THE COMPLEXITY OF ADDRESSING WATER QUALITY IN VIETNAM'S CRAFT VILLAGES

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ABSTRACT

Does seeing water quality as a 'complex commons' create new windows for environmental management? Vietnam's craft villages are rural villages with many small family-based workshops, specializing in the production of 'traditional' handicrafts as well as newer activities such as solid waste recycling. Recent growth in the number and size of craft villages has created economic benefits, but also water pollution and risks for health, agriculture, and other livelihood activities. The Government treats water pollution as an externality to be managed through strict regulations, market-based instruments or public education. In contrast, this research considers what can be learned from viewing water pollution as a complex commons issue. Since water quality is impacted by numerous small and dispersed point sources of pollution, the study aims to understand the scope for coordinated action among individual craft village residents, across villages and between tiers of government. Initial findings suggest that state regulation and local self-regulation are in themselves insufficient; attention needs to be given to coordination between actors at multiple sites, different sectors (e.g. state, resource users and civil society) and at different scales (e.g. local, regional, and national) as a critical factor in addressing pollution from craft villages.

KEY WORDS

Water pollution, Vietnam, craft village, complex commons, multi-scale

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Vietnam's craft villages, specialising in handicraft and other small-scale production, simultaneously illustrate the benefits of locally driven economic development and the complexity in managing its environmental impacts. Focusing on the issue of water pollution, and drawing on common property theory, this paper asks whether considering water pollution as a collective action problem where water quality is seen as a 'complex commons' can open new policy windows. In the case of craft villages in Vietnam, such an approach may be more promising than the simple designation of pollution as an externality, which currently informs Vietnam's regulatory and market-based pollution management regime, but fails to address small, dispersed pollution sources with a complex set of drivers. A 'complex commons' approach particularly highlights opportunities and barriers for cross-scale coordination and for collective action among individual craft village residents, across villages and between tiers of government. The findings speak more broadly to the challenge of sustainably developing small-scale rural industry and enterprise in the developing world.

Craft villages in Vietnam are rural villages that specialize in the production of 'traditional' crafts such as agro-food processing, textiles, ceramics, fine arts and furniture, as well as newer activities such as solid waste recycling. Over 70% of craft villages are relatively new, emerging since the *Doi Moi* economic renovation policy in 1986, which aimed to open up the economy and shift from central planning to market-orientation. The products from craft villages reach domestic and export markets, and account for a substantial proportion of industrial production in several provinces (Dang and Nguyen 2005).

Although craft villages contribute significantly to the rural economy and rural employment, these benefits have come at a high social and environmental cost. Severe pollution contaminates the air, water and soil, with associated impacts on the health, livelihood and welfare of craft village residents and neighbouring communities. Craft village pollution has emerged as an important focus of national and local concern. In response, since 2003 the government of Vietnam has released several directives that call for stronger regulation of craft activities to control pollution and ensure their sustainability (see Section 5). In addition to direct regulation, the government has adopted economic or market-based measures based on the 'polluter pays principle' (PPP) , where taxes and charges are used to internalize the negative externalities caused by craft activities, and thereby provide an incentive for producers to reduce pollution. As discussed later, such measures are proving ineffective, given weak state capacity and complexity of pollution sources and production chains in craft villages (Section 5).

Small scale technical solutions, such as waste-water treatment facilities have also been piloted at the household level or for a small group of households, with a view to scaling up effective facilities. However, these measures have also failed (see Section 5). Despite widespread concern in government, urban communities and craft villages themselves, pollution, especially water pollution remains unresolved and on the rise.

By assessing the nature and situation of craft production and the policy and regulatory regime for managing water pollution in the Red River Delta of Vietnam, the current research reveals that this rise in pollution has a complex set of drivers. These are elaborated in subsequent sections, and highlight that the current regime is failing in the face of weak state capacity, the complex nature of craft production chains, and many small and dispersed sources of pollution in craft villages. Supplementing these with an analysis where water quality and water pollution are considered as cross-scale and collective action problems opens new windows for policy intervention.

Following an overview of the research methodology (Section 1), the paper goes on in Section 2 to discuss why it is problematic in the case of craft villages to treat water pollution solely as an externality that can be managed through economic instruments. Useful concepts from recent commons literature are identified, that emphasise the need to frame management around a richer understanding of the drivers of pollution, including the social, economic and political conditions of craft village production within the wider political economy, interdependencies amongst various actors, and the opportunities and barriers to coordination and collective action. Sections 3 -5 go on to apply this richer mode of analysis to two case study villages, drawing together the implications for our understanding of the causes of craft village water pollution and for intervention approaches in the Conclusion.

1. METHODOLOGY

This analysis draws extensively previous research, government documents and interviews from an ongoing research project to examine the drivers of pollution from craft villages in Vietnam. Working in collaboration with Vietnam's Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD), the authors conducted interviews and focus groups with a total of 106 informants in 4 craft villages, including officials from commune, district and provincial agencies. A further 7 interviews were conducted with staff of the national agencies responsible for craft village development and the management of water pollution.

The findings here draw particularly on data from two villages: Duong Lieu and Nha Xa (see Table 1), which represent some typical characteristics of Vietnamese craft villages. Both have complex production chains, intensive social networks and independency among producers and many small dispersed pollution sources. Although not a major focus in this particular paper, the differing location (Duong Lieu is close to Hanoi, while Nha Xa village is 100 km away), size and product types of these villages was also a factor in their selection.

Table 1. Case study characteristics

Village Name	Commune/ District/Province	Products	Population (no. of households)	Number of respondents

Duong Lieu	Duong Lieu/Hoai Duc/Ha Tay	Arrowroot noodles and malt	11,000* (2500 HH)	30
Nha Xa	Moc Nam/Ha Nam	silk products	803# (243 HH)	35

*population of Duong Lieu village
population of Nha Xa village

2. WATER POLLUTION: CONCEPTUAL ISSUES

Existing explanatory frameworks for water pollution and related policy centre on the notion of pollution as an 'externality'. This section highlights that, while the notion of exernality has some currency in case of craft villages, the characteristics of pollution from these craft enterprises calls for a richer explanatory framework to understand pollution and its causes.

2.1 Pollution as an externality and related policy approaches

Water pollution occurs when waste is released into water bodies both from specific identifiable and monitorable *point sources*, and from diffuse *non-point sources.* Where waste exceeds the absorptive capacity of the water body, chemicals start to accumulate in the water and wider ecological system (Nguyen et al. 2006). In economics, pollution is framed as a negative externality, since the environmental and social costs of pollution are generally treated as external to the production process.

Two policy approaches are commonly used deal with pollution as an externality: command-and-control or direct regulation and market-based instruments. Direct regulation along with monitoring and enforcement systems has been the dominant strategy for pollution control in both the developed and developing world. This approach encompasses environmental standards for maximum waste discharge, and specifications for production technology, schedules for achieving standards, enforcement procedures and penalties for non-compliance. The responsibility for defining and enforcing the standards are generally shared in legally prescribed ways between national, state, and local governments (Bernstein 1993).

Although direct regulation has been a significant strategy in reducing pollution, the approach has been criticized for under-achieving on environmental outcomes, for being economically inefficient and difficult to enforce, especially in the developing world (Bernstein 1993; McAllister at al. 2010). In developing countries like Vietnam, limited law enforcement capacity and low levels of regulatory compliance undermine the effectiveness of a regulatory approach. Because pollution is a complex phenomenon, the state agencies have difficulty gathering and processing the information necessary to enforce environmental protection laws, and also lack the technical capacity and political power to enforce full compliance with the laws. Other factors that undermine the State's implementation of regulations include lack of resources, low pay and pervasive corruption, lack of leadership and coordinating capacity (O'Rourke 2004; McAllister at al. 2010).

Given these shortcomings, environmental economics has focused on using market-based policy instruments to 'internalize' the costs of externalities in markets, so that prices reflect the full environmental and social costs of production (Tietenberg 2006). Market-based instruments depart from a strictly regulatory approach as a motivator for behiavoural change (Sarker et al. 2008a). While a regulatory approach uses laws and regulations to mandate standards and technologies for producers, economic instruments aim to provide producers with the flexibility to meet environmental goals in appropriate ways at least cost. Examples of tools that have been applied to manage or improve water quality include:

- Emissions charges per unit of pollution emitted. Based on the 'polluter pays principle'[2], such charges are seen to give polluters a financial incentive to reduce pollution up to the point where it is cheaper to pay the tax than reduce pollution. A key challenge is setting the fee at a rate high enough to achieve the behavioral change sought, which is usually managed through modeling and ultimately a process of experimentation.
- Emissions trading: the pollution control authority sets an overall limit on emissions, and allocates pollution permits that add up to this overall limit. Polluters can choose to (i) meet their permitted discharge levels (ii) achieve lower emissions and sell remaining pollution credits or (iii) purchase additional pollution credits to enable them to exceed their original allocated pollution level (Bernstein 1993).

The potential benefits of economic instruments include raising public revenues to support environmental programs, and promoting innovation in pollution control technology at least cost by allowing the producer to determine the most efficient technology.

In a developing country context, however, such economic instruments have certain disadvantages. Far from reducing government involvement, in many cases they require sophisticated institutions to implement and enforce them. For instance, precise monitoring of pollution levels is needed both for fees and for permit schemes. Similar to a regulatory approach, economic instruments also face the challenge of balancing environmental protection and economic competitiveness in a global economy. If high charges are introduced in one country, producers there may be less competitive than producers in those countries with less stringent environmental controls. Finally, some environmental pollutants, such as toxic substances that cause serious health problems, are may be better suited to some form of direct regulation (Bernstein 1993, O'Rourke 2004).

[2] **Polluter pays principle:** the polluter pays a financial penalty according to the level of pollution emitted. The fees can thus contribute to the full social cost of maintaining a clean environment, for instance, with the treatment of waste water.

In Vietnam, the notion of externalities from individual point sources has underpinned the state's regulatory and policy response. However, state capacity has been heavily over-stretched in managing the small and spatially dispersed sources of pollution from craft villages.

2.2 A complex commons: small-scale and diffuse pollution sources

The preceding discussion highlighted that, in order to enforce regulations and implement MBIs, the state needs to know who and what causes pollution; what levels of emissions are safe and how to monitor and regulate polluters to these safe levels. In general, direct regulations and MBIs have shown greater success with larger point source pollution (PSP) but have had a little success with diffuse non-point sources of pollution, since the latter is challenging to identify and monitor (Sarker et al. 2008a).

Given small and dispersed sources of pollution from a large number of small-scale and informal enterprises in Vietnamese craft villages, the enforcement of government regulations and implementation of MBIs is extremely difficult and costly. Furthermore, existing instruments target individuals rather than groups of producers. The outcome is that individual craft enterprises or households may be unable or unwilling to bear the cost of pollution fees given their meagre profit margins, and feel aggrieved at being penalised when other polluters within the village and elsewhere escape regulation (see Section 5).

In the absence of effective state regulation and where collective arrangements have not been reached, resources such as water and air within and beyond craft village boundaries tend to function as open access systems. Typical consequences include: too much water being used; too much pollution being emitted, the output of polluting commodities is too large, prices of polluting products are too low, and, as the costs of pollution are externalised, there is little incentive to reduce pollution.

Williamson et al. (2003) usefully distinguish between 'exogenous' and 'endogenous' externalities, which is relevant in the craft village case. Where pollution is an exogenous externality that primarily affects those outside the community, for instance those downstream from a production site, there may be little incentive for producers to combat pollution. However, where pollution is an endogenous externality with direct impacts on the producing community, there is an incentive for pollution to be addressed through collective strategies (Williamson et al 2003: 66). Vietnam's craft villages fall into the second category, as the greatest impact on water quality, health and livelihoods is within the producing community itself.

An emerging body of literature now suggests that a combination of commons and externality concepts are useful for such pollution dilemmas, involving small-scale and diffuse sources of pollution andinter-connected interests that function within diverse property regimes (Sarker et al. 2008b; German 2010).

2.3 Water quality as complex CPR issue

A common pool resource is commonly defined as a set of sufficiently large or diffuse resources with multiple users who

1. cannot be easily excluded from appropriating benefits from the resource (low excludability), and
2. once extracted, the benefits are not available to other users (subtractability) (Dietz et al. 2002)

Sarkar et al. (2006 and 2008) are amongst the first to draw on commons theory in anlaysing water pollution from diffuse sources. They suggest that water quality is similar to other common pool resources since it is difficult to exclude people from appropriating water quality by polluting the water body, and quality is subtractible – the reduction of water quality by one user reduces the quality available to other users (Sarker et al. 2008b). As with other CPRs, the challenges with water quality remain (1) managing over-appropriation of resources - in this case the emission of too much waste into a water body, and (2) addressing substractibility, in this case degradation of the water body. Further, the inherent challenge in excluding individuals from using the resource means that those who do not follow rules for resource use can still benefit from the actions of others (the 'free rider' problem) (Dietz et al. 2002: 20). As with other CPRs, the management challenge with water quality is also one of devising effective collective arrangements to enable resource users to coordinate and manage their actions, thus addressing resource related conflicts (Ostrom 1992).

German et al. (2010) find CPR theory particularly useful for situations where externalities and economic inefficiencies are caused by non-cooperation among resource users. Examples include land use practices on one farm affecting other farms because pests, diseases and weed easily spread across boundaries, or degradation of a CPR such as groundwater from practices on private land (e.g. use of pesticides). Many such challenges remained unadressed despite widespread local concern and understanding about these issues, because of the absence of governance arrangements that help translate local concern into behavioral change (German et al 2010). This is pertinent to craft villages, which typically involve common or interdependent interests among resource users but lack of cooperation on pollution issues (see Section 3.1 and 5)

Sarker et al. (2008b) suggest that it is vital to understand the interdependencies between resource users and related CPRs in order to effectively govern a complex CPR such as water quality. With craft villages, for instance, the actions of individual craft enterprises discharging untreated waste water can affect the health and livelihoods within that village and of other communities downstream. Furthermore, the interdependence and lack of boundaries between surface and ground water mean that pollution from one village can affect the CPRs of other villages right up to the sub-basin level. The complex interdependencies between groups and systems in the case of water quality means that collaboration between a wide range of stakeholders is required to manage water pollution — including local communities, different levels of government and even industry (Sarker et al. 2008b).

Recent approaches to managing the complex commons also recognize that, like water quality in a river system, many common pool resources are large, diffuse and cannot be managed through local organization alone (Ostrom 2009; Adger *et al.* 2006; Armitage 2008; Berkes 2008). Commons governance necessarily involves a network of interactions at various levels and requires institutions that links local with higher levels of social and political organization (Berkes 2008). Indeed, this observation is not new - all resource management system have some external linkages and drivers at different scales, and a failure to recognize such linkages has led to management failure before (Berkes 2002).

Apart from understanding the complex attributes of the resource, sustainable management of CPRs also requires an understanding of the characteristics and the situation of resource users: their situation, values, social networks, and perceptions of environmental problems, as well as the influence of local, regional, and global economic and political forces (McCay 2004: 393). Armitage (2008) adds that governance is not a technical but a political process, infused with power and knowledge differentials and with important distributive implications. He therefore calls analysis of the political economy of environmental management.

The remainder of this paper goes on to do just this: analyse the characteristics of the resource, resource users, their situation and the complexity of interactions and drivers impinging on the issue of water pollution from craft villages. It also assesses why the imposition of regulatory resource management or "top down management" by government agencies is failing locally, and what this means for future policy intervention

3. CRAFT VILLAGES IN AN ERA OF CHANGE

For centuries, craft villages have been an integral part of Vietnam's rural economy and society. For example, Nha Xa village was established 500 years ago and the village temple has a memorial to their founder. Craft villages historically engaged in food processing, in the manufacture of agricultural and fishing tools, ritual goods, household wares, construction materials, paper, and textiles, and in service provision, for instance in trades such as carpentry (Digregorio 2001: 62).

According to Gourou (in DiGregorio 2001), craft villages arose as peasants looked to supplement their income through craft production in response to an oversupply of labour in agricultural sector and a lack of farming land.

> "In this way, they have created an industry cut to their measure, a small craft industry wasteful of labour and lacking machinery; an industry

possessed of extreme simplicity and sometimes of highly subtle technique, an irrational industry illogically distributed, but faithful to tradition, an industry to which we can detect the exclusivism of the village; an industry which is not very remunerative and merely helps the farmers, underfed by the earth, not to die of hunger"(Gourou 1936 in DiGregorio 2001: 60).

In other words, the production of handicrafts in the first half of the 20th Century was primarily an important supplement to farming activities. Production was small in scale and undertaken at the household level. An estimated seven per cent of the adult population was engaged in craft production in the Red River delta (Gourou in DiGregorio 2001). Such production was undertaken by peasants to supplement farming income during their "leisure" time, partly because the social status of artisans was lower than that of peasant farmers in Confucian ideology (Luong and Unger 1998).[3]

Following the 1945 revolution and up until 1986, craft production went through several important transitions. Artisans were forced to join cooperatives that manufactured products according to state plans and targets, which specified the quantity, type, design and price of products. For some crafts, production expanded beyond domestic markets and was exported to other socialist countries such as Russia, China, East Germany and Poland. In general, however, highly controlled production contributed to the gradual disappearance of many crafts that fell outside the perceived needs of the state (Dang et al. 2005: 12).

In 1986, Vietnam's '*Doi Moi'* (economic renovation) policy took the country from a centrally planned to market-oriented economy. The end of collectivization through this reform also brought the demise of handicraft collectives, enabling villagers to develop their own family enterprises. In many villages, this brought the revival of local crafts such as wood carving, weaving, pottery, and sewing which had virtually disappeared during collectivization. A handicraft household could now function as a small business, employing family members (full- or part-time) and hiring additional labour on a daily or piecework basis (DiGregorio 2001).

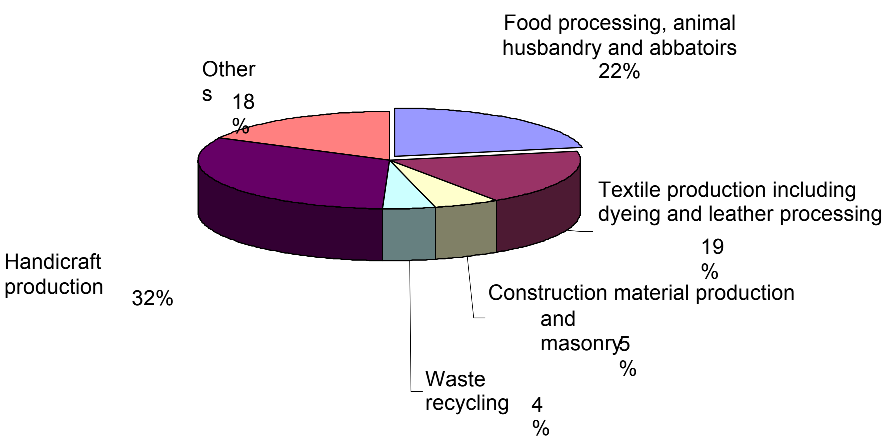
These changes have encouraged the rapid growth of the handicraft industry, which now provides employment to a significant proportion of the Red River Delta's population. In the early 1990s, best estimates indicate that handicrafts accounted for between 30 per cent of non-State manufacturing employment in the province of Ha Noi and 75 per cent in the province of Ha Nam. Thousands of households either engaged full-time in handicraft production or part-time around farming activities (MoSTE 1994). The most recent government statistics suggest that by 2009, 2790 craft villages employed around 11 million workers, accounting for 30 per cent of Vietnam's total rural labour workforce (EPA 2009). Of this, the highest number of craft villages is in the North, particularly in the Red River Delta, which accounts for about 60% of the total craft villages in Vietnam

[3] According to Confucian values, traditional society consisted of four occupational groups in the hierarchy: 1. scholar, 2. peasant, 3. artisan and 4. merchant.

(MONRE 2008). Craft production is no longer an income supplement for farming households, but increasingly a primary economic activity that has brought significant increases in rural incomes.

For administrative purpose, the government divides craft villages into six different categories: (1) food processing, including animal husbandry and abattoirs (2) textile production including dyeing, silk production and leather processing, (3) production of construction material and masonry, (4) recycled products, (5) handicraft production,[4] and (6) others.

Figure 1 Craft villages by product type



(Source: MONRE 2008: 7-9).

3.1 Craft village characteristics

Although diverse in product types, Vietnam's craft villages share a number of common characteristics and constraints in their social and economic organisation.

Firstly, similar to other villages in Vietnam, craft villages are much more than just clusters of homes. Kinship and other social networks are important to their socio-economic and administrative functioning. Historically, villages were closed communities with a high degree of autonomy vis-à-vis other villages and state. Most villages owned communal land that was redistributed periodically to their residents (O'Rourke 2004). Craft villages often had rules to exclude non-residents from learning "the secrets" of their handicrafts. For example, villagers in Nha Xa silk production village recalled that in order to exclude others from learning their silk production techniques, village girls were forbidden from marrying into other villages (Interview, Nha Xa, July 2010). Today the villages have more open interaction and exchange with others, but have retained their complex social ties and relatively high social capital.

[4] Handicrafts (*thu cong my nghe*) refers to a high-value craft product created by highly skilled artisans that are considered to be fine art.

A second factor common to all craft villages is the use of old and inefficient technologies, the majority of which was manufactured in the 1950s or 1960s (Dang and Nguyen 2005; Konstadakopulos 2008). One researcher writes “some machines that ought to be consigned to a museum still remain in operation throughout Vietnam” (O’Rourke 2004: 109). Inefficiency causes significant waste of input materials, and therefore leads to higher production costs. It also contributes to pollution as more inputs and waste are associated with each unit of production.

A third common feature of craft villages is the household as the basic unit of production, with family members providing most of the labour and the family home serving as a production site. In most cases, craft enterprises have developed according to market demand and the skills and resources of individual producers who determine the type, scale and location of their operation, without reference to any regulations and plans (Dang et al. 2005: 168; VACNE 2004). As a result, scattered, unplanned, and small-scale family-based workshops are the norm in craft villages.

High population density together with lack of production space, shortage of capital, and a shortage of trained workers are a fourth common element in craft villages. A recent study found that the around 60% of the surveyed enterprises faced capital shortage, while 36 per cent of enterprises could not find enough trained workers, and nearly all lacked sufficient land to house production facilities (Konstadakopulos 2008: 57). This was confirmed in the current research, where residents in Duong Lieu and Nha Xa highlighted that land, capital and skills were the key constraints to the future development of their business (Interviews, March and July 2010).

Finally, the complexity and strength of intra-village networks discussed earlier, mean that craft village households are highly interdependent socially, economically and environmentally. Economically, the constraints to land, capital and capacity have often led individual craft households or enterprises to specialize in one part of the overall production process for a craft commodity. For example, in Nha Xa village, the final product of dyed silk results from at least 4 different stages of production with trading between producers engaged in these different stages. Figure 2 demonstrates the complex network of relations and linkages within this village.

Figure 2: Production processes and relationships in Nha Xa village

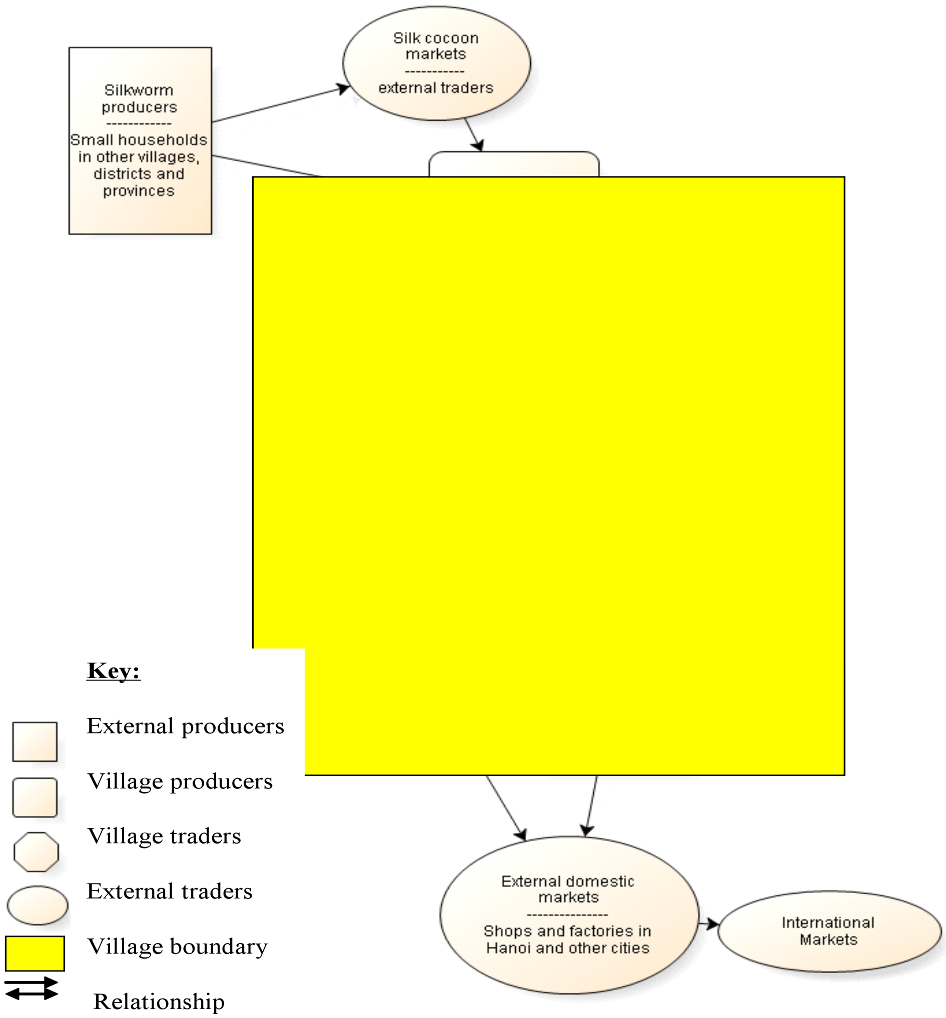


Figure 2 shows that the initial production of silk thread occurs outside Nha Xa village, but the key phases of preparing thread for weaving machines, weaving and dying are specialised activities undertaken by different households within the village. In the case of larger workshops with more workers and looms, thread preparation and bleaching/dying have been incorporated under the same roof. The buyers and consumers of the product are based in urban centres and sometimes internationally. The most polluting stages of production are bleaching and dying, without which the silk would not be saleable as the market only demands the finished textile.

In Duong Lieu food processing village, the production chain is similarly specialised and complex (see Figure 3).

Figure 3: Production processes and relationships in Duong Lieu village

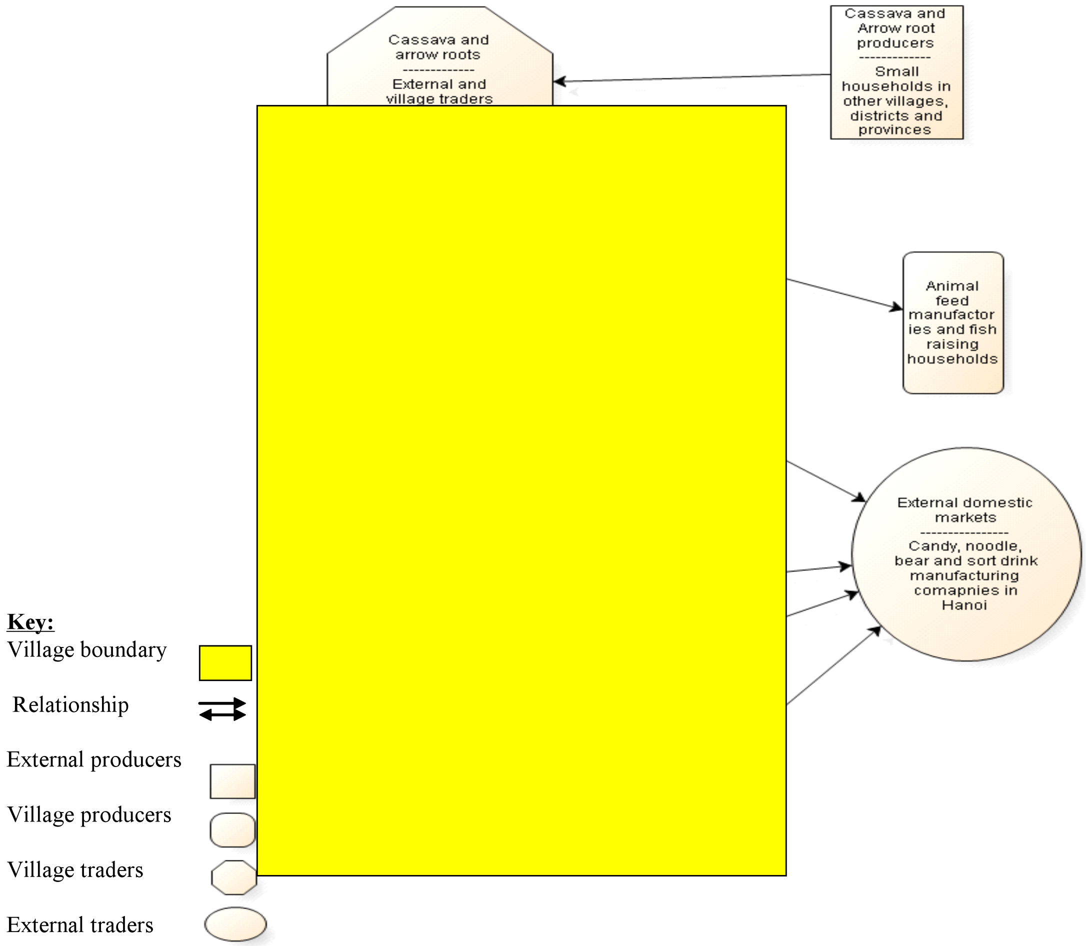


Figure 3 shows that the village produces foods using cassava and arrowroot as a base product, which is sourced from outside the village. The initial processing of this material into powder is undertaken by some households, who then sell this powder to other producers that specialise in noodle and malt production. Village traders take the product to domestic markets, particularly in Hanoi. The most polluting stage is the production of cassava and arrowroot powder.

4. THE LEVEL AND IMPACTS OF WATER POLLUTION

As noted earlier, the impacts of water pollution are experienced most severly within craft villages themselves, and also in neighbouring communities. This section provides an overview of the extent and implications of these impacts.

A recent government study found that 90 per cent of craft villages have levels of pollution that exceed standards set by the national environmental protection law (EPA, 2009). The type and level of pollution (including water, air and soil pollution) differs between craft villages. Water pollution is common to most craft villages; however, the highest levels of water pollution are associated with food processing, textiles and waste recycling, which informed the selection of case studies for this research. Villages involved in food processing, animal husbandry and abattoirs are responsible for releasing large volumes of waste water containing high levels of organic materials (MONRE 2008), for example Duong Lieu releases an estimated 6,800 cubic meters of waste per day (MONRE 2006: 7)

Silk and textile production, waste recycling and metal industries release less waste water, but the water contains higher levels of toxic chemicals. On average, each textile village discharges about 200 to 1000 cubic meters of untreated waste water per day (MONRE 2008: 26-28). Waste water from textile processing villages contains high levels of pollutants according to indicators such as Phosphorus, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD) and coloured dissolved organic matter (CDOM) (Dang et al. 2005: 115). According to MONRE, the level of COD and BOD in waste water from textile and textile dyeing craft villages is 2 to 15 times higher than Vietnam's allowable standards. Other indices such as coliform levels, Nitrogen and Phosphorus are also far above Vietnam's allowable standards (MONRE 2008).

4.1 Common factors in pollution from craft villages

Several common patterns can be identified in craft village pollution.

Firstly, craft villages include many households and small enterprises for which the family home doubles as a production workshop. Each village therefore has many, scattered and small pollution sources. For example, Duong Lieu commune has 2300 households engaged in different stages of food processing activities, including production of cassava powder, barley sugar, noodles and candy. Around 500 cassava powder-producing households scattered through the villages are considered the main source of water pollution (Interviews, Duong Lieu, March 2010). In Nha Xa village, 243 households engage in different stages of silk production, including weaving, bleaching and dying. The main sources of water pollution are 36 households and two larger workshops involved in the final bleaching and dying stage of production (Interview, Nha Xa, July 2010).

A second commonality is that the concentration of these small pollution sources in a particular hamlet, village, or commune poses a direct risk to the entrepreneurs and workers themselves (KEI and the World Bank 2003). One study found that 95 percent of workers in craft villages are exposed to toxic particles, 85.9 percent to heat, and 59.6 percent to toxic chemicals (KEI and the World Bank 2003; MONRE 2008). This high level of local risk is supported by this research, for instance in a story from a dyer in Nha Xa village:

> I am a dyer in a dyeing workshop. Because of working directly with chemicals, sometimes I get sick and go to the hospital. The hospital staff has often asked me to stop doing this work but I have to keep going. I

> know the chemicals are toxic, but there is no choice. I am concerned about health but need to work for this income otherwise we would die of hunger (Interview, Nha Xa, July 2010).

Given high population density and the use of homes as production sites, a third common factor is the impact of craft village pollution on village CPRs such as surface and ground water and air. This is having significant impacts on the general health and well-being of all village residents, including non-producers. A resident in Nha Xa complained,

> Regarding surface water quality, it's so polluted now that nobody dare use any pond water for domestic use. In the past it was clear but now it's polluted from chemical discharge. I'm also concerned it will pollute the underground water system. The water has a very bad smell – when it evaporates into the air the smell is really sour. Now none of the children ever dare to play or swim in the pond (Interview with village Womens' Association leader, Nha Xa, July 2010)

It is said that pollution in Nha Xa is associated with high rate of respiratory diseases, intestinal diseases, sleep disorder and skin diseases, especially for those involved in bleaching and dying silk. A female weaver living next to a dying workshop said,

> Regarding health impacts, of course there are big impacts. Maybe there is even a potential risk to me. The children can't learn to swim in our ponds like in the past. Many villages have reduced health and more women have diseases, such as lung disease, and diseases of the digestive system. …There is more disease among women, also higher incidence among young women. Malnutrition rates are higher. Among the women – around 70 per cent have gynaecological disease. I know the pollution may have some effect on pregnant women, like when they take a bath, or drink water. If you eat vegetables grown near the edge of the ponds you can get stomach problems….There are 3 or 4 cases of stomach cancer (Interview with female weaver, Nha Xa, July 2010).

Pollution also impacts negatively on other livelihood activities such as animal husbandry and fish farming. It often kills or decreases the productivity of fish in ponds, contaminates vegetables, decreases rice production and causes skin irritation amongst farmers who work in nearby fields (Moc Nam commune statistics 2008). One man in Nha Xa commented:

> The pollution is visible. Water flowing into paddy fields, ponds or lakes can trigger the excessive growth of water-ferns and paddy but when we or our animals eat these, we can get food poisoning. People even refuse to feed pigs on these polluted plants. Paddy in polluted areas can grow at an amazing rate but the yield is totally lost due to defected grains…
> (Interview, Nha Xa, July 2010)

A key study by the Korean Environmental Institute and The World Bank in the Red River delta found that the health status of craft village residents compared very poorly with agricultural villages. Craft villagers were more likely to suffer from eye disease, respiratory disease, intestinal disease, and skin disease, in addition to high rates of cancer and other potentially fatal disease.[5] Health impacts were often most serious for women and children (KEI and The World Bank 2003). The life expectancy of craft villagers was estimated to be ten years shorter than the national average and five to ten years shorter than non-craft villagers (MONRE 2008).[6]

Finally, the greatest impact of water pollution from craft villages is local, on neighbouring downstream areas, and ultimately the river sub-basin and basin. For example, waste water in Duong Lieu commune through its open drainage system can impact several communes and districts until it reaches Nhue –Day river sub-basin (Interview, Hoai Duc district official, July 2010). Water pollution in Nha Xa also affects agricultural cultivation of neighbouring communes downstream, who often raise their concerns with higher authorities (Interviews, Nha Xa, July 2010).

In general, however, the most significant pollution impacts appear to be at the local level and immediately downstream. At the larger river basin scale, the proportion of pollution from craft villages is relatively small in comparison with other sources of pollution. For example, in the Nhue-Day river sub-basin, 458 craft villages released an estimated 45,000 to 60,000 cubic meters of wastewater per day without prior treatment (MONRE 2006; MONRE 2008); this, however, accounts for only four percent of the total waste water discharge to the rivers nationally (MONRE 2006: 28).

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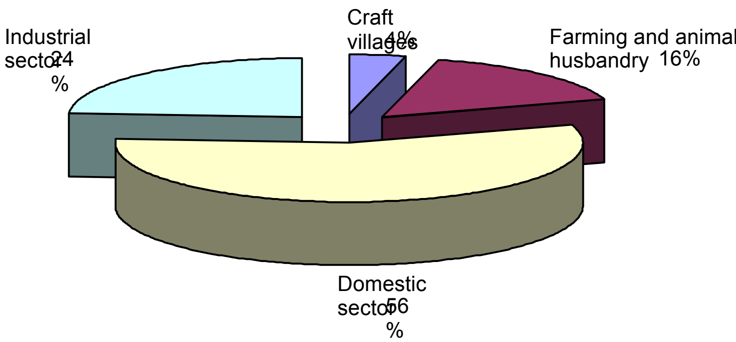
[5] In Dong Mai lead recycling village (Hung Yen province), 71.1 per cent of residents are reported to have mental illnesses associated with lead poisoning and 65.6 per cent have respiratory diseases. The rate of serious pollution-related issues is also high among children, in the form of mental and physical disabilities, such as lameness, polio, and blindness. An estimated 100 per cent of workers in this village suffered from chronic lead poisoning (KEI and the World Bank 2003).

[6] According to Ha Nam province's statistics on seven craft villages and seven non-craft villages, the incidence of skin, respiratory and intestinal diseases among residents in craft villages is many times higher than that in non-craft villages. In particular, the rate of respiratory diseases in craft and non-craft villages is 50 per cent and 40 per cent respectively. The rate of diarrhoea was 80 per cent and 10 per cent respectively for craft and non-craft villages. For skin diseases 70 per cent of craft villages suffered from these ailments compared with 20 per cent in non-craft villages (MONRE, 2008).

Figure 4 Waste water discharge by sector in Nhue Day river sub-basin



(Source: MONRE 2006: 25)

5. CURRENT POLLUTION MEASURES AND THEIR RESULTS

As noted earlier, current measures to mitigate water pollution in craft villages can be classified into (1) Central government measures including direct regulations and MBIs (fees per unit of pollution); (2) Local measures in the form of zoning, water treatment pilot and awareness-raising, some of which fall to local government.

5.1 Direct regulation and MBIs

A combination of laws, decrees and regulations (see Table 2) forms the basis of Vietnam's regulatory system to address pollution in general and pollution from craft village in particular. As noted earlier, the government of Vietnam has also adopted economic instruments such as taxes and environmental protection fees that are charged to polluters according to the units of pollution they discharge. Vietnam's policy makers hold fast to the "Polluter-Pays" principle to internalize the costs of pollution and motivate producers to mitigate pollution (MONRE 2008).

Table 2: Laws and regulations on craft village pollution

Name	Purpose	Year enacted
Decree 67/2003/NĐ-CP	Sets guidelines to environmental protection fees	2003
National Environmental Protection Law	Article No. 38 emphasizes environmental protection in craft villages and assigns responsibility to provincial level Peoples' Committees	2005
TCVN	Sets environmental standards for water quality	2005

(Vietnam Standard) 5945-2005		
Decree 66/2006/NĐ-CP	Article 7 stipulates that provinces are responsible for planning craft development, and that any new development must comply with environmental protection; also address preferential land pricing, tax concessions and subsidies to assist craft producers in moving to concentration zones.	2006
Decree No. 80/2006/NĐ-CP and Decree No. 21/2008/NĐ-CP	Provides guidelines to implement the environmental protection law and instructions to operating units on Environmental Impact Assessment and preparation of environmental protection plans (Decree No. 21 amendmend some articles of Decree No. 80/2006/NĐ-CP to better suit actual village conditions)	2006/2008
Decree No. 81/2006/NĐ-CP	Sets penalties for administrative violations concerning environmental protection	2006

As noted earlier (and shown in Table 2), Vietnam has an impressive number of the laws-on-the-books, but enforcement remains a challenge. Existing legal documents provide no clear delineation of responsibilities between ministries, departments, and local government, which leads to weak coordination. Furthermore, local and provincial government has limited human and financial resources available to implement current regulations. According to MONRE, 95 per cent of environmental management staff from the district to village level has no environmental qualifications, and most communes have no full-time environmental staff (MONRE 2008).

A second key issue is the difficulty faced in regulating the small and dispersed sources of pollution associated with craft villages. Provincial environmental police departments, which have the highest responsibility for environmental enforcement, have little interest in implementing these laws in craft villages. Villagers believe that environmental police prefer to visit large, rich enterprises in the cities where they are more likely to receive bribes, rather than low income and difficult-to-monitor craft households (Interviews, Duong Lieu, March 2010). So far, the task of environmental protection in craft villages has fallen to lower level local authorities that lack the authority and capacity to meet expectations. They face real difficulties in implementing laws, monitoring pollution and enforcing compliance by the many small-scale, family-based and unregistered craft enterprises that populate craft villages.

> It is very difficult to control the production because of the large number of production households and the difference in production pattern of each household. If their production is carried out regularly in a specific location,

> it will be much easier to control. However, in this village, they produce in their homes and timing is unpredictable. Sometimes when the officers visit their house, their production is over or has not begun, which creates a lot of difficulties for us ... (Interview with commune official, Duong Lieu, March 2010)
>
> The City People's Committee has prepared a bill on craft villages in which there are regulations on waste water. However, it is not an easy task to distinguish between the domestic waste water and the production waste water (Interview with district official, Hoai Duc, March 2010).

A third issue is the challenge faced by local authorities in enforcing the laws where there are conflicts of interest between promoting local economic development and managing the negative impacts of environmental pollution. An official in Moc Nam commune commented,

> We can shut down the operation of seriously polluting enterprises in the village by enforcement of laws, but then, what can they and other dependent households live on? Any policy needs to take people's livelihood into consideration. If we close them, we need to ensure their livelihood and economic development. (Interview with commune official, Moc Nam, July 2010).

A commune official from Dung Lieu adds,

> "In general, state regulations are not practical. For instance, under Regulation 16, a polluter has to pay VND 380,000 (equal to USD 20) per ton of waste. This regulation aims to help protect the environment but it cannot be applied to the handicraft village. A household making arrowroot powder making processes 10 tons of cassava, where they only get 3 tons of powder and the rest is mainly water and waste - at least 5 tons of waste. According to the regulation, the producer has to treat the waste themselves, carry it to the dump and pay the discharge fees. However, if he pays the full cost for his waste, he makes a loss." (Interview with a Duong Lieu commune official, March 2010)

In addition, regulations and laws enable affected persons to take legal action against environmental polluters. In reality, however, the complexity of legal procedures and priority placed on social networks means that litigation never occurs in the village. Village residents say things like:

> We are dependent on each other.
>
> We don't want to have quarrels with each other; we want to live in harmony.
>
> We want to solve the problem ourselves.

The polluter is my relative. (Interviews, Nha Xa, July 2010).

Thus, low compliance and weak enforcement (by both authorities and affected people) are mutually reinforcing, and undermines the implementation of these regulatory and economic instruments (Sinclair 1997). As a result, investigation of pollution events is infrequent or absent; and sanctions for violations are rarely implemented. The collection of environmental protection fees for the discharge of wastewater is unable to be implemented, and craft villages enterprises have not undertaken any commitments to environmental protection as the laws requires.

Finally, the emphasis on direct regulation and MBIs by government agencies has diminished their capacity to incorporate feedback or learning from local resource users, communities and civil society. They have elicited little engagement from key stakeholders with an interest in environmental protection in craft villages. The end result is an unrealistic set of policies that have little legitimacy in the eyes of craft producers, with the outcome of weak compliance and unabated pollution from craft villages.

5.2 Zoning, water treatment pilots and awareness-raising

Some provinces and districts have initiated plans for industrial zones or production concentration areas for craft production activities. By concentrating polluting activities in a zone, the aim is to facilitate its control and treatment. However, not many industrial zones have been established yet due to limited financial resources and land, as well as weak coordination between local authorities. For example, the commune and district levels of government are responsible for planning and zoning but do not have authority over land allocation, which needs to be approved by the province.

A handful of districts and communes used their own budgets and available land to establish industrial zones for craft villages. However, given a lack of resources, expertise, clear planning and strategy, few zones have sufficient drainage and treatment infrastructure. In most cases, infrastructure is limited to roads and electricity and there are no standards and effective rules for environmental protection and water treatment. Moreover, many enterprises do not have the capital to move to a new workshop in an industrial zone, so continue to produce in their homes. This means that zoning, where it is taken up, has tended to shift and concentrate pollution rather than prevent it (Konstadakopulos 2008).

Some state agencies and NGOs have supported enterprise level facilities for waste water treatment and the use of new ‘environmentally friendly’ technologies in craft production. Many water treatment pilots have been implemented, generally attached to one enterprise or a small cluster of enterprises in a craft village, with the aim of scaling up when they proved effective. However, all of these facilities have closed within some months or years because of their high running costs, making them unaffordable for the enterprise or village. For example, a state-sponsored water treatment pilot in the mid-

1990s (costing VND 80 million - USD 45,000) was installed at one silk weaving and dying enterprise in Moc Nam. The treatment facility initially worked well and delivered water clean enough “to raise fish”, but once the running costs were handed over to the enterprise, the owner could not continue its use due to high running costs. He reported that these additional costs made his business uncompetitive with other producers in the village, in other parts of Vietnam and in China (Interview, Nha Xa, July 2010).

Another measure promoted by state agencies and NGOs is awareness-raising, on the assumption that low awareness is a fundamental cause of pollution. Activities to increase environmental awareness include information dissemination, education, and training, and attempting to incorporate environmental protection into informal village rules. An alternative perspective is that people are already aware of the effects of pollution on health, but they continue to work in toxic environments because their top priority is to secure a better livelihood for their family (Nguyen et al. 2003). Our findings confirm that villagers are very concerned and aware of pollution impacts on their health, but prioritise livelihood security over environmental risk:

> Waste water here is very poisonous. When the rain comes, the smell of the water becomes terrible. The smell is so bad that it makes people want to vomit. If you have to walk into the waste water…you will immediately have skin problems. All the villagers here know how harmful the waste water is so there has been serious conflict in the village. But we have to keep the craft village alive. This is gradual suicide for the villager but if we stop production immediately we also die. We have no way around this. We have to choose to keep our livelihood and would rather die gradually (Interview, Nha Xa, July 2010).

Thus, awareness may not be the fundamental issue; instead the problem lies in the absence of governance arrangements that can translate local concern into coordinated behavioral change. Given the absence of systematic and effective environmental protection activities by government agencies, residents in craft villages have organized their own environmental sanitation activities through the Communist Youth Union and Women’s' Union bodies. However, these activities are so far limited to cleaning roads, dredging ditches, and burning domestic waste manually (KEI and the World Bank 2003).

5. Conclusion

Although craft enterprises in Vietnam are treated as ‘point source’ polluters, their small, dispersed nature makes craft village pollution more akin to pollution from non-point sources, such as agriculture, where the drivers and actors are complex. Old technology, use of homes as production sites, lack of space, shortage of capital, low income and livelihood priorities are direct drivers. Indirect drivers include the need for producers to maintain market competiveness, complex and interconnected production chains, and the absence of effective management arrangements regarding pollution. The plethora of small and dispersed sources of pollution in the face of weak state capacity, undermine existing regulatory arrangements.

Vietnam's current approaches of direct regulations and MBI, which are premised on the notion of pollution as an individually produced externality are insufficient to address this complexity and have so far failed to improve environmental outcomes in craft villages. This research has particularly highlighted the challenges faced at the commune, district and provincial level in implementing current laws and MBIs, given the small and dispersed sources of pollution in craft villages. It also suggests the current legal framework has a low level of legitimacy amongst craft producers, who fear that unilateral costs and actions will be imposed upon them, while producers elsewhere in the country and internationally take up their market share.

The current legal framework also fails to recognise high level of socio-economic and environmental interdependence among craft producers, and between craft producers and their other CPRs, such as water quality within and outside craft villages. Given these factors, an approach that treats water pollution as cross-scale collective action problem or complex common may point to new areas for action, particularly the need to strengthen coordination between actors within craft villages, between craft villages, across different sectors (e.g. state, resource users and civil society) and at different scales (e.g. local, regional, and national). The development of trust and mechanisms for communication and coordination amongst actors is a key component of this.

As Dietz et al. (2002: 12) suggest, the most effective policies for complex CPRs are based on a strong understanding of the resource and user characteristics, and incorporate multiple institutional strategies, that address the social, political and economic context in which the CPR is embedded. Policies to combat water pollution in Vietnam's craft villages therefore need to incorporate CPR governance, based on the characteristics and the circumstances of producers and the craft sector, addressing interdependence issues and the wider socio-economic and political realities and drivers that directly or indirectly affect the issue.

LITERATURE CITED

Adger, WN, K Brown, and EL Tompkins. 2006. The political economy of cross-scale networks in resource co-management. *Ecology and Society* 10 (2):9.

Armitage, Derek. 2008. Governance and the commons in a multi-level world. *International Journal of the Commons* 2 (1):7-32.

Berkes, Fikret. 2002. Cross-scale institutional linkages: perspectives from the bottom up. In *The drama of the Commons*, edited by T. Dietz, N. Dolsak, E. Ostrom, P. Stern, S. Stovich and E. U. Weber. Washington DC: National Academy press.

———. 2008. Commons in a Multi-level World. *The International Journal of the Commons* 2 (1):1-6.

Bernstein, Janis D., and World Bank. 1993. *Alternative approaches to pollution control and waste management : regulatory and economic instruments*. Washington, D.C.: Published for the Urban Management Programme by the World Bank.

Dang, Kim Chi, N. L. Nguyen, and L. M. Tran. 2005. *Lang Nghe Viet Nam va Moi Truong [Vietnam's craft villages and environment]*. Ha Noi: Nha Xuat Ban Khoa Hoc va Ky Thuat.

Dang, Kim Chi, and Thi Huong Nguyen. 2005. Wastewater from production activities in craft villages and some mitigation solutions Institute for Environmental Science and Technology.

Dietz, T, N Dolsak, E Ostrom, and P Stern. 2002. The drama of the commons. In *The drama of the commons*, edited by T. Dietz, N. Dolsak, E. Ostrom, P. Stern, S. Stovich and E. U. Weber. Washington DC: National Academy press.

DiGregorio, Micheal Robert 2001. Iron Works: Excavating Alternative Futures in a Northern Vietnamese Craft village, Urban Planning, Unversity of California, Los Angeles.

EPA. 2009. Tai Lieu Hoi Thao Khoa Hoc: Phong Ngua, Dau Tranh Chong Vi Pham Phap Luat Ve Moi Truong Lang Nghe. Hanoi: EPA (Vietnam's Environmental Police Agency).

German, Laura Anne, and Andrew Keeler. 2010. “Hybrid institutions”: applications of common property theory beyond discrete property regimes

International Journal of the Commons 4 (1):571–596.

KEI, and The World Bank. 2003. Environmental Management for Traditional Craft Villages in Vietnam. Korea environment institute and the World Bank.

Konstadakopulos, D. 2008. Environmental and Resource Degradation Associated with Small-Scale Enterprise Clusters in the Red River Delta of Northern Vietnam. *Geographical Research* 46 (1):51.

Luong, Van Hy, and J Unger. 1998. Wealth, power, and poverty in the transition to market economies: the process of socio-economic differentiation in rural China and northern Vietnam. *The China Journal* 40:61-93.

Mcallister, Lesley K., Benjamin Van Rooij, and Robert A. Kagan. 2010. Reorienting Regulation: Pollution Enforcement

in Industrializing Countries. *Law & Policy* 32 (1).

McCay, Bonnie J. 2002. Emergence of Institutions for the Commons: Contexts, Situations, and Events. In *The drama of the commons*, edited by T. Dietz, N. Dolsak, E. Ostrom, P. Stern, S. Stovich and E. U. Weber. Washington DC: National Academy Press.

MONRE. 2006. Environment report of Vietnam, 2006: the current state of water environment in 3 river basins of Cau, Nhue-Day and Dong Nai river system. MONRE (Ministry of Natural Resource and Environment).

———. 2008. Bao Cao Moi Truong Quoc Gia 2008: Moi Truong Lang Nghe Viet Nam. Hanoi: MONRE (Ministry of National Resources and Environment).

MoSTE. 1994. Red River Delta Master Plan. Hanoi: MOSTE (Ministry of Science, Technology and Environment).

Nguyen, Khac Quynh, V.T. Tran, and V.L. Le. 2003. Project VIE/00/018/08: Assessing Participatory Rural Environmental Management in the Craft Villages (Cat Que commune, Hoai Duc distrit, Ha Tay province). Vietnam Agricultural Science Institute.

Nguyen, To N., Richard T. Woodward, Marty D. Matlock, Alyssa Denzer, and Mindy Selman. 2006. A Guide to Market-Based Approaches to Water Quality. World Resource Institute.
O'Rourke, D. 2004. *Community-driven regulation: Balancing development and the environment in Vietnam*: The MIT Press.
Ostrom, E. 1992. Community and the endogenous solution of commons problems. *Journal of Theoretical Politics* 4 (3):343-351.
Sarker, A, H Ross, and KK Shrestha. 2008a. A common-pool resource approach for water quality management: An Australian case study. *Ecological Economics* 68 (1-2):461-471.
Sarker, Ashutosh, Helen Ross, and Krishna K. Shrestha. 2008b. Interdependence of Common-Pool Resources: Lessons from a Set of Nested Catchments in Australia. *Hum Ecol* 36 (821-834).
Sinclair, Darren. 1997. Self-Regulation Versus Command and Control? Beyond False Dichotomies. *Law & Policy* 19:529-59.
Tietenberg, Tom. 2006. *Emissions trading, principles and practice*. Washington, DC: Resources for the Future.
Williamson, Sima, David Brunckhorst, and Genard Kelly. 2003. *Reinventing the Common: cross-boundary Farming for a Sustainable Future*. NWS, Australia: The Federation Press.