational realities, particularly the size, informality and interconnectedness of craft production, as well as coordination and capacity challenges within government. The second theme (subsection “The Limits of Institutions”) captures the limitations of institutional design in overcoming the historically fraught relationships between craft entrepreneurs and state actors; these will complicate the implementation of pollution management institutions.

Water Pollution and Institutional Design

Water quality, like other common pool resources (CPRs) has low excludability (users cannot be easily prevented from polluting a water body) and subtractability (reduction of water quality by one user reduces it for others) (Ostrom 2009a; Sarker et al. 2008). For commons theorists, effective governance involves devising effective

collective arrangements and rules (institutions) to manage the CPR and address resource-related conflicts (Ostrom 1992). Pollution has so far received very limited attention in commons research (aside from Dawes et al. 1974; Sarker et al. 2008).

Ostrom's institutional analysis and design framework suggest that effective commons governance requires (1) appropriate rules (formal, informal, rules-in-use, and rules-in-form) by which social relationships are ordered in relation to a resource, that are (2) appropriate to the biophysical/material conditions and (3) to community attributes, including norms, values, homogeneity, size, composition, and their level of asset equity (Ostrom 2005). Furthermore, large and diffuse CPRs such as river systems comprise a "complex commons" whose management needs coordination between users in different localities through nested systems of governance, and mutually supportive institutions at the local, regional, national and even international level (Ostrom 2005, 2009a; Berkes 2008; Armitage 2008).⁴ A common challenge with such arrangements for collaborative governance is determining how and where responsibilities should be allocated (Marshall 2007). Furthermore, multiscale governance does not emerge in a political vacuum (Armitage 2008; Dowsley 2008), but is shaped by the power and positioning of different social actors and their horizontal and vertical relationships (Berkes 2008; Dowsley 2008).

These criteria and conditions identified by commons theorists guide our assessment of the relevance and suitability of Vietnamese institutions for managing craft village pollution (discussed in the third section). However, to gain insights into the *process* of institutional design and implementation, we need to look beyond commons theory to political science and anthropology. Given space constraints, we briefly summarize some pertinent issues from this rich body of literature.

The influence of complex historical and social environments over the form and evolution of instrumentally designed institutions may well overshadow the intentions of the designer (Pierson 2004; Mosse 1996; Cleaver 2000). The commons that institutions seek to manage are not a neutral canvas, but historical and political domains in which social relations are continually articulated, reproduced and contested (Mosse 1996, 467). On implementation, purpose-crafted institutions enter a complex landscape where they can be interpreted, combined and used differentially by a range of actors through a process of "institutional bricolage" (Cleaver 2002). Furthermore, institutions may not just be designed with an instrumental purpose in mind; other motivations may be equally or more influential, such as moral (deontological) concerns (Goodin 1996; Olsen 1997). Ultimately, the viability and effectiveness of instrumentally designed institutions may be uncertain, given the potential for unanticipated impacts, and changes over time to the actors driving design, their relationships, and the broader sociopolitical environment (Goodin 1996). In short, evolution and accident may rival design as influences on institutional change (Goodin 1996).

These challenges to institutional design are evident in the historical, social and political context of Vietnam. Between 1954 and the mid-1980s, the government struggled to reshape the economy and society according to socialist central planning and collectivization principles. Institutions that did not enjoy popular support, such as collective farming, proved unworkable and could not be implemented (Scott 1998; Kerkvliet 2005). In his study of collectivization in Northern Vietnam, Kerkvliet shows that the "everyday politics" of villagers, including passive resistance and evading or modifying formal rules, contributed to the demise of collective farming (Kerkvliet 2005). Post-1970s land reforms were similarly undermined by villagers, who used kinship, informal local social networks, and informal institutions to protect

private land and evade redistribution policies (Dang 2010). The *Doi Moi* or post-socialist context has added further challenges, including weak government capacity and resources, corruption, rapid institutional change, and low public trust, which have been common in other post-communist societies, where the reconfiguration of rules and roles creates competition for power and resources (Elster et al. 1998).

Drawing on these analyses of institutional design and implementation, we explore the constraints in designing effective institutions to manage pollution in Vietnamese craft villages. We give particular attention to fraught state–society relations and local disobedience of institutions, which have previously contributed to institutional change.

Methodology and Case Overview

Our research draws on document analysis (secondary research, policy, and legislation) as well as new data from an ongoing research project to examine the drivers of pollution in the Red River Delta region of Vietnam, selected for its high levels of craft village pollution (MONRE 2008). Four case-study villages (see Figure 1 and summary in Table 1) were chosen for in-depth study on the basis that they:

1. Made products associated with high levels of water pollution (textiles, food processing, recycled paper production).

Figure 1. Location of case-study communes.

Table 1. Socioeconomic characteristics of case study craft communes

	Commune			
	Duong Noi	Phong Khe	Moc Nam	Duong Lieu
Craft villages studied	2 (Y La and La Noi)	1 (Duong O)	1 (Nha Xa)	1 (Duong Lieu)
District, Province; distance from Hanoi	Ha Tay district; Hanoi City; 15 km	Yen Phong district; Bac Ninh Province; 32 km	Duyen Tien district; Ha Nam; 100 km	Hoai Duc District; Ha Tay Province; 27 km
Population (number of people)	17,000	8,546 (1,964 HH)	4,131 (1,211 HH)	11,000 (2652 HH)
Product	Polyester and cotton textile	Recycled paper	Silk	Cassava and arrowroot starch, noodles, and malt
Number of craft enterprises	20 large and 9 medium; 800 small trading shops; 100 animal husbandry	7 large-scale factories with over 30 regular workers; 190 medium-scale factories; countless smaller businesses sort, weigh, carry waste paper and trade the finished product	186 weaving households; 30 dyeing households of which 2 are medium scale; 30 trading households	500 cassava and arrowroot processing households; 300 starch filtering; 146 malt production; 150 noodle making; 20 trading households); 30 medium and large enterprises including 18 working in food processing
Number of interviews	18	27 + 1 focus group	43 + 1 focus group	30 + 1 focus group

Note. From commune records in Duong Noi, Phong Khe, Moc Nam, and Duong Lieu.

2. Featured a range of different enterprise sizes (small to large).
3. Were situated in provinces at varying distances from Hanoi, the Vietnamese capital.

Interviews and focus groups were held with a total of 113 participants from these craft villages and with commune, district, provincial and national government staff. These interviews assessed the development of craft production systems over time, changes to major livelihood activities, perceptions of pollution—its extent, causes, and impacts—and perceptions about rules related to pollution and their implementation. Village informants were selected from differently sized enterprises (small to large), positions holding important community knowledge (e.g., commune officials, teachers, health workers), and households not involved in craft production. The data was then analyzed using NVivo software to code interview transcripts, government reports and newspapers. The codes were initially defined according to the topics in interview guides, and were then elaborated to incorporate additional issues and themes that emerged from the data. Interview data were also coded to record basic demographic information and attributes (e.g., location, gender, age, and occupation) to enable us to analyze and compare data by selected attributes.

This article uses village names for Nha Xa, Duong O, and Duong Lieu, but refers to the commune name for Duong Noi, where two villages were studied. At the time of fieldwork, Nha Xa, a traditional craft village on the Red River, had predominantly small household enterprises involved in specialized stages of silk production. Water pollution in Nha Xa arose from the dumping of bleach and dyes in village ponds and into the river. Duong Noi, also on the Red River, produces printed polyester, cotton, and knit textiles. Here, the predominantly large-scale factories released untreated wastewater and dyes into village canals and the river. The recycled paper village of Duong O had numerous large and medium factories, as well as small household enterprises that sort and recycle urban waste paper. The untreated wastewater from Duong O workshops contains cleaning, bleaching, and dying chemicals. Duong Lieu produces cassava and arrowroot starch, noodles, and cakes, releasing wastewater that is high in biological contaminants into village drains and canals.

Institutional Design and Its Limits in Managing Craft Village Pollution

Our research shows several areas where the current institutional configuration, following a command-and-control approach, is inappropriate and could be improved to better fit the drivers of water pollution. However, some of these drivers, such as social and political conflict, constrain and complicate the implementation of pollution management institutions yet cannot be addressed through institutional design alone.

Designing for Complexity

The appropriateness of pollution control institutions must be assessed in light of their suitability to the targeted problem—in this case, water pollution—within its social and biophysical environment (Ostrom 2005). Although craft industries in Vietnam expanded rapidly in the wake of *Doi Moi*, laws to regulate pollution did not appear until over a decade later. The most important among these was the National Environment Protection Law (2005), which outlines environmental protection standards for craft villages and assigns enforcement responsibility to provincial

People's Committees. Additional regulations informed by the polluter pays principle specify emissions standards (TCVN [Vietnam Standard]; Decision 22/2006/QĐ-BTNMT; Decision 16/2008/QĐ-BTNMT), pollution fees (Decree 67/2003/NĐ-CP and Decree 26/2010/NĐ-CP), and penalties for administrative violations concerning environmental protection (Decree 81/2006/NĐ-CP), and guide the implementation of the environmental protection law, including procedures for environmental plans and reports by enterprises (Decree 80/2006/NĐ-CP and Decree 21/2008/NĐ-CP). Provincial Committees are also required to plan and zone craft activities (Decree 66/2006-NĐ-CP). In Ostrom's terminology, the rules for managing craft village waste take the form of external regulations laid down by an authority, in this case the state (Ostrom 2005, 16).

Vietnam's environmental regulations reflect prevailing international thinking on the causes of and solutions to pollution. Current scholarship presents pollution as a negative externality—an impact that is unintended and not accounted for within formal markets—which is most effectively and efficiently solved by accounting for the costs of pollution within markets (van den Bergh 2010) following the “polluter pays principle” (Fischendler 2007). The rhetoric of “polluter pays” has been taken up by Vietnamese policymakers in the form of fees per unit of pollution to give producers an incentive to reduce their polluting behavior (MONRE 2008). McElwee (2011), however, points out that in Vietnam's post-socialist environment, market-based instruments tend to hybridize into a combination of incentives underpinned by strong state control. Since the incentives in this case involve the imposition of a fee, the difference between “polluter pays” and strict regulation was not evident to craft producers.

Craft Village Conditions

Historically, craft production was undertaken by peasants to supplement household incomes in light of an oversupply of labor in the agricultural sector and lack of additional farming land (Gourou 1955 [1936]). Production was small-scale and family-based and, for various economic and social reasons, villages specialized in particular products as part of trading networks that connected them to commercial centers in Hanoi and elsewhere in Vietnam (Spitzenpfeil 1999).

From the 1945 revolution to 1986, craft production changed significantly. The socialist centrally planned economy destroyed many existing trade networks and curtailed the free development of craft villages (Spitzenpfeil 1999: 121). Artisans were made to join handicraft cooperatives that manufactured products to state plans and targets. Some goods were exported internationally to other socialist countries such as Russia, China, East Germany, and Poland (Dang et al. 2005, 12).

In 1986 the *Đổi Mới* reforms opened up the economy to privatization, redefining peasant households as autonomous economic units (Dang et al. 2005; Nguyen 2005). The demise of handicraft collectives and the redistribution of collective land to individual households under *Đổi Mới* enabled villagers to develop their own family enterprises. Villagers could employ labor, determine the quality, quantity, and type of products, and do their own marketing (Spitzenpfeil 1999: 149). Handicraft households became small businesses, with the family home serving as a production site and family members providing most labor (DiGregorio 2001).

In interviews, craft entrepreneurs explained their recent growth as a spontaneous local response to new market opportunities that was largely self-driven, with little planning or government support. Individual entrepreneurs purchased machines from former cooperative workshops and state-owned enterprises using their own savings

or credit. The last two decades have seen increases in mechanization and product diversification to include recycled paper, plastic, and metal products. Importantly, craft manufacturing has now come to constitute a primary, rather than a secondary, source of income and employment for many rural communities (MONRE 2008).

Craft enterprises are highly variable in their size and legal status. According to official figures, 72% of craft enterprises are small family-based workshops, 18% are cooperatives, and only 10% are registered private enterprises (MONRE 2008, 11). Unregistered, small-scale, family-based workshops predominated in the case study villages. We found that the legal status of enterprises affected their “legibility” to the state (cf. Scott 1998), and thus the state’s ability to effectively regulate them. As one official noted:

I estimate about 20% of businesses pay [fines]—the ones with a close relationship to government because they come here to apply for licence and we can urge them to pay. (DONRE official, Bac Ninh Province, December 2009)

The legal status of an enterprise was often correlated with its size, but not always. Business size was generally based on the number of laborers employed. A workshop with less than 10 paid workers was considered small-scale; a medium workshop had between 10 and 20 workers, and workshops employing more than 20 workers were large-scale.⁵ This diversity suggests that enterprises had substantially different resources in terms of capital, land, and production capacity, yet were subject to the same pollution thresholds and sanctions, and to requirements to produce environmental management plans.

Where small enterprises prevailed (Nha Xa and Duong Lieu), production systems were more complex and interdependent, with individual businesses taking responsibility for a discrete stage in the production process (see Figure 2). Medium- to large-scale factories (Duong Noi) operated more autonomously. A mix was evident in Duong O, which featured several unregistered medium-scale enterprises,

Figure 2. Production processes and relationships in Nha Xa village.

which were served by small businesses that sorted and transported waste paper or traded finished products.

Figure 2 shows that in Nha Xa, dyed silk involved at least four distinct stages of production distributed across several specialized households. Producers along the silk value chain had long-term relationships, including the extension of trade credit, and were highly conscious of their interdependence. Although they could readily identify the 30 or so workshops that undertook the most polluting activities of bleaching and dyeing, they saw the value addition provided by these businesses as essential, since the market demanded finished textiles:

We are relying on each other to make a living. No matter how much wastewater bleachers continue to discharge, other residents still have to sell their goods to them. We cannot force them to shut down their business; if we do so, silk production and livelihoods of all households in the village are affected. (Focus group, Nha Xa, July 2010)

This is consistent with past research that suggests that in rural Vietnam, stable trading relationships based on interdependent family connections or friendships are overwhelmingly considered more important than formal law (Gillespie 2009).

The situation differed in communities with larger enterprises, where the size and registered status of enterprises enabled government to fine identified polluters. In Duong Noi, the main stages of textile production—weaving, dying, printing, and marketing—were handled within the one medium to large enterprise. Owners of such enterprises often reported paying fees for releasing wastewater, particularly after their village came under Hanoi City administration in 2009. In Duong O, the level of interdependence varied between small, medium, and large enterprises. More than size, the ability of environmental protection agencies to impose pollution fees here depended upon whether a business was formally registered with the district authorities (Interview, DONRE official, Bac Ninh Province).

We found the implementation of current pollution regulations was an ongoing challenge in all of the case-study villages, not just for reasons of capacity, political will, and corruption that are common to many developing countries (cf. Glazyrina et al. 2006). Regulations treated individual producers as autonomous and unconnected agents, when in fact production was distributed across several highly interdependent enterprises, some of which created more pollution than others. This suggests that a coordinated approach to wastewater treatment across several businesses might have been more appropriate, but this was made difficult by their dispersal through residential areas. The regulatory focus on individual enterprises appeared more viable where enterprises were larger and independent in their production systems. Whether or not a business was formally registered also influenced the ability of regulators to fine polluting factories.

In interviews, many craft producers outlined how financial pressures, including difficulty accessing credit, concerns about competition and maintaining family livelihoods, took precedence over pollution impacts. In this context, the ability or willingness of individual enterprises to meet the costs of pollution fees, upgrade infrastructure, or install waste management facilities was severely restricted.

In summary, the unique characteristics of craft production, and the associated monitoring and waste treatment challenges, were not well addressed in the regulatory and policy framework. Driven by the polluter-pays principle and based on a

large-scale, profitable, urban industrial enterprise model, the current regulations could not be less suited to the predominantly unregistered, small-scale, economically marginal and interdependent craft business.

Vertical and Horizontal Coordination

Although craft village pollution most heavily impacts production communities and their neighbors, there was no evidence of efforts to locally organize action on pollution in spite of a high level of awareness about its effects. In one sense, this might be explained by the fact that none of Ostrom's requisite principles for self-organized management of the commons were met in the craft village context. Spatial boundaries were diffuse, the benefits of pollution (i.e., in terms of livelihoods) outweighed costs in the short-term, collective choice arrangements were weak, resource monitoring was nonexistent, conflict resolution mechanisms were not developed and there was minimal recognition of local rights or responsibilities in relation to water pollution (Ostrom 2009b). Although producers in Nha Xa and Duong Lieu worked together on solid waste management and maintenance of drainage systems, they stopped short of collaborating on wastewater management. Informants explained this in terms of the high cost of treatment, even if shared by groups of producers. At Duong Noi and Duong O there were largely dormant producers' associations whose coordination role was limited to issues such as product price. Thus, no locally based institutions existed to address waste management or organize collective action.

In any event, as a complex commons, water pollution in craft villages ultimately requires more than just local coordination (Armitage 2008). This was evidenced in our research, where producers expressed a wariness about unilateral action that could add to their costs and reduce their ability to compete with producers elsewhere in their province, Vietnam, and internationally.

In this context, there was a significant need for cross-scale coordination between Vietnam's four levels of government. Various arms of central government set national policies and laws for craft village development and environmental management, while provincial government administers state budgets and is responsible for planning and regulation. District government also has regulatory responsibilities, and deals with monitoring and approvals. The subdistrict or commune level of government comprises elected officials from the constituent villages and carries out the day-to-day monitoring and reporting on craft activities (MONRE 2008; Kerkvliet 2004). However, we found that vertical and horizontal coordination among these various agencies was very weak.

Unsurprisingly, given their immersion in production villages, commune-level authorities enjoyed the strongest relationships with producers, but were restricted in their ability to enforce regulations and manage waste due to issues of capacity and proximity. Commune officials expressed sympathy for the needs of producers and the tension between implementing state policies and maintaining local livelihoods:

The local authority can shut down seriously polluting enterprises in the village by enforcing laws, but then what can these households live on? Any policy needs to take people's livelihood into consideration. (Commune official, Moc Nam, July 2010)

To some extent this tension was also recognized at the district and provincial level, but was most strongly expressed by commune staff.

Communes also had limited authority on issues of land and infrastructure provision and monitoring, which emerged as central concerns in reducing craft village pollution. For instance, in Duong Noi, the commune authority was powerless to allocate land for a dedicated industrial zone to concentrate manufacturing activities and house waste treatment facilities; this decision rested with the People's Committee of Hanoi City. In Nha Xa, commune officials said they lacked the authority and capacity to monitor pollution and enforce compliance (commune official, Moc Nam, July 2010).

Higher levels of government were plagued by a lack of financial resources, equipment, and skilled staff in state agencies. Provincial Departments of Natural Resources and Environment (DONRE)—key players in managing water pollution—were understaffed, were under skilled, and lacked coordination with other agencies and levels of government. Blame-shifting for perceived inadequacies was commonplace between government agencies. Staff members from provincial authorities stated a need for national agency support, while those in national agencies, such as the Ministry of Natural Resources and the Environment (MONRE), asserted that provinces had budgets for environmental management, but under-invested because they assigned a low priority to environmental protection:

There are Provincial Peoples' Committees who do not understand their responsibility in environmental protection. They do not implement the law that 1% of their budget should be used to protect the environment. The National Environment Protection Law states that the [Provincial] People's Committee has the responsibility to protect the environment but they never do this. (MONRE official, July 2010)

We have VND 3,000 billion per year (USD 150 million) for the whole budget of Ha Nam but only 1% for environmental work and it's not enough. (Ha Nam Province DONRE official, July 2010)

Lapses in vertical and horizontal coordination among the complex array of agencies responsible for environmental regulation in Vietnam have previously been identified as a major constraint (Kerkvliet 2004; O'Rourke 2004). In the craft village context, the unwillingness of any particular tier of government to shoulder either the responsibility or the substantial costs of infrastructure for wastewater treatment directly affected the efficacy of pollution regulations. Designated industrial zones within craft villages merely concentrated wastewater instead of treating it, and pilot activities generally faltered after their initial start-up funds were exhausted.

Although decentralization in Vietnam creates the scope for more locally nuanced implementation, in practice the weaknesses in coordination, capacity, and resources within and between levels of government has been found to undermine this possibility (Sikor 2001). Other well-documented challenges faced by developing countries in implementing pollution management institutions were also found, such as lack of political will and corruption (Glazyrina et al. 2006; Fritzen 2006). The resulting variability in the implementation of state policies understandably looked to producers like inconsistent application of the law. In craft villages, these factors contributed to individual producers' lack of faith that other producers—within their village or elsewhere in Vietnam—would act, or indeed be forced, to reduce pollution. This further underscores the need for collective, rather than unilateral, action in the case of craft village pollution.

The preceding discussion suggests that the current institutional framework is poorly designed in two major ways. First, it is premised on a prefabricated analysis of the causes of pollution (as a market externality) rather than a detailed and nuanced understanding of the production contexts it seeks to influence. Second, its implementation is undermined by extreme weaknesses in governance coordination and capacity.

The Limits of Institutions

Our research uncovered how poor relationships between enterprises and the state weakened the implementation of pollution institutions. These arose from historical conflicts between producers and state actors, and current struggles over resources—most notably land.

Given the self-driven nature of craft enterprise growth, craft entrepreneurs have had little connection to the state except in its regulatory role. Vietnam currently has about 33 regulations and incentive-based tools to manage production and environmental protection in craft villages that apply to all craft producers, regardless of their size or location. While largely ineffective up to now, the government recently declared its intention to more strictly enforce the law and, where necessary, force enterprises to shut down or suspend production until they take the necessary steps to reduce pollution (Tuyen 2011). This approach will most likely fuel current perceptions of the state as a strict regulator, insensitive to producers' circumstances, while it does nothing to support enterprises with the necessary waste treatment infrastructure. Most producers were recalcitrant and expressed a lack of trust in the integrity of state actors:

It's time they have fair and strict rules that apply to all enterprises, but actually the government is not objective and under the table money is going on. (Medium-scale enterprise owner, Duong Noi, April 2010)

Suu (2007, 332) identifies three major areas of corruption in rural Vietnam: in land management and use, the construction of infrastructure projects, and financial management. All three of these were found to affect the three core strategies to manage water pollution: the establishment of industrial zones, investment in water treatment facilities, and the collection of fees.

The availability and control of land comprise a particularly significant area of state–producer conflict. Vietnam's land tenure system is distinguished by state ownership, with limited, time-bound rights to use land allocated through “red book certificates” (Kerkvliet 2006). Provincial and district authorities ostensibly manage land management in accordance with national laws. In practice, competition for land and land use disputes are common among land users and between land users and state agencies.

Village industrial zones were being promoted by provincial and district governments as a means of concentrating craft producers and their waste in one space, to enable common treatment. However, due to land scarcity, producers viewed industrial zones as an opportunity for enterprise expansion, rather than for concentration and treatment of waste (DONRE official, Bac Ninh, December 2009). In Duong Noi and Nha Xa, industrially zoned land was highly sought after, particularly by larger

enterprises. Producers spoke of corrupt dealings by some commune officials in relation to industrial zones, including nepotism and demanding prices for land that were unaffordable for smaller enterprises. The construction of new residences for producers and officials in newly developed industrial zones showed that land was being misappropriated for nonproduction uses.

Lack of production space was a recurring factor in decisions about production and waste treatment. Land pressures have driven craft enterprises to use crowded family homes or farming plots for production, with little space for drainage or waste treatment facilities. In most cases the farmland has not been legally reclassified as residential or industrial land, but has been informally accepted by commune authorities.

Lack of formally recognized and purpose-built production space influenced production in many ways. The use of houses and farmland meant that workshops were dispersed widely through villages. Their unregistered status and informal land use arrangements made enterprises highly vulnerable in land acquisition processes, as farming land is cheaper than residential or industrial zoned land.⁶ Land insecurity in turn shaped producers' decisions on wastewater treatment, which was already low on their list of priorities. As one producer said, "I desire to upgrade my machinery but because my production site is not stable I will not do this" (medium-scale enterprise owner, Duong Noi, April 2010).

In summary, historical relationships between producers and the state created an unpredictable interplay between new pollution management institutions and existing norms and relationships. First, uncertainty over their already limited production space made producers unwilling to invest in technical improvements, even if they had the capital to do so. Second, land competition further poisoned an already fraught relationship between producers and government. Such relationships are less amenable to "design" within single-focus environmental institutions. Instead, these historically embedded, complex and changing social and political relationships tend to confound (Mosse 1996) and transform (Cleaver 2002) the rules-in-use for pollution management.

Conclusions

Institutions to manage pollution, in Vietnam and beyond, were originally founded on a command-and-control approach, which has now been supplemented with the notion that pollution is caused by market failure, which can best be redressed through the "polluter pays" principle. This research demonstrates the fallibility of institutional design founded on prefabricated assumptions and approaches, rather than on a rich understanding of the problem within its social and historical context.

As commons theorists suggest, effective institutional design needs appropriate rules that take account of prevailing biophysical and social conditions (Ostrom 2005). In the craft village case, the scale, informality, and interconnectedness of enterprises can and should be addressed in the design of policy and regulatory institutions. Rather than treating craft enterprises as independent "mini factories," which is relevant only in a small minority of cases, it would be more appropriate to consider joint or collective waste treatment options (although the specific opportunities for collaboration will vary between villages, depending upon the existing economic and social interdependencies). Furthermore, the spatially networked nature of craft village trade, and of river basin environments, means that the best prospects for dealing with pollution will be through a coordinated and multilevel approach. The

capacity and vertical and horizontal coordination required to implement relevant institutions must therefore be factored in at the outset or they are bound to fail.

Beyond these suggested improvements, we find that purpose-designed environmental governance institutions may also have their limits. Critical scholarship on institutions questions what can reasonably be achieved through institutional design, and where social complexities will intervene. Our research highlights important contextual factors underlying craft village pollution that are less amenable to institutional crafting and that can undermine the effectiveness of pollution institutions. In Vietnam, poor relationships between producers and government actors and ongoing contests over resources such as land are outside the purview of pollution institutions, but significantly impact their outcomes.

Institutions to manage craft pollution must therefore be founded on a rich understanding of the social, political and economic conditions in which small-scale rural industries are evolving, rather than applying scaled-down versions of industrial environmental management policies. Furthermore, it is not just the design of “rules and tools” that will shape outcomes (Ostrom 2009a). Outcomes will also be shaped by relationships and processes of coordination and implementation among relevant actors and across scales (Berkes 2008), within dynamic political and economic contexts (Adger et al. 2006; Cleaver 2002; Mosse 1996).

This suggests that instrumentally designed institutions with a single purpose are less likely to succeed than design processes that recognize institutions as interrelated and changing domains, shaped by wider societal processes (Olsen 1997). In the craft village context, questions of land and relationships between producers and the state are a central facet of institutional outcomes, alongside developing rules that better reflect local realities.

Notes

1. The implementation of the *Doi Moi* (economic renovation) policy in 1986 sought to transform the Vietnamese economy from a centrally-planned to a market-oriented one.
2. In policy terms, rural villages are designated craft villages if at least 30% of households are engaged in off-farm activities. Each craft village specializes in one of the following specific areas of production: (1) food processing; (2) textile and leather products; (3) construction materials and masonry; (4) recycled products; (5) traditional handicrafts; or (6) “other” products (MONRE 2008, 4).
3. These reports note that water pollution overrides atmospheric and solid waste as a locus of community concern.
4. The coordination of resource appropriation, monitoring, enforcement, conflict resolution, and governance, at multiple levels of governance is one of Ostrom’s eight principles of robust CPR governance (Ostrom 2005). Multilevel governance links local to higher levels of social and political organization in order to address multiple management objectives, knowledge systems, and collaborative problem solving (Berkes 2008).
5. Government regulations stipulate that family-based workshops cannot hire more than 10 workers. Since many craft enterprises with more than 10 workers still called themselves family-based workshops, we found it more useful to classify workshops according to size, and developed this classification of small-, medium-, and large-scale enterprises based on our field observations.
6. During the period of our research, Duong Noi was absorbed into the urban administrative boundaries of Hanoi. Village land that was compulsorily acquired by the state was purchased at low “farmland” rates of compensation because craft producers had not rezoned their land for industrial purposes. A number of producers lost significant amounts of money after being forced to sell manufacturing equipment at cost when they made a loss on the land housing their workshops. The same land dramatically increased in value when

rezoned for urban residential use. Such events have reinforced poor relationships between villagers and the state and further undermined regulatory compliance.

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