

Sustainable Water Supply and Sewerage Services for Small Towns in Vietnam

O. M. Keski-Saari

Water and Sanitation Programme for Small Towns in Vietnam, 37 Le Dai Hanh, Hanoi, Vietnam
(E-mail: olli.keski-saari@lappavesi.fi)

Abstract

The paper describes justification, scope, objectives, purpose and results of a 11-year development co-operation program between the Governments of Vietnam and Finland aimed at construction and sustainable management of water supply and sewerage in selected class V (in the scale of I-V) towns in eight provinces of northern Vietnam. Twenty-two water supply schemes and nineteen wastewater schemes were completed and put into operation. Alternative models for the scheme operation and maintenance were developed, and most suitable model selected for each scheme, reflecting to the geographic, socio-economic and institutional characteristics and conditions in each town. Water supply and sewerage services meeting the customers' expectations are provided by almost all water supply schemes and ten sewerage schemes. Technical assistance focusing on strengthening the technical, financial, institutional, social and environmental sustainability of constructed schemes was provided to the project owners and scheme operators.

Keywords

Water Supply, Sewerage, Vietnam, Small town, technical assistance, sustainable operation

PROGRAMME BACKGROUND AND SCOPE

Water sector co-operation between the Governments of Vietnam and Finland has a history extending more than 30 years. The highlights of this co-operation have been Hanoi Water Supply Project (1985-2001), Haiphong Water Supply and Sanitation Programme (1990-2004), National Urban Water Supply Strategy (1993-1994), National Urban Wastewater Collection and Sanitation Strategy (1994-1996), and Water and Sanitation Programme for Small Towns in Vietnam (WSPST). The last one was launched in 2004 to be the last grant intervention of the Finnish Government in the Vietnam water sector. WSPST is an 11-year development co-operation program aimed at construction and sustainable management of water supply and sewerage services in selected class V towns (smallest class in the scale of I-V) in eight provinces of northern Vietnam. Each of the three WSPST phases was implemented by an international team of a Finnish technical assistance consultant, in co-operation with the Ministry of Construction of Vietnam and the provincial Departments of Construction under respective Provincial People's Committees.

While systematic development of water supply services in provincial capitals and secondary cities has been and is supported by several donors and financiers, e.g., governmental development agencies of Germany, Japan, Australia and Denmark, and progressively more by the Asian Development Bank and the World Bank, little attention has been paid to water and sewerage services in small towns. Many class IV and V towns have no piped water and sewerage systems, while others have simple schemes supplying water from drilled wells or mountain streams untreated for consumption. Majority of small town schemes seem to have been put in place with little consideration of sustainability, and are rapidly degraded in lack of maintenance. WSPST was meant to be a pilot project, exploiting the long-term experience of Finnish water professionals in Vietnam water sector, to establish "best practices" for the development of sustainable water and wastewater services in class V towns, but also to learn and disseminate valuable lessons of the key issues,

challenges and solutions involved.

Fourteen towns of three Red River delta provinces and one mountainous province were selected for the first phase of the Programme (2004-2008). In the second phase (2009-2013) three more towns of the phase one provinces and eight towns of four additional mountainous provinces were included in the WSPST scope. The third and last phase (2014-2016) has the challenging scope of overseeing the construction works and commencing operation of ten water supply schemes and ten sewerage schemes designed during phase two, and ensuring technical, financial, institutional, social and environmental sustainability of all forty-one schemes. The water supply schemes include both groundwater and surface water schemes with conventional water treatment plants, and separate sewerage systems with centralized or decentralized wastewater treatment. Location, start-up phase and type of schemes in each of the twenty-five Programme towns are shown in Figure 1 below.



Figure 1. Water and Sanitation Programme for Small Towns in Vietnam: location, start-up phase and type of schemes in the twenty-five Programme towns.

OVERALL OBJECTIVE AND PROGRAMME PURPOSE

The overall objective of the program according to the Project Document, the core document guiding the implementation, was that “*water and wastewater services in Programme towns should fulfill the needs of the population, services and businesses, contribute towards improved health and environmental hygiene and enable projected development of the towns. Incidence of water and hygiene -related diseases was to be reduced, 100 % of households in the defined service areas were to be served by improved water supply and 75 % connected to sewer, 80 % of the customers were to rate the services as good and satisfying their needs, and no negative environmental impacts from wastewater discharge and sludge disposal around the treatment plants or discharge points were to be observed*”.

The Programme purpose was to ensure reliable and safe operation of all implemented water supply and drainage/sewerage schemes. A set of targets was to be achieved: i) 30,000 households provided with access to water supply networks fulfilling the relevant Vietnamese standards, ii) 9,800 people provided with access to sewerage systems fulfilling the standards, iii) all constructed water supply schemes providing reliable service with unplanned interruptions not exceeding eight hours per month, iv) pressure in water supply sufficient to bring water to the third floor, v) quality of supplied water and effluent of all schemes meeting national standards, vi) non-revenue water not exceeding 15 %, and vii) less than ten cases of customer complaints per year received by each scheme.

KEY RESULTS OF THE PROGRAMME

Physical results produced by the Programme with its provincial co-operation partners regarding water supply (WS) and drainage/sewerage (DS) by mid-2016 are presented in the Table 1 below.

Table 1. Physical results of Water and Sanitation Programme for Small Towns by mid-2016.

Name of town	Scheme	Capacity [m ³ /d]	Investment [€]	Households served	Scheme	Capacity [m ³ /d]	Investment [€]	Households served
Hung Nhan	WS	2 000	599 392	2584				
An Bai	WS	1 500	527 464	2440	DS	534	425 021	1046
Tien Hung	WS	1 070	421 018	1927	DS	406	422 638	746
Nam Trung	WS	1 500	794 673	2593	DS	284	638 698	500
Tien Lang	WS	1 400	517 661	3876	DS	600	736 000	857
Minh Duc					DS	690	462 319	211
An Lao	WS	800	221 310	3900				
Bang Lung	WS	800	261 422	1728				
Na Phac	WS	500	209 241	742				
Cho Moi					DS	325	306 617	300
Cho Ra	WS	800	346 833	1438	DS	400	489 269	329
Yen Lac	WS	750	443 333	4385	DS	284	342 083	456
Vuong	WS	1 500	600 238	1606				
Yen My					DS	470	335 977	1200
Phung Hung	WS	1 000	574 167	1205				
Tian Thang	WS	2 000	748 570	1247	DS	450	478 097	556
An Thi	WS	947	561 750	2240	DS	805	520 608	na
Mu Cang Chai	WS	300	252 676	600	DS	120	408 564	209
Nghia Lo	WS	700	424 419	1737	DS	350	385 270	316
Nuoc Hai	WS	880	414 167	1201	DS	160	389 583	403
Thanh Nhat	WS	500	371 667	552	DS	140	309 167	10
Vinh Loc	WS	1 500	255 000	1735	DS	600	415 833	369
Na Hang	WS	1 500	529 125	1201	DS	330	432 100	403
Yen Minh	WS	1 000	495 369	919	DS	400	489 667	392
Tam Son	WS	1 000	378 996	801	DS	450	466 738	606
Total		23 947	9 948 491	40 657		7 798	8 454 249	8 909
Average		1 089	452 204	1 848		410	444 960	495

Current Government of Vietnam policy is that water supply shall cover its full cost, but sewerage systems can be invested from public funds. Accordingly, WSPST water supply (WS) schemes were invested with Finnish Government grant, which was converted by the Government of Vietnam into soft loans to project owners. Drainage/sewerage (DS) schemes were invested 65-75 % with Finnish Government grant combined with 25-35 % counterpart funding from respective provincial budget.

Technical assistance provided by the WSPST, particularly in the last three-year phase of the Programme, was focused towards strengthening the technical, financial, institutional, social and environmental sustainability of the schemes. Key results of the Programme regarding operation and maintenance are: i) alternative models for scheme operation and maintenance were developed, and most suitable model selected for each scheme reflecting to the geographic, socio-economic and institutional characteristics and conditions in each town, ii) WHO's water safety planning concept was introduced and daily on-site water quality monitoring commenced in all WS schemes, iii) technical performance of most WS schemes and ten DS schemes meet the customers' expectations, iv) financial performance of WS schemes was constantly improved, and v) basic customer service functions were established among WSPST scheme operators.

Technical development efforts resulted in most control samples taken quarterly by health authorities complying with national drinking water standards, in reduced service interruptions, in sufficient service pressure and in reduced non-revenue water rates shown in the Table 2 below.

Table 2. Technical performance of WSPST water supply schemes in the first quarter of 2016.

Name of town	Water quality compliance (yes/no)	Service interruptions (h/month)	Service pressure (bar)	Non-revenue water ratio (%)
An Bái	yes	43	35	24
Hung Nhân	yes	137	25	26
Tien Hung	yes	243	25	21
Nam Trung	yes	283	25	24
Tiên Lăng	yes	0	20	9
An Lão	yes	5	25	20
Băng Lũng	yes	0	40	23
Chợ Rã	yes	0	40	25
Nà Phặc	yes	0	38	25
Yến Lạc	yes	0	40	30
Vương	yes	27	15	15
Toàn Thắng	yes	35	15	20
Phùng Hưng	yes	17	20	18
Ân Thi	no (salinity)	3	20	21
Nghĩa Lo	n/a	n/a	n/a	n/a
Mu Cang Chai	n/a	n/a	n/a	n/a
Nuoc Hai	yes	3	45	18
Thanh Nhat	no (low Cl)	8	60	30
Na Hàng	yes	0	40	20
Vinh Loc	yes	0	45	18
Yen Minh	n/a	n/a	n/a	n/a
Tam Son	n/a	n/a	n/a	n/a

Programme targets regarding service interruptions (< 8 h/month) and non-revenue ratio (< 15 %) are not yet met by most WS schemes. Vast majority of service interruptions, however, are caused by operators' attempts to save in O&M costs and reduce non-revenue water. Convincing scheme operators of major benefits of 24/24 water supply is one focal point of the remaining work of

WSPST. Non-revenue water (NRW) has already been reduced to bearable 15...25 % levels in most WS schemes, having only a minor impact on scheme sustainability. Elimination of non-technical NRW, particularly that caused by defective metering, is still important to increase water sales and revenues.

Gradual financial improvement of WS schemes has been demonstrated by better results in WSPST benchmarking and by increasing cost recovery rates. During the first quarter of 2016 fourteen out of twenty-two WS schemes covered O&M costs from water revenues (four most recently completed schemes failed to report their financial results), and ten WS schemes managed to recover both O&M costs and capital costs with 20-year depreciation, i.e. full costs, as shown in the Figure 3 below.

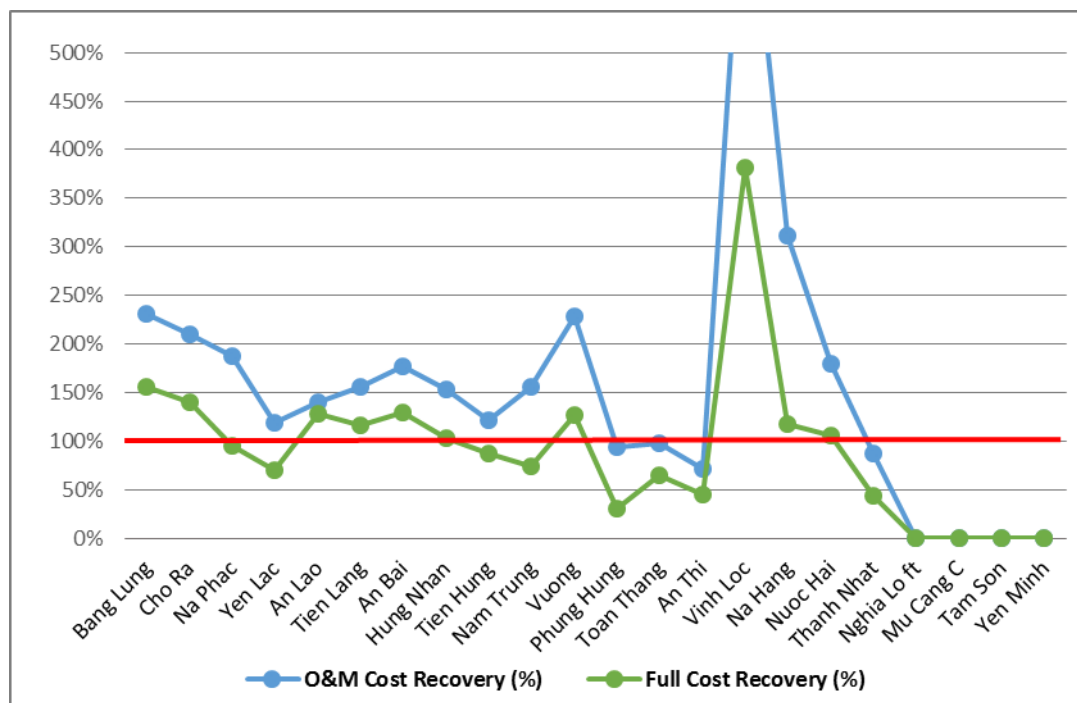


Figure 3. Recovery of O&M costs and full costs in WS schemes during the first quarter of 2016.

In accordance to the current laws and regulations DS schemes rely on provincial budgets for their O&M funding. According to Decree 80 from 2015, Provincial People’s Committee is to decide on wastewater tariff and compensate any difference between approved unit cost of wastewater service provision and provincial wastewater tariff to each scheme operator. Delay in enforcement of the Decree, however, has caused delays to the commencement of O&M activities in most DS schemes. As the sewerage systems are new, most of them do provide limited service, but proper O&M activities have only been commenced in ten of nineteen DS schemes. These activities have been funded either from Provincial Water and Sanitation Utility (project owner) or local Town People’s Committee budgets. Negotiations are on-going between the Embassy of Finland, the Ministry of Construction and Provincial People’s Committees to ensure O&M funding for all DS schemes from provincial budgets latest from the beginning of 2017.

Every WSPST water scheme is operated by a branch of respective provincial water utility, except for one scheme operated by a district water utility, and two schemes by a contracted service provider. Three models are applied in O&M of wastewater schemes: eleven schemes are operated by a branch of respective provincial water utility, six schemes by an O&M team directly under

Town People’s Committee, and two schemes by a contracted service provider. Formal classroom training and practical hands-on advice were provided to strengthen the knowledge and practical skills of scheme operators in the technical and financial scheme management, and particularly in customer services.

Overall improvement in customer satisfaction to the small town water and wastewater services was clearly demonstrated by their improved ratings in customer satisfaction surveys regularly carried out by the WSPST. Most recent customer satisfaction ratings are summarized in the Figure 4 below.

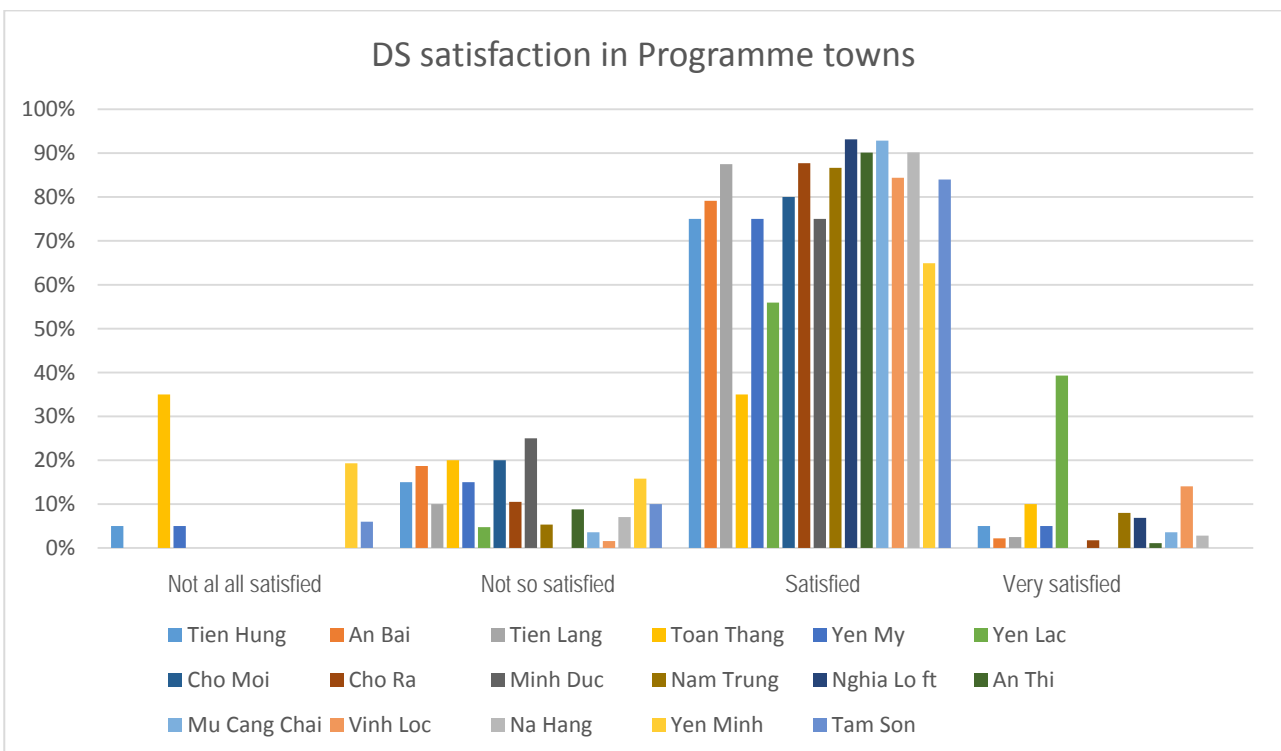
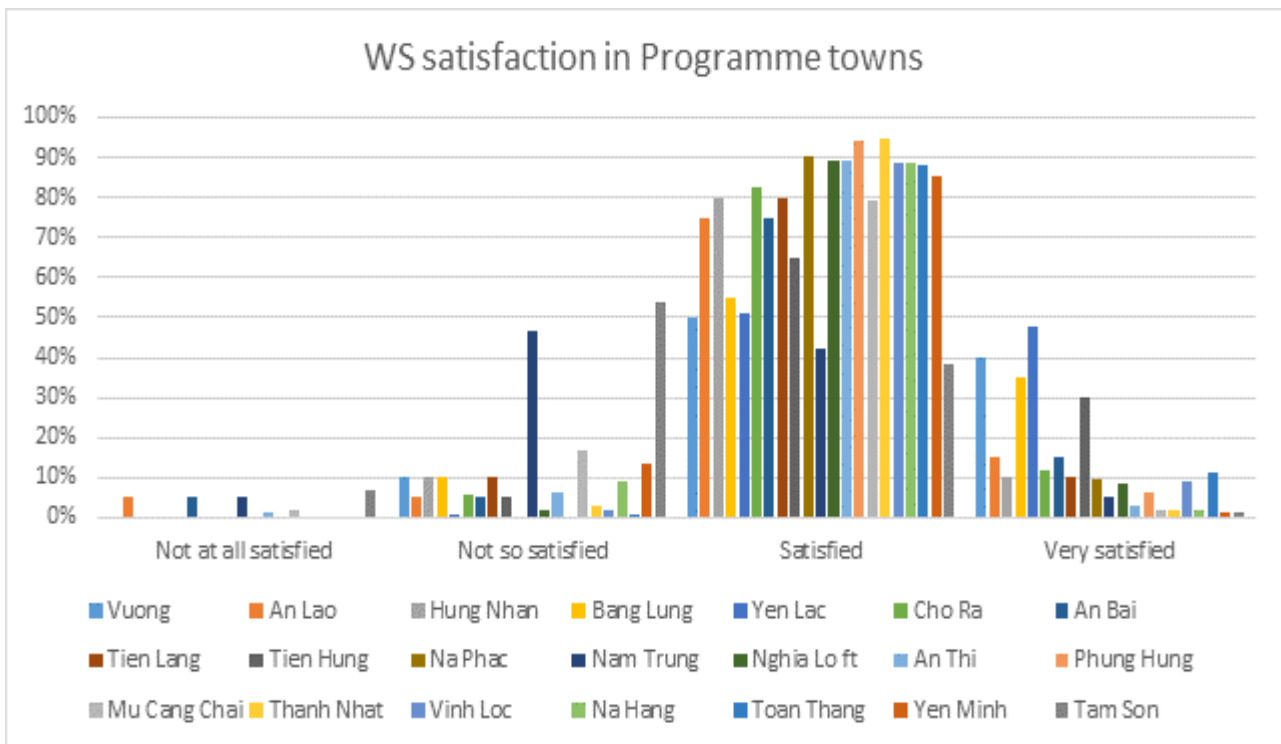


Figure 4. Most recent customer satisfaction survey ratings of WSPST water and wastewater schemes.

LESSONS LEARNED

Besides constructing a number schemes in selected small towns, another main aim of the Programme was to find out about the key issues faced in planning, implementation and operation stages of small town water and wastewater services to benefit a larger number of similar projects in the future. Most relevant lessons regarding implementation of water and sewerage services in small towns of Vietnam are summarized in the Table 4 below.

Table 4. Key lessons learned regarding implementation of small town water and sewerage services.

Feasibility studies and basic design

Administrative boundaries restrict identification and development of most feasible options to provide WS and DS services.
Preliminary design of WS schemes is often unrealistic – not adequately based on realistic projected water demand.
Local knowledge and expertise of eventual scheme operators is often ignored in the preparation of basic designs.
Revenues of WS schemes in early years of operation are severely overestimated – assuming full use of system capacity from day one.
All necessary cost items are not included in the financial feasibility calculations.
Coordination between WS and DS development on the one hand and physical planning and other infrastructure, especially roads, is weak.
Wastewater management in small towns has a low priority among provincial authorities deciding on public spending.

Design and construction

Detailed design, in practice, is copying the basic design (feasibility study), although detailed design should involve comprehensive field surveys.
Chlorine gas is disliked by many operators for good reasons, corrosiveness and acute toxicity, but often applied by designers.
Design of gravity sewers leaves substantial number of potential customers out of service due to location and elevation of sewer connection points.
Design-build model, widely used in many countries is not yet really suitable for implementation of small WS and DS projects in Vietnam.
External Project Management Units have little interest in scheme performance and sustainability, which causes major problems to scheme owners.
Big main-contractors often showed little interest in the actual performance of their (or their sub-contractor's) staff in remote small towns.
Serious delays in implementation of contracts result in unnecessary additional project management, supervision, etc. costs.
Contractors generally have difficulties in timely provision of as-built documents and of O&M manuals (of specified quality).

Management and operation of schemes

Operational water quality monitoring is not commonly practiced at small water schemes.
On-site jar-testing is a cost-effective means of troubleshooting for design and operational defects of water treatment plants, but quite rarely used.
WS scheme owners and operators are reluctant to maintain constant pressure in the network, because of assumed increase in O&M costs and NRW.
Management and O&M of small schemes lack initiative and commitment, and their budgets do not include adequate allocation to customer services.
Regular assessment of scheme performance and benchmarking with similar schemes gives useful information of scheme strengths and weaknesses.
Customer satisfaction surveys provide valuable information about the level of service and performance of scheme operator to the utility management.
Convenience, modernity, quality of life and willingness to pay for good service are often referred to as reasons for increased customer satisfaction.
Recruiting skilled individuals with high feeling of responsibility and good motivation to key positions is a key to successful scheme performance.
Wastewater schemes are in risk of degradation due to insufficient O&M caused by absence of even quite modest O&M budgets.
Designed sewer connections were made by the contractor during implementation, but few new connections were added after scheme completion.