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Policy support for wastewater use in Hanoi

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Domestic wastewater use has the potential to be an important part of urban water management in Hanoi if it is supported by Vietnamese policy. This appears to be the case, with the water and environmental legislation stipulating discharge and treatment requirements; outlining financial incentives; and encouraging research, development and private participation in treatment and use. However, policies in potential reuse sectors, principally agriculture and aquaculture, do not reflect these positive assertions. Furthermore, inadequate financial provision for treatment that would facilitate planned use and stimulate private sector interest is also an impediment. In Hanoi, the result is that wastewater use takes place informally through the utilization of polluted water for agriculture and aquaculture. However, small changes could lead to safe, cost effective planned reuse which would protect the environment and provide Hanoi with a much needed water supply in the future.

Introduction

Hanoi, like many cities in Asia, is struggling to meet its citizens' water and sanitation demands. Currently the majority of Hanoi's water is derived from groundwater but over exploitation has led to reduced water levels and subsidence. The city government has therefore prohibited the construction of new wells and will in future rely on surface water from Da, Red and Doung Rivers (WHO et al., 2011). The sanitation sector is also under pressure because although 80% of households have septic tanks, these are designed to have an overflow to the sewer or drain but >90% of the wastewater is not treated (WHO et al., 2011). In addition, many of these septic tanks are poorly designed, constructed and maintained and do not provide effective treatment (Evers et al., 2010). The consequence is high levels of water pollution. For example, UNHabitat (2002) noted that the Nhue River is heavily polluted by industrial and domestic discharges of nutrients, organic matter and chemicals; and the city's inner lakes are eutrophied and polluted by faecal matter. This has implications for downstream users, including farmers and fish farmers operating in and around Hanoi.

Many measures are being implemented by the State and local governments to address these issues. One option that has been suggested by many commentators as part of the solution for Hanoi, as well as several similar cities throughout the region, is that of managed reuse. At present reuse appears to be taking place informally in Hanoi but formal treatment and reuse has not been established. This study considers whether there is policy support for such an approach and whether the content of the legal framework not only allows treatment and use of wastewater in agriculture and aquaculture but also actively facilitates organizations and individuals to undertake such ventures, for example by providing financial and technical support. It also begins to identify, through secondary sources, how effectively the legislation is being implemented; research is ongoing into this aspect.

Methodology

This paper draws on policy and legal documents, and secondary literature to understand the current legislation around wastewater treatment (WWT) and use. A methodology called Triangle Analysis, which divides the analysis into consideration of content, structure and culture, has been used to review and evaluate the material. The content component is presented here, describing elements of legislation that appear to offer

legal support for formal wastewater use or which prohibit certain activities. Support is defined broadly as any piece of policy or legislation that makes it legal to utilize wastewater, as well as legislation that actively facilitates its use, for example through funding for infrastructure, tax incentives, technical guidance, training or mechanisms that enable revenue collection, thereby sustaining the system.

The culture and structure components of the study are still underway and will only be touched on here. These refer to stakeholder acceptance and interest in wastewater use, and the mechanisms that have been put in place to implement the laws and policies, including governmental and non-governmental organizations, programmes and funding.

Current wastewater use practices

Evidence exists that wastewater use may already be substantial in Hanoi. Raschid-Sally and Jayakody (2008) estimated that 658,000 farmers use wastewater to irrigate 43,778 ha of land in Hanoi. While several studies in Thanh Tri District have identified extensive use of wastewater for agriculture (25 ha) and aquaculture (185 ha of fish ponds), producing 3,000 tonnes of fish and generating USD 5,760 ha⁻¹ yr⁻¹ and USD 7,200 ha⁻¹ yr⁻¹ from vegetables and fish respectively (Vo Quy Hoan, 2001; Lan et al., 2012). Most of this reuse is unplanned and informal, and takes the form of extraction from polluted water bodies.

Reuse has great potential given that the total wastewater load received by the four main rivers that drain Hanoi is 315,000-355,000 m³ day⁻¹ (Dao, Con and Khai, 2010). However, Evers et al. (2010) found that wastewater management in Hanoi is strictly separated from agricultural water management, and farmers are not integrated in the chain. An exception is in Yen So commune, Thanh Tri District, where Vo Quy Hoan (2001) found that all the farmers interviewed displayed a strong willingness to obtain wastewater, and that its long term use had resulted in an effective system that had become part of the district development plans.

Legislative support for wastewater use

Given the current context of water and sanitation demand, water pollution and informal use of wastewater for agriculture and aquaculture, the question remains as to whether current policy and legislation allows wastewater reuse and in what form, and what it offers in terms of official support for the sector. The most overt support for treatment and use is Decision No 1930/QĐ-TTg dated November 20, 2009, which describes development of urban drainage and wastewater up to 2025 and a vision to 2050, includes extensive treatment of 20-30% of treated wastewater from domestic properties and reuse for plant watering, road cleaning and other purposes within the city. Several other pieces of Vietnamese legislation, spanning water exploitation and supply, sanitation and pollution control also endorse resource recovery and reuse (RRR) including WWT and use.

The key laws of relevance are the Law on Environmental Protection (LOEP, 2005) and the Law on Water Resources (LOWR, 2012), as well as multiple decrees and decisions that accompany them. These are outlined in Table 1. A clear example of the support for RRR can be found in the LOEP (2005), which states that activities to be encouraged include reduction, collection, recycling and reuse of wastes; and scientific research, transfer and application of technologies for treating and recycling wastes (Order No. 29/2005/L-CTN, 2006). The LOEP goes beyond encouragement offering financial support to organizations engaging in waste recycling in the form of exemption from various taxes and environmental fees, subsidies for products and energy from waste (LOEP, Article 117), and the establishment of “Environmental Protection Funds” (LOEP, Article 115) which could finance recycling and reuse.

Comparison of legislation and practice

There appear to be many elements of Vietnamese legislation that support wastewater use, in the form of formal treatment and use or extraction from water bodies, provided that the water quality conforms to the requirements for surface water or irrigation. Loan (2010) points out several contradictions in the legislation, primarily between the top level laws (LOEP and LOWR) and the lower level decisions and decrees designed to offer guidance for implementation, and also between the LOWR and LOEP, which result in confusion over responsibility (primarily between the Ministry of Agriculture Rural Development (MARD) and the Ministry of Natural Resources and Environment (MONRE)). However, none of these appear to affect the overall position on reuse as much as more general limitations to the legislation and its implementation. For example, despite there being over 300 pieces of legislation related to the LOWR, there is inadequate guidance on appropriate WWT technologies, insufficient funding mechanisms and sanctions require clearer definitions. There is also a general lack of implementation and support for application of policies and legislation, including projects and programmes to assist state operators or private sector.

Table 1. Summary of legislation pertaining to resource recovery and reuse	
Laws and codes	Selected elements for RRR
Law on Environmental Protection (LOEP) No. 52/2005/QH11 and Decree No. 179/1999/ND-CP to guide the LOWR's implementation.	<ul style="list-style-type: none"> • Encourages reduction, collection, recycling and reuse of wastes; and technologies for treating and re-cycling wastes • Makes individuals and organizations responsible for RRR and reducing discharge and disposal • Tax exemptions for organizations engaging in RRR and subsidies for products from RRR • Provides for private sector to enter waste management and RRR market • Fosters support for environmental funds within businesses • Lays out charges for disposal • Urban areas must have centred WWT; storm water drainage; and solid waste collection, storage, treatment and recycling • Effluent must be treated to the standards stipulated in QCVN 14:2008/BTNMT and QCVN 24: 2009/BTNMT • Wastewater treatment technologies must be appropriate for the waste, have sufficient capacity, comply with standards, connect to drains and operate on a routine basis
Law on Water Resources (LOWR), 2012	<ul style="list-style-type: none"> • Covers all wastes entering water sources that may pollute • Stipulates that master plans include wastewater collection and treatment systems • Prohibits discharge of untreated or inadequately treated wastewater • Prioritises research into treatment, recycling and reuse, and water use efficiency in all sectors including agriculture
Vietnamese national technical regulations, decrees and decisions	
QCVN 14:2008/BTNMT on Domestic Wastewater, QCVN 24: 2009/BTNMT on Industrial Wastewater, QCVN 39: 2011/BTNMT on Quality of Water for Irrigation, QCVN 39: 2011/ on Surface Water Quality	Provide the standards that must be met for the discharge of wastewater, for water the quality of water used in irrigation (especially pertinent if wastewater is being used) and the quality that water bodies used for aquaculture must conform to.
Decree 149/2004/ND-CP on Water Resource Exploration, Exploitation and Use, or for Discharge of Wastewater into a Water Source.	Individuals and organizations, discharging anything other than small volumes of non-hazardous must have a license to do so
Decree No. 67/2003/ND-CP and Decree No 04/2007/NĐ-CP on Environmental Protection Charges for Wastewater.	Domestic and industrial sectors must pay a fee for discharging wastewater into the environment, not exceeding 10% of the clean water tariff, collected by the water supply company
Decree 88/2007/ND-CP on Drainage and Sewerage for Urban Areas and Industrial Zones (being revised 2013).	Created the legal and institutional framework for wastewater management. All households and organizations discharging wastewater into drainage systems must pay drainage charges.
The Orientation For The Development Of Urban Drainage In Vietnam Up To The Year 2020, ratified by Decision No: 35/1999/QĐ-TTg	90-100% drainage coverage planned for Hanoi. Systems to be put in place to secure funding from sources other than central government so as to eliminate subsidies. Includes a drainage toll and foreign investment.
The Master Plan on Socio-Economic Development of Hanoi City Through 2020, with Orientations Toward 2030, approved in Decision No. 1081/QĐ-TTg	Includes treating > 80% of wastewater by 2020, forming specialized production zones for safe vegetables, high-grade vegetables, flowers, ornamental trees and fruit trees, and increasing areas for aquaculture.
Decision No. 38/2007/QĐ-TTg on Criteria for Classification of and List of Enterprises with One Hundred (100) per cent State Owned Capital:	The state shall hold 100% charter capital of enterprises operating irrigation works, and urban water drainage enterprises shall be equitized and the state shall hold > 50% of the total shareholding.

Sources: Ministry of Justice (2014); FAO, IUCN and UNEP (2014); World Bank, (2006)

Wastewater discharge and treatment

Discharging untreated or inadequately treated wastewater is prohibited under the LOWR (2012, Article 9) and specifications for licensing and remediation are given in Articles 26, 27 and 37. Despite these clear requirements, it is widely acknowledged that wastewater is inadequately treated due to lack of infrastructure, enforcement and financing, resulting in surface water pollution.

Technologies for treatment are stipulated in the LOEP (2005, Article 82). The LOEP does not specifically endorse technologies to be used for recycling water but neither does it exclude novel technologies that could facilitate reuse. It has also been suggested by AusAid and the World Bank (2013) that the stringent discharge standards stipulated in QCVN 14:2008/BTNMT and QCVN 24: 2009/BTNMT preclude certain technologies that may be more appropriate, cost effective and that could provide options for safe use.

A potentially effective means of protecting receiving waters, reducing treatment costs and facilitating safe reuse is to keep storm water and wastewater separate. This is mandated in the LOEP (2005, Article 81) and LOWR (2012, Article 37). Despite this, the reality in Hanoi is that most of the sewage network is combined (WHO et al., 2011) and the waste does not receive treatment.

Funding

Funding is essential to stimulate treatment and use, and to encourage entrepreneurs to enter the market. At present, whilst mechanisms for funding are specified they are inadequate or not effectively implemented.

Capital expansion is funded from central government but financial constraints mean that little has taken place (DFID, 2005). There has been significant investment in sanitation over the years by a number of international donors and several have shown an interest in treatment and use (ADB, 2010; WHO et al., 2011) but the investment as yet has not been sufficient to stimulate significant change.

Operation and maintenance (O&M) is funded locally and is derived in part from drainage fees, originally set as a 10% surcharge on the water fee, charged to everyone discharging effluent into a drainage system (Decree No. 88/2007/ND-CP). The government has introduced legislation for tariff increases, with the intention of achieving cost recovery (ADB, 2010) but these have not been implemented to the extent required for sustainable operation. At present each household in Hanoi pays approximately USD 0.15 per m³ but the fee bears no relation to actual costs, with only 25% of Hanoi Sanitation and Drainage Company's (SADCO's) O&M expenses being covered (DFID, 2005; WHO et al., 2011). As a result, the waste management companies rely heavily on subsidies.

Integrated water resource management

Even though integrated water resource management (IWRM) is mentioned in the LOWR and LOEP, and River Basin Commissions have been established for three river basins in Vietnam, these approaches are not yet implemented in practice (AusAid and WB, 2013). In terms of IWRM across wastewater management and agriculture or aquaculture, there is no regulation that prohibits the use of wastewater for irrigation and aquaculture as long as it meets the standards stipulated for irrigation and surface water quality (QCVN 39: 2011/BTNMT and QCVN 39: 2011). Environmental protection of reservoirs for irrigation is covered in the LOEP (2005, Article 64). As such, planned agriculture and aquaculture using treated wastewater are acceptable, as is unplanned reuse from surface water if irrigation water quality standards are met. However, no policy or legislation appears to be in place to actively promote agricultural or aquacultural reuse.

Private sector involvement

In Hanoi, and a few other major cities, autonomous drainage and wastewater companies have been established. These Urban Environment Companies (URENCOs) are self-accounting state owned enterprises operating in accordance with Decree 56 (1996) and the Law on State Enterprises (2003) but they lack commercial orientation and rely largely on subsidies (ADB, 2010). Furthermore, their presence constrains true private sector involvement and competition. Developing the private sector and civil society in Vietnam requires an enabling environment but for this to exist, the Government needs: to ensure that the public and private sectors are treated as equals; to strengthen the effectiveness and efficiency of market institutions; and invest in entrepreneurial and management skills development. The important and positive role to be played by Vietnamese NGOs should also be recognized (Viet Anh, 2004).

International experience

Other countries in the region make use of wastewater to varying degrees and for various purposes. Singapore for example is well known for its treatment and use of water for potable supplies, under its

NEWater scheme (USAid, 2012). Bangalore is now collaborating with Singapore to introduce treatment of urban wastewater for sale to industries and to return to open water bodies prior to further treatment and inclusion in the water supply. Such projects are supported by India's National Water Policy, 2002 and 2012, the National Environment Policy, 2006 and by local level legislation which has created a 'New Initiatives Division' within the Bangalore Water Supply and Sewerage Board. Reuse also takes place in apartments and communal buildings, in line with the Water (Prevention and Control of Pollution) Act, 1974, and local legislation enacted by the Karnataka State Pollution Control Board (Krishnamurthy et al., unpublished).

Such initiatives are beginning to be seen in Hanoi, for example, the Yen So WWTP, completed in 2013, is designed to treat 50% of Hanoi's wastewater and to recycle it back to rivers where downstream use can take place (Breaking News, 2014) but more could be done to support such efforts and foster planned reuse.

Summary and recommendations

Although policies, strategies, laws and guidelines support the use of wastewater in agriculture and aquaculture, at present, little is done to implement or enforce them (Viet Anh, 2004). Part of the problem is that although the LOEP and LOWR endorse reuse they make little mention of the form it should take and offer limited technical guidance. Furthermore, there is no reciprocal support in agriculture, aquaculture or irrigation policies, and no regulation around health impacts (Viet Anh, 2004). For reuse to work this policy space must be filled. One example of where this is happening is Thanh Liet commune where sewerage and drainage management is delegated to the Local Agricultural Committee (LAC) (Lan et al., 2012).

Appropriate policies and incentives are not in place to encourage private sector participation in the wastewater sector from either financial or operational perspectives. In particular, inadequate tariffs for cost recovery and the lack of an effective regulatory system are barriers to entry. To date, there are few examples of wastewater projects with private sector participation initiated in Vietnam (AusAid and WB, 2013).

To put policy into practice the mismatch between treatment technologies and requirements must be addressed, with a focus on end use. Technologies are sometimes "imported" based on donor preferences (AusAid and WB, 2013). Overcoming this and giving consideration to technologies that can facilitate water reuse requires a two-pronged approach. Local engineers, planners and decision-makers need access to knowledge about technologies that can provide cost effective treatment for a variety of uses that is safe for all stakeholders. This means taking account of the effluent quality required for the planned use and not treating beyond these requirements. Donors must also consider a greater variety of appropriate technologies and fund holistic solutions along the whole sanitation chain.

Linked to this, rationalizing the effluent standards, which are strict and confusing, and linking them to reuse requirements could offer benefits such as simpler technologies, lower land requirements and reduced capital and running costs; not to mention incomes from reuse. For example, nutrient removal requirements could be relaxed for wastewater intended for irrigation.

Finally, for expansion of safe reuse, users must be in a position to make informed decisions. This can be facilitated by awareness raising and training. In Thanh Liet, farmers and fishermen are encouraged to participate in agricultural extension training organized by the LAC and the district extension division. The content of these training programs includes the safe use of wastewater (Lan et al., 2012).

Further research

To date this research has only touched on the involvement of the private sector in wastewater use. A better understanding is required of their motivations and whether there are legislation-related barriers to entry.

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