

Urban Wastewater and Sanitation Situation in Vientiane, Lao PDR

Phengkhamla Phonvisai

Pollution Control Division, Department of Environment
Water Resources and Environment Administration
E-mail: phonvisai@hotmail.com

Abstract

Rural to urban migration, tourism and industrial sector growth have significantly contributed to increased waste production, both liquid and solid. Wastewater treatment needs more attention in urban environment. In Vientiane, water and sanitation management in the urban area is experiencing stagnant pollution. Unsanitary conditions and threat of seasonal pollution in selected spots is likely to occur and increase with the growing urban population. The sanitation system entails an on-site disposal of human waste without introduction of full water-borne sewerage with treatment facility and safe disposal arrangement. The majorities of households relies on water flush latrines and are connected to a pit or chamber for containment of excreta. However, due to the low permeability of the soil and the high groundwater table around Vientiane, many soak-a-ways fail to operate effectively resulting in discharge of sewage from tanks into drainage channels or low lying areas. This results in polluted effluent overflows, environmental degradation and health hazards.

Keywords: Urban Wastewater Discharge, Sanitation, Environmental Policy, Vientiane Capital City, Lao PDR

Introduction

Urbanization is one of the most important demographic trends of the twenty-first century, and growth has been particularly rapid in low-income countries. The majority of urban growth is associated with rapid expansion and development of small urban centers. Much growth is unplanned and informal, with community members and informal sector developer taking advantage of the fact that regulatory capacity of government authorities is weak, particularly in those areas that are outside official municipal boundaries. Peri-urban areas are characterized by mixture of land uses associated with a range of urban and peri-urban livelihoods. Settlements are generally inhabited by communities of different economic status relating to land prices, which are affected by locations in relation to the city, and which are considerably higher than in rural areas. Many industries locate on the edge of the city because land is relatively cheap and not subject to stringent development controls. At present, the wastes they produce rarely receive adequate treatment. Due to the ongoing development, peri-urban areas are generally in a state of rapid transition that may result in serious social and environmental tensions.

At the moment, Vientiane has a population of 692,900 people with a density of 176 people per km² (ADB, 2000). The population density is increasing at a rate of 4.7% per year (ADB, 2001). The urban area is divided into 189 villages with a total area of approximately 30 km². (ADB, 2001b) The core urban population has been estimated to be 180,410 people. The urban area of

Vientiane is located between the Mekong River and a hinterland of swamps and ponds. The wastewater from individual households in Vientiane is discharged into open drains along the roads and into the natural wetlands in and around the city (Cecilia, 2003). Vientiane capital city (as the largest city) contains almost 1,500 km² of permanent and seasonal water bodies, floodplains, swamps and marshes. The wetland areas supply a wide range of economically valuable goods and services, including fishery products, farming and natural resource collection activities, and flood attenuation, maintenance of water quality and supplies, and treatment of domestic, agricultural and industrial wastes (DANIDA, 1998).

Overtime, Urban Vientiane land has been going through tremendous transformations due to sprawls in agricultural cultivation, industrial developments and urbanization. The changes in land use affect the ecosystem in terms of land cover, land quality and capability, weather and climate, and the extent of land that can be sustained. The development projects include:

Rehabilitation of Sihom Area, UNCDF/UNDP, 1991-1997¹: The Vientiane Master Plan identified priority areas afflicted from environmental problems related to poor drainage, household sanitation, and access to services such as waste management. The priorities of the project were to improve the living conditions of the population of Sihom area through rehabilitation and upgrading, improve the sanitation and storm water drainage, and strengthen the institutional capacity (ADB, 2000).

Wastewater Management of Thatluang Marsh, EU, 1993: Thatluang wastewater management project was designed to improve wastewater treatment and drainage out of the central Vientiane area. The project built a system of stabilization ponds at Thatluang Marsh designed to serve an estimated population of 44,590 for 2005 with a per capita BOD¹ discharge of 45g/capita/day assuming 50% of the pollutant load would reach the treatment plant. (ADB, 2000b)

Vientiane Integrated Urban Development Project, ADB, 1996-2000: The overall objective of the Vientiane Integrated Urban Development Project was to improve access to basic services and infrastructure, thus providing benefits of urban environmental health to the population of Vientiane. The project supported the formation of Vientiane Urban Development and Management Committee (VUDMC) to institutionalize urban planning and strengthen the development of the control system.

Improvement of Urban Environment in Vientiane, Danida, 2001-2004: The project aimed to continue support to the municipal planning with the development of linkages between green and brown environmental issues and increased village involvement in environmental planning, implementation and monitoring.

Status of Wastewater and Sanitation in Vientiane

Through the years, the government has set up four water analysis laboratories in different regions throughout the country. These laboratories cooperate by exchanging information and dividing responsibilities over the water analysis processes in an efficient manner. For example,

¹ Biochemical Oxygen Demand

the management and control of water in the Mekong River and its tributaries are the responsibility of the water analysis laboratory of the Irrigation Department. The quality of water drinking is analyzed and laboratory of the Ministry of Health is responsible for it; water released from industries is handled by the laboratory of Ministry of Industry and Commerce. Wastewater in urban surroundings in VCC is taken care by the laboratory of Science Technology and Environment Agency.

For Thatluang wetland, its water quality is a part of the water quality-monitoring project of Mekong Secretariat, in the vicinity of VCC. Main problems found are wastewater and sewage (from the city area) which discharge into the marsh. A part of such water is diluted by irrigation water pumped from the Mekong River to the surrounding rice fields through various canal systems (Figure 1).

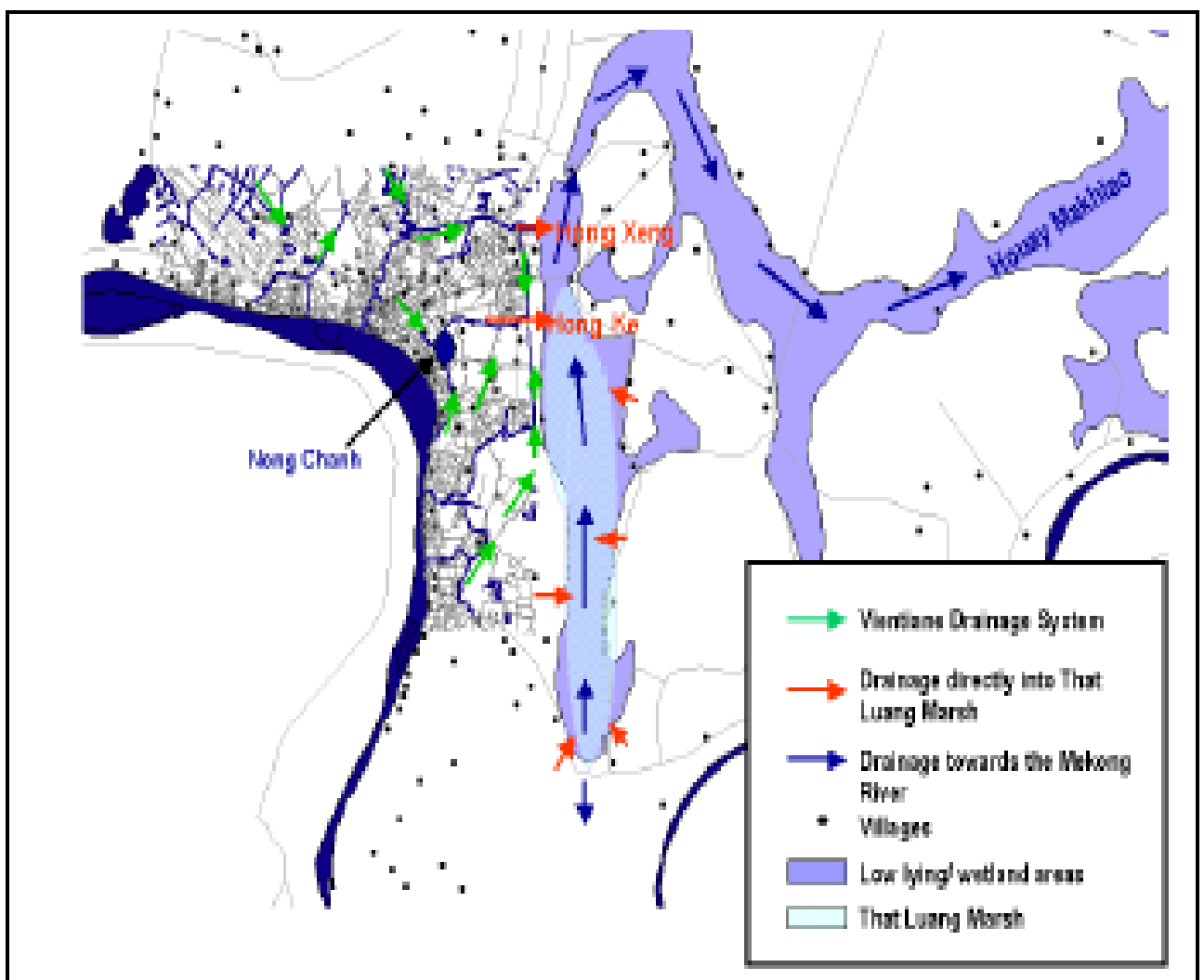


Figure 1. Thatluang Wetland Area, (for nature wastewater treatment of urban city).

As known, urban centers are always attractive places for both educational institutions and employment opportunities, and increasing in-migration from rural to urban areas is commonly

observed. Currently, Vientiane city lacks effective systems of development control, and therefore the means to control the future development and its concomitant environmental degradation are inefficient. The drainage system is shown to be inadequate. Added to that, the contaminated liquid waste with fecal matter from the latrines is being directly discharged into the drainage channels or drains with oviform from septic tank effluents. This presents health risk, which would increase with the rising urban populations with similar sanitation practices. It also leads to the contamination of underground water sources such as wells and eutrophication of water bodies leading to a pressure on urban water resources. Increased risks of water borne and other vector borne epidemics have been perceived. For example, stormwater drainage is found to be a serious issue in Vientiane city in the year 2000. The present system suffers from inadequate design and lack of maintenance. Most drains are clogged with garbage, reflecting the absence of an organized system for solid waste disposal in the city.

Wastewater Discharge

In Vientiane city, there are three main drainage channel systems including Hong Xeng, Hong Ke and Hong Khoua Khao. Hong Xeng mainly drains water from Sikhottabong district and some part of Chanthaboury district, through Nong Duang marsh and Pasak stream. Hong Ke drain is the main channel, which is connected to Hong Thong and Nong Chanh swamp, draining water from Chanthaboury and Sisattanak district through the Morning market. Hong Khoua Khao is a drainage system for draining water from Nong Chanh to Mekong River and finally to Thatluang wetland through Hong Ke drainage channel (Figure 2).

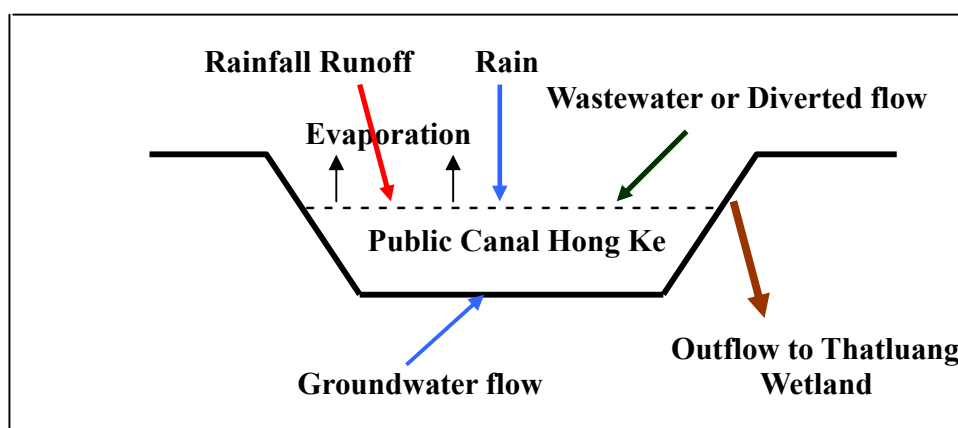


Figure 2. Water Balance in the Present Situation.

In Vientiane city, storm water drainage consists of roadside drains leading ultimately to natural streams or rivers. Drains are generally not adequately interconnected and do not form a network. Drains are lined in the center area, and covered in front of commercial establishments. Water in the drainage system is invariably contaminated with fecal matter from latrines and E. coli from septic tank effluent, presenting health risks. The absence of overall urban drainage plans with a functioning integrated network combined with lack of clear arrangements for maintenance causes flooding and stagnant water pools over large parts of the urban center. Sanitation system in VCC entails an on-site disposal of human waste without any introduction of full water-based sewerage with treatment facility and safe disposal

arrangements (STEA, 2001). Such a system continues to have a detrimental impact on the public health by mixing sewage in the storm drainage system, polluting the natural water courses in the medium and the long term.

Sanitation and Wastewater Purification

Although the drainage system in Vientiane has improved somewhat as a result of the projects listed earlier, the situation of sanitation and wastewater purification is still very limited. Since the completion of the EU project, Wastewater Management of Thatluang Marsh, the stabilization ponds which were built as part of the project have been unused for wastewater treatment and are now being managed as aquaculture ponds. Similarly, the sewage waste treatment plant funded by ADB was built in a smaller size than what was originally planned. Moreover, it was not properly maintained. Due to complaints of smell by local residents, it was shut down and despite increased hauling cost, sewage is now disposed of at a secondary waste treatment plant 18 km outside of the city. However, the Danida project Improvement of the Urban Environment in Vientiane, gives hopes for a positive result of considerable improvements for urban residents in the core downtown area. The project is in the process of constructing communal septic tanks, improving the Nong Chanh Marsh in the center of the town, and will re-establish the use of the original EU built sewer line and stabilization ponds. Above all, these improvements are focused on the core downtown area and do not extend to other areas of the city or surrounding city areas.

The amount of industrial wastewater production around the city is little known as well as about the extent of industrial water pollution. According to the country's Environmental Law (Provisions on Discharge of Wastewater from Factories, Ministry of Industry and Handicrafts decree No. 180/H), industries are responsible for the treatment of all wastewater and by-products produced as a part of the industrial processes (MIH, 1994). The Science Technology Environment Agency (STEA) is responsible for the assessment and monitoring of wastewater quality. STEA is currently in the process of developing an environmental monitoring system for the country as a whole but at this point, very little information is available about the industrial wastes.

In relation to Sanitation and Wastewater Purification, Thatluang Marsh is currently performing wastewater treatment services for domestic wastewater that is being drained into it. As stated above, drainage areas: Urban protection area (A), Commercial area (B), Urban development area (E), and Resident area (F) drain via primary and tertiary canals to Hong Ke canal and then into Thatluang marsh (Table 1). The marsh is thus providing wastewater and sanitation services for household wastewater and sewage drainage. There are two major types of costs that are associated with artificially replacing the wastewater treatment and water purification services of Thatluang marsh:

- Construction or improvement of household sanitation facilities in areas that drain directly in the marsh.
- Extension of the waste treatment plant so that it can deal with increased waste load. According to the ADB survey in Sanitation, Drainage, and Wastewater Management, there are 1,256 households which directly discharge their sewage into surface water and 501 households with no toilet within areas are draining their wastewater into Hong Ke and Thatluang marsh.

It should be noted that with high water table and impermeable soils throughout the Vientiane Municipality, sanitation using cesspools or elevated soak-a-ways are largely inefficient and provide inadequate services.

Table 1. Sanitation situation and needs in Vientiane and its surrounding area.

Drainage Areas in VCC	Area (ha)	Population	HH	Drain into	%	Septic Tank Cesspool		Direct discharge to surface water		No toilet		
						hh	%	Hh	%	hh	%	hh
A	214	17,451	2,959	Hong Ke	60	1,775	32	947	7	207	2	59
B	556	35,572	5,971	Hong Ke	67	4,001	22	1,314	9	537	2	199
C	306	17,529	2,882	Hong Xeng	69	1,989	24	692	5	144	1	29
D	572	35,214	6,007	Nan Pasak	66	3,965	29	1,742	4	240	3	120
E	728	34,150	5,281	Hong Ke	63	3,327	30	1,584	4	211	3	158
F	435	15,744	2,413	Hong Ke	71	1,713	23	555	3	72	3	72
Total that Drain into Hong Ke	1,933	102,917	16,624	Hong Ke	66	10,816	26	4,400	6	1,028	2	409

(Source: ADB, 2000)

Settings of Wastewater and Sanitation Management

The Lao Government strategies on development and maintenance of urban environment infrastructure are based on achieving sustainable and affordable environmental improvement of its main urban center (STEA, 2001). Implementation priorities relate to specific urban center needs, which would be identified along with urban hierarchy adopted by the government. The management of water supply requires the government involvement and institutional capacity as well as financial resources for its development. Drainage master plan for VCC urban area, covering all catchments, needs to be given high priorities. Such urban drainage plans with the need for creating and maintaining functioning drainage networks, including identification of final points of discharge must be emphasized.

Public-Private Participation

In response to the deficiencies of centralized approaches to service delivery, in recent years, there has been increasing emphasis on the potential benefits of adopting decentralized approaches to sanitation and wastewater management. These relate to the opportunities for

stakeholder involvement in decision-making and planning, financial advantages, and benefits of segregation of wastewater at source and the compatibility with local demands for wastewater reuse. In general, central elements that shape the institutional setting for environmental management include: a) the key actors in the public and private sectors whose motives and mandates significantly affect the urban water and sanitation; b) management functions that can be used to address environmental issues in the city, including the instruments of intervention and mechanism for coordination; and c) existing initiatives that affect efforts to manage wastewater and sanitation problems.

Wastewater and Sanitation Management Function

Management function consists of policy and other instruments that actors can apply to affect environmental quality and mechanisms in coordinating environment-oriented decisions. Urban governance often adopts policies to deal with wastewater and sanitation management problems. Based on that, the government will formulate a long-term national wastewater and sanitation strategy to guide any future investment in water and sanitation activity. The most prevalent tool for environmental management that affects a city is legislation with its regulations. The sophistication and effectiveness of this tool is low in Laos, since there are only few environmental standards and an incomplete set of environmental laws. Moreover, lack of enforcement is a pervasive problem. However, the environmental impact assessment (EIA) process is being positively promoted and selectively implemented in Lao PDR.

Planning and Policy Development

The processes of planning and implementation can be addressed in partial aspects of environmental problem, since there are may be an ability to handle wastewater disposal within the municipality borders. However, water and sanitation disposal often calls for city-wide solution, metro-level authority to plan, coordinate, and execute a wastewater disposal program. The planning has generally not been an effective environmental tool, although monitoring varies according to the city's level of economic and human resource development. It has been observed that coordination across different levels of the government has been improving in a more centralized manner although there still exist problems in recent decentralized policies.

In terms of environmental coordination and decision-making processes, intersected coordination to manage urban environmental affairs has been lacking and has become a problem in Vientiane city, although the coordinating mechanism given below has been established for urban development in Vientiane city.

- At the central government level, there is a planning body that is in charge of synchronizing interdepartmental coordination for urban activities.
- At the city level, there is a community to coordinate sectoral program and projects from loans (i.e., ADB, Work Bank loans).
- For implementation of infrastructure activities, there is a program to coordinate investment and institutional strengthening (i.e., VUDAA, DCTPC).

Conclusion

Sanitation, including wastewater treatment is an important environmental service that is closely linked to water management. In urban areas, poor management of sanitation system generally contributes to wastewater pollution. In Vientiane city, outfall from poor functioning central sewage system contaminates water resources. Poor system coverage results in serious lagoon and stream pollution, as well as soil contamination from open defecation in slum and around the city. Moreover, urban VCC land has also been going through tremendous transformations due to sprawls in agricultural development, industrialization and urbanization. As the urban areas develop with new buildings and infrastructure, the wetlands are becoming increasingly isolated and their capacity to perform their environmental functions greatly diminishes. Urban development throughout the city has been growing in an unplanned manner often resulting in aggravating flooding and drainage problems, partly due to the limited capacity at the municipal planning level. Moreover, there has been little sustainable built-in project design resulting in discontinued use of wastewater stabilization ponds and limited use of the waste treatment plant in Thatluang wetland. Access to and affordability of adequate sanitation is always a problem for the poor, especially in the low-income households. Combination of poor management and low-level service to the poor that causes inadequate sanitation has eventually negatively affected health consequences.

Acknowledgements

The authors are grateful to the assistance of Science Technology and Environment Agency (STEA), Vientiane Urban Development Administration Authority (VUDAA), Science Technology and Environment Office of Vientiane City (STEO), as well as Saysettha, Sisathanak, and Hasayfong administration districts.

References

- ADB (2000). Country Environment Review: Lao's People Democratic Republic, Policy Coordination Unit, Asian Development Bank.
- ADB (2001). Final Report, Sanitation, Drainage and Waste Water Management. Vientiane Urban Infrastructure and Services Project ADB-TA 3333-LAO- Vientiane Urban Development and Administration Authority.
- ADB (2001). Report and recommendations of the President to the board of directors on a proposed loan to the Lao People's Democratic republic for the Vientiane Urban Infrastructure and Services Project. RRP: LAO 33432, Vientiane, Lao PDR.
- Cecilia, T (2003). The links between urban and rural development, Development Planning Unit, University College London
- Cecilia, T (2003). The links between urban and rural development, Development Planning Unit, University College London
- DANIDA (1998). Environmental Problems of the Energy Sector, Presentation to DANIDA Natural Resource and Environment Program, DANIDA, Vientiane.
- Gerrard, P. (2004). Integrating Wetland Ecosystem Values into Urban Planning: The Case of Thatluang Marsh, Vientiane, Lao PDR, and IUCN – the World Conservation Union Asia Regional Environmental Economics Programming WWF Lao Country Office, Vientiane, Lao PDR.
- Josef, L. (1993). Towards Environmental Strategies for cities, UMP Discussion Paper,

Washington DC.

JICA. (1990). Feasibility Study on Improvement of Drainage System in Vientiane. Japan International Cooperation Agency, Vientiane, Lao PDR. Volumes 1-4.

MTPC and JICA (2002). The survey on existing road and drainage conditions in Vientiane Municipality Project. Ministry of Communication Transport Post and Construction, Department of Roads and the Japan International Cooperation Agency, Vientiane, Lao PDR.

STEA (2001). State of the Environment of Lao PDR

Vientiane Municipality, Irrigation Sector. 2000. Socio Economic Survey of Villagers

Living around That Luang Marsh, 2000. Government of Lao PDR, Vientiane Municipality

