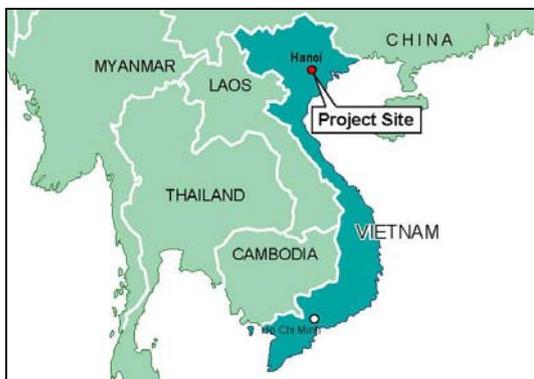


**1. Project Description**



Project Site



Yen So Pumping Station

**1.1 Background**

Hanoi, located in the Red River Delta, is the capital city and the socio-economic, political and cultural center of Vietnam. As of 1992, the city consisted of six urban districts and five suburban districts with a total area of 924.5 km<sup>2</sup> and a population of 2,100,000. As Hanoi is located in a lowland area surrounded by the Red River, the To Lich River and the Nhue River, historically it has suffered frequent heavy floods in the rainy season. The drainage and sewerage systems of Hanoi were very old with many of the facilities built before 1954. These had become degraded and were not well maintained, and the existing drainage capacity of the system was very much limited. Also there was no wastewater treatment plant in Hanoi. This resulted in frequent flooding, with serious economic loss and damage in the urban area as well as water quality deterioration in the rivers and lakes of the surrounding area, creating a serious problem in the urban environment and hampering economic development activities. It was under these circumstances that the Master Plan for Urban Drainage and Wastewater Disposal System in Hanoi City was prepared in 1995 by JICA.

**1.2 Project Outline**

The objective of this project is to control the floods in Hanoi city and improve the water quality of the rivers, lakes and reservoirs by the construction of flood works and the rehabilitation of the channel and sewage system, thereby contributing to the improvement of environmental, living and health conditions in Hanoi.

	Phase I-1 (VNII-7)	Phase I-2 (VNV-1)
Approved Amount/ Disbursed Amount	6,406Million Yen / 6,228 Million Yen	12,165Million Yen / 9,059Million Yen
Exchange of Notes Date/ Loan Agreement Signing Date	April, 1995 / April, 1995	March, 1998 / March, 1998

	Phase I-1 (VNII-7)	Phase I-2 (VNV-1)
Terms and Conditions	Interest Rate: 1.8% p.a. Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: Untied	Interest Rate: 0.75% p.a. or *1.3% p.a. Repayment Period: 40years or * 30 years (Grace Period: 10 years) Conditions for Procurement: Untied or *Partially Untied
Borrower / Executing Agency(ies)	The Government of the Socialist Republic of Vietnam / Hanoi People's Committee (HPC)	
Final Disbursement Date	September 2005	September 2005
Main Contractor (Over 1 billion yen)	Ebara Corporation (Japan) - Vietnam Construction & Import-Expert Corporation (VINACONEX) (Vietnam) (JV)	
Main Consultant (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan)	
Feasibility Studies, etc.	F/S: February 1995, JICA	
Related Projects (if any)	Second Hanoi Drainage Project for Environmental Improvement (I)(II)	

Note: \* For Consulting Services

## 2. Outline of the Evaluation Study

### 2.1 Evaluator

The Vietnam-Japan Joint Evaluation Team 2009 consisted of three Working Groups, each of which evaluated different projects. This project was evaluated by the Hanoi Drainage Group joined by the following 12 members:

- Ms. Nguyen Minh Thuan, Hanoi Authority for Planning and Investment (HAPI)
- Ms. Do Thị Kim Thoa, HAPI
- Mr. Le Sinh Tien, HAPI
- Mr. Do Anh Tuan, Hanoi Sewerage Drainage Project Management Board (HSD-PMB)
- Mr. Nguyen Van Quy, HSD-PMB
- Ms. Ha Thị Hong Van, HSD-PMB
- Ms. Nguyen Thị Thuy Nga, Hanoi Sewerage and Drainage Company (HSDC)
- Ms. Nguyen Thanh Huong, Ministry of Planning and Investment (MPI)
- Ms. Luong Lan Dung, Evaluation Advisor<sup>1</sup> / National Power Transmission Corporation
- Mr. Keishi Miyazaki, External Evaluator / OPMAC Corporation
- Mr. Nghiem Ba Hung, National Consultant / PeaPROs
- Mr. Le Quang Trung, National Consultant / PeaPROs

### 2.2 Duration of Evaluation Study

Duration of the Study: September 2009 – June 2010

Duration of the Field Study: January 2010 – March 2010

### 2.3 Constraints during the Evaluation Study

There were difficulties in collecting statistical data relating to key outcome indicators, including

<sup>1</sup> In order to promote a leading role for the Vietnamese evaluation members, an evaluation advisor who had participated in the joint evaluation in 2008 was invited to the working group.

flood damage costs and the number of water-borne diseases in Hanoi, due to unavailability of data as well as the reluctance of the related agencies to disclose information.

### 3. Results of the Evaluation (Overall Rating: A)

#### 3.1 Relevance (Rating: a)

##### 3.1.1 Relevance with the Development Plan of Vietnam

At the time of appraisal, the Five Year Socio Economic Development Plan (SEDP) 1996-2000 stated that the necessity to gradually improve the water supply and sewerage in urban centres, giving priority to areas still without such systems.

Based on the JICA Master Plan on Urban Drainage and Wastewater Disposal System in Hanoi City (1995), a revised Master Plan was officially approved by the Vietnamese government in 1998.<sup>2</sup> The development of drainage and sewerage systems in Hanoi was programmed in accordance with the revised Master Plan. This target project was planned in the initial phase of the Master Plan described as the “To Lich River Basin Drainage Plan”, which aimed at urgent solution for the existing serious flooding in Hanoi (see Table 1). This project was clearly identified and prioritized in the Hanoi SEDP 1996-2000.

At the time of the ex-post evaluation, the SEDP 2006-2010 stated that improvement of drainage systems, sewerage treatment and solid waste water treatment in urban areas should be made in the Chapter 6, 2. investment orientation and the development of infrastructure for industries and sectors, and the Second Hanoi Drainage Project for Environmental Improvement (I) (II), which is the second phase of this target project, is listed among the ODA projects to be implemented during 2006-2010. Development of drainage systems was an important priority in the Hanoi SEDP 2000-2010, which emphasizes the importance of creating synchronization and modernization in the entire drainage system together with improvement of living standards, of flood control after a rainfall of 310 mm per 2 days, and of the city environment. Also, the National Strategy for Environmental Protection to 2010 and the Vision 2020<sup>3</sup> stress the rehabilitation and strengthening of drainage systems in big cities and industrial areas. In addition, in the Comprehensive Urban Development Programme in Hanoi City (HAIDEP)<sup>4</sup> prepared in May 2007 by JICA, flood control in Hanoi is a priority area.

Table 1: Outline of the Master Plan on Urban Drainage and Wastewater Disposal System in Hanoi City (1995)

Project	Outline
<b>I. Drainage Plan</b>	
A. To Lich River Basin Drainage Plan	• Development of drainage area 77.5km <sup>2</sup> by 2004.
B. Nhue River Basin Drainage Plan	• Development of drainage area 57.9km <sup>2</sup> by 2015.
C. Sewer/Channel Drainage Works	• Execution of drainage works for the existing combined sewer (120km) and channels (31km), initiated by the procurement of machinery.
D. West Lake Conservation	• Execution of the West Lake Comprehensive Environment Study, proposed separately.

<sup>2</sup> Decision No. 108/1998/QĐ-TTg issued on June 20, 1998 by the Prime Minister.

<sup>3</sup> Decision No. 256/2003/QĐ-TTg.

<sup>4</sup> HAIDEP was prepared in May 2007 by JICA for the purpose of revising the existing Urban Development Master Plan of Hanoi up to 2020, approved in 1998.

<b>Project</b>	<b>Outline</b>
E. City Lake Conservation	<ul style="list-style-type: none"> <li>• Implementation of shoreline revamping works for 50 lakes and environmental conservation works for 20 lakes in the long term.</li> </ul>
<b>II. Wastewater Disposal Plan</b>	
H. Centralized Treatment System	<ul style="list-style-type: none"> <li>• Development of 5 zones with a public sewerage system by 2020.</li> </ul>
I. On-site Treatment System	<ul style="list-style-type: none"> <li>• Installation of community plants and/or septic tanks in 2 zones.</li> </ul>
J. Pilot Wastewater Treatment Projects	<ul style="list-style-type: none"> <li>• Formulation of some pilot projects for advance implementation prior to the implementation of the centralized treatment systems which would commence after 2020.</li> </ul>
K. Flushing Water Diversion Plan	<ul style="list-style-type: none"> <li>• Presentation of a preliminary plan to convey Red River water.</li> </ul>
<b>III. Non-structural Measures</b>	<ul style="list-style-type: none"> <li>• Recommendation of institutional/financial measures to support the drainage/sewerage development plan.</li> </ul>

Source: The Study on Urban Drainage and Wastewater Disposal Systems in Hanoi City, Final Report, Executive Summary, February 1995, JICA.

Note: The projects of “A. To Lich River Basin Drainage Plan” and “J. Pilot Wastewater Treatment Projects” are to be implemented by Hanoi Drainage Project for Environmental Improvement (I-1) (I-2).

### 3.1.2 Relevance with the Development Needs of Vietnam

At the time of appraisal, Hanoi frequently suffered heavy floods in the rainy season due to its location on lowlands surrounded by the Red River, the To Lich River and the Nhue River. A major flood covering almost the entire city happened every 4-5 years, with a minor flood occurring every year. The existing drainage and sewerage system was old, with 80km out of 120km (total length) built before 1954. This system was falling into a state of disrepair with conveyance capacity reduced. The existing rivers, lakes and reservoirs were also filled with sediment which reduced their carrying capacity. In addition to this, there was no wastewater treatment plant in Hanoi. This all resulted in frequent flooding with serious economic loss and damage in the urban areas as well as a deterioration of water quality in the rivers and lakes of the surrounding area, creating serious environmental problems and hampering economic development activities. Therefore, the improvement of the existing drainage and sewerage systems was urgently required.

At the time of the ex-post evaluation, even though the drainage systems have been significantly improved and inundation mitigated in many places in Hanoi, there are spots where floods still occur and where it takes a long time to drain water. Some areas are still seriously flooded due to a lack of synchronized infrastructure development that requires a more comprehensive and larger-scale investment. In addition, the current urbanization and expansion of the city area together with population growth causes increase of wastewater and the necessity of a more synchronized and larger drainage system. Therefore, further development of the drainage and sewerage systems in Hanoi is still highly necessary.

### 3.1.3 Relevance with Japan’s ODA Policy

At the time of appraisal, the Japanese Country Assistant Program for Vietnam was not yet established. According to Japanese government aid policy, objectives for operations in Vietnam were (i) support for macro-economic stability, (ii) support for the transitional economy, (iii) support for economic infrastructure development, (iv) support for human resource development, (v) support for social issues and (vi) support for environmental protection. In particular, regarding (iii) support for economic infrastructure development, priority was given to the power,

transport and environmental sectors.

At the time of the ex-post evaluation, the existing Japanese aid policy, the Country Assistance Program for Vietnam, established in July 2009, sets the basic assistance policy as (i) promotion of economic growth and strengthening of international competitiveness, (ii) improvements in living and social conditions and corrections of disparities, (iii) environmental conservation, and (iv) strengthening of governance. In particular, regarding (iii) environmental conservation, priority has been given to urban environmental management, including support for construction and the improvement of facilities related to water quality management, water supply, wastewater and sewage treatment, solid waste management and air environment control.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

### **3.2 Efficiency (Rating: b)**

#### **3.2.1 Project Outputs**

The main feature of the planned outputs was the expansion of drainage capacity in the target area of Hanoi city (7,750ha)<sup>5</sup> through the construction of a pumping station to discharge flooded water into the Red River, together with the rehabilitation and improvement of the existing lakes, rivers, reservoirs, channels and sewers. In addition to this, the installation of two small-scale pilot waste water treatment plants was another important component. The pilot plants tested the appropriateness of newly introduced treatment technology (i.e. the activated sludge method) in Hanoi, which under consideration for application to full-scale sewerage system development in the future. Furthermore, capacity development for the O&M staff of this project was incorporated in the outputs to enhance the effectiveness and sustainability of this project. The outputs originally planned were mostly realized with some modification and additional scope. Table 2 shows a comparison of the planned and actual outputs.

The reason why the number of bridges and culverts constructed for river improvement decreased from 29 to 7 in package 2 was that some of the locations were removed from the target area due to overlapping with other on-going urban development projects of the HPC. Some of these ongoing projects were already constructed during implementation of this project. Also 6 km of road construction along the To Lich River was added to the project scope with the intention of improving road traffic and living conditions and urban scenery. The amount of procured equipment in package 7 was increased based on a request for the procurement of additional equipment from the Project Management Board (PMB) of this project as PMB realized that equipment bought in the first batch worked effectively and they wanted to have more equipment in consideration of the sustainable operation and maintenance of this project after the project completion.

The reasons for the increase in the work volume of consultants were: (i) frequent changes in some work items, tasks and the scale of the project at the time of detailed design; (ii) the prolonged construction period, and (iii) additional scope for reexamination of the feasibility study of this project as well as preparation work for the feasibility study of the second phase of this project.

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<sup>5</sup> The project target area of 7,750 ha includes (i) 3,738 ha of urban districts (Dong Da, Ba Dinh, Hoan Kiem, and Hai Ba Trung), (ii) 3,445 ha of sub-urban districts (Thanh Tri and Tu Liem), and (iii) 567 ha of the West Lake Area.

Table 2: Comparison of Planned and Actual Outputs

Items	Plan	Actual
1. Construction of the Yen So Pumping Station cluster	<ul style="list-style-type: none"> <li>Construction of the Yen So Pumping Station: capacity 45m<sup>3</sup>/s</li> <li>Construction of regulating reservoirs: storage capacity 4.9 mil. m<sup>3</sup></li> <li>Spillways: 3</li> <li>Inlet channel: 1.2km</li> <li>Outlet channel: 1.6km</li> <li>Yen So channel: 3.4km</li> <li>8 bridges and 6 culverts</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned except the number of culverts was reduced from 6 to 5.</li> </ul>
2. River improvement	<ul style="list-style-type: none"> <li>Dredging and embanking of the To Lich River, the Lu River, the Set River, the Lu-Set floodway, and the Upper and Lower Kim Nguu River (total length 33.8km)</li> <li>Construction of 29 bridges and culverts</li> </ul>	<ul style="list-style-type: none"> <li>Dredging and embankment took place almost as planned (total length 31.1km).</li> <li>Construction of 7 bridges and culverts</li> <li>Additional: 6km road construction along the To Lich River</li> </ul>
3. Construction of flood and control gates	<ul style="list-style-type: none"> <li>7 locations</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned</li> </ul>
4. Lake improvement	<ul style="list-style-type: none"> <li>Dredging of 4 lakes (Giang Vo, Thanh Nhan 1, Thanh Nhan 2a, Thanh Nhan 2b)</li> <li>Aeration applied in Thanh Cong Lake and Thien Quang Lake</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned</li> <li>Dredging of Thanh Cong Lake and Thien Quang Lake was implemented instead of aeration</li> </ul>
5. Drainage channel improvement	<ul style="list-style-type: none"> <li>Construction of bridges and culverts at 54 locations</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned</li> </ul>
6. Construction and rehabilitation of Sewers	<ul style="list-style-type: none"> <li>West Lake basin, To Lich basin, Set River basin, Upper Lu River basin, and Kim Nguu River basin</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned</li> </ul>
7. Construction of pilot waste water treatment plants at Kim Lien and Truc Bach	<ul style="list-style-type: none"> <li>Capacity of Kim Lien WWT plant: 3,700m<sup>3</sup>/day</li> <li>Capacity of Truc Bach WWT plant: 2,300m<sup>3</sup>/day</li> <li>Applied technology: Activated sludge method</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned.</li> </ul>
8. Procurement of dredging equipment and facilities	<ul style="list-style-type: none"> <li>1 batch/package of 63 equipment units</li> </ul>	<ul style="list-style-type: none"> <li>1 batch as planned, and 1 additional package (total 88 equipment units)</li> </ul>
9. Development of resettlement area	<ul style="list-style-type: none"> <li>10.3ha at the Dong Tau resettlement zone</li> </ul>	<ul style="list-style-type: none"> <li>10.8ha</li> </ul>
10. Training	<ul style="list-style-type: none"> <li>No. of staff trained: 377</li> <li>O&amp;M of Yen So Pumping Station: 34</li> <li>O&amp;M for drainage systems: 288</li> <li>O&amp;M for WWT plants: 55</li> </ul>	<ul style="list-style-type: none"> <li>Same as planned</li> </ul>
11. Consultant services	<ul style="list-style-type: none"> <li>International consultant: 368 M/M</li> <li>National consultant: 1,092 M/M</li> </ul>	<ul style="list-style-type: none"> <li>International consultant: 507.8 M/M</li> <li>National consultant: 1,651.9 M/M</li> </ul>

Note: The components of lake improvement, construction of pilot waste water treatment plants and the construction of the resettlement area were added during the appraisal of VNV-1.

Photographs of Selected Project Outputs



Yen So Pumping Station



Yen So Channel



Spillway B at Yen So Pumping Station



Upper Kim Nguu River



Thanh Liet Flood and Control Gate



Bridge



Thien Quang Lake



Kim Lien WWT Plant



Procured Equipment

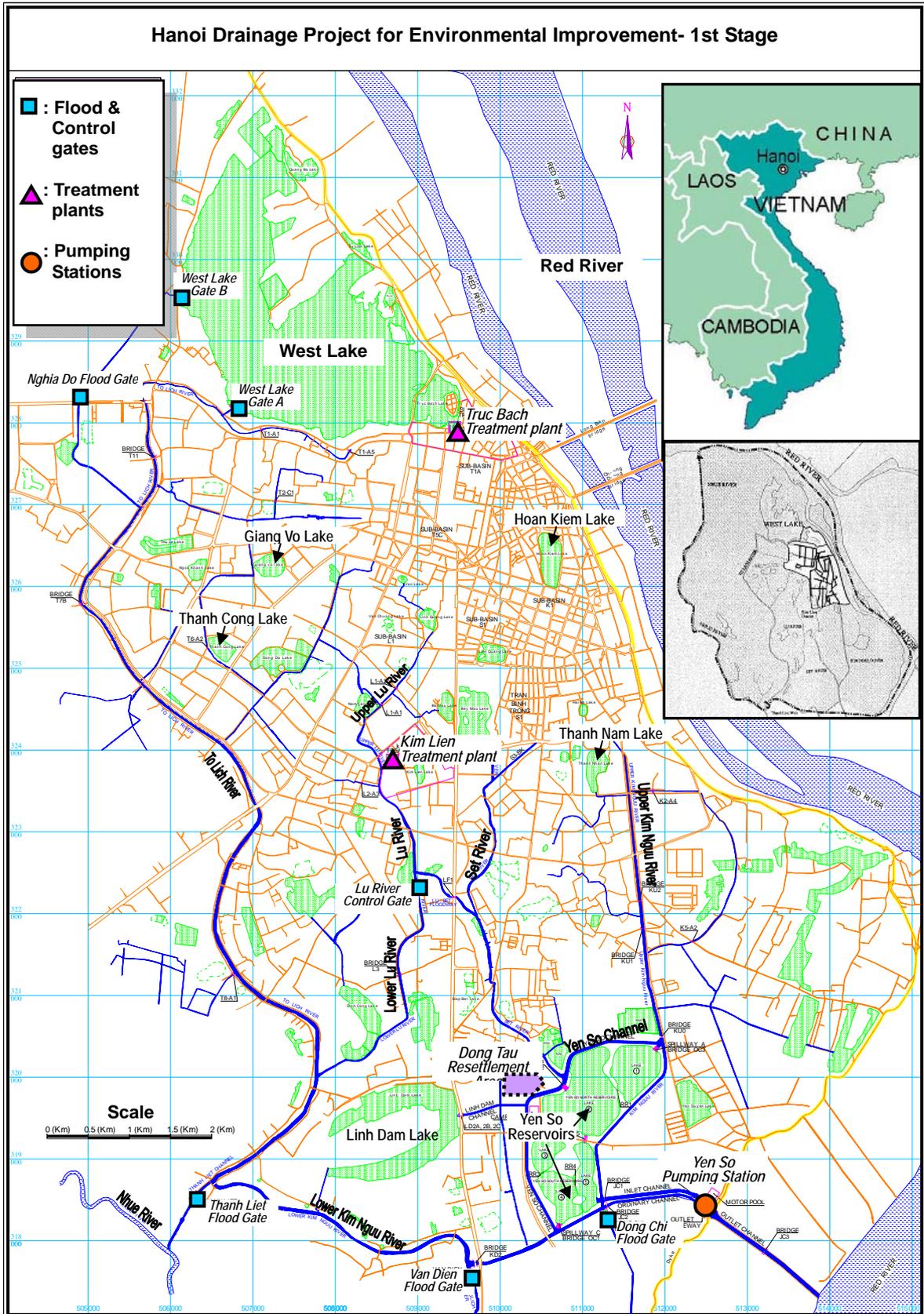
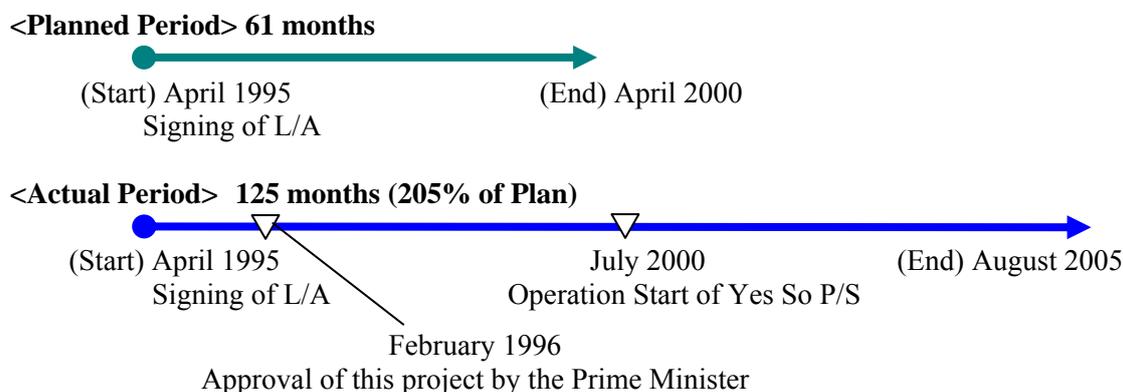


Figure 1: Project Site Map

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Period

The actual implementation period was 125 months (from April 1995 to August 2005) against 61 months of the planned project period (from April 1995 to April 2000), which was significantly longer than planned. The actual project period meant a 64 month delay or a 105% period longer than planned.



There were five main reasons for the delay in this project. First, administrative procedures of the executing agency were prolonged due to a lack of experience in the implementation of a Japanese ODA loan project and understanding of the regulations and guidelines of JICA, as well as complicated administrative procedures among the project related organizations in Vietnam<sup>6</sup>; (ii) delays in detailed design caused by delays in the detailed city plan of Hanoi<sup>7</sup>, adjustment of the design<sup>8</sup>, increases in the number of contract packages<sup>9</sup> and inadequate performance on the part of the consultant; (iii) delays caused by local contractors due to lack of capacity<sup>10</sup>, difficult geographic conditions at some project locations and adverse weather conditions<sup>11</sup> and the

<sup>6</sup> HPC and PMB took a lot of time to deal with the problems arising from the differences in approval procedure and procurement system between the Vietnamese government and JICA since this project was the first Japanese ODA loan project for HPC. For instance, the selection of consultant was not completed until November 1997 after signing of the Loan Agreement in April 1995, which was a delay of almost 2 years.

<sup>7</sup> At that time, the Hanoi Chief Architect (HCA) in charge of city planning in Hanoi city was preparing the “Hanoi Master Plan toward 2020”. However, detailed city plans of respective planning areas had not yet been completed, which seriously affected the progress of the detailed design of the project as detailed designs had to be prepared based on planning data provided by HCA, while project boundaries had to be approved by HCA.

<sup>8</sup> Some examples of adjustments to the design were: (i) change of height of the Truc Bach wastewater treatment plant by lowering the underground treatment tanks and the elevation of the control center, and (ii) additional items for lake improvement such as construction of a water fountain and the walkways around the lakes.

<sup>9</sup> At the time of appraisal of Phase I-1 (VNII-7) in 1995, the number of planned tender lots was 6, consisting of (i) the supply of equipment for urgent rehabilitation work, (ii) site preparation work, (iii) main civil works including hydro mechanical equipment, (iv) bridges on drainage channels, (v) lake dredging, and (vi) sewer construction. Procurement methods for these 6 lots were: international competitive bidding (ICB) for (i) and (iii), limited local competitive bidding (LCB) for (iv)(v) and (vi), and direct appointment of local contractors for (ii). However due to a lack of capacity of the local contractors as well as additional scope through the appraisal of Phase I-2 (VNV-1) in 1998, the planned 6 tender lots were segmentalized into 18 lots in order to meet the capacity of the contractors, particularly the Vietnamese contractors. As a consequence contracting management became complicated and time consuming.

<sup>10</sup> According to the SAPI report, these inappropriate local contractors were mostly awarded through the limited LCB.

<sup>11</sup> As the site of the outlet sluiceway civil work in package 4 was close to the dyke of the Red River, work was not allowed during rainy season for the safety of the dyke. In addition, the ground condition of the Yen So area was unstable and with a high level, which affected the progress of the works. Furthermore, storm weather in the rainy season sometimes caused a flood in the city, which impeded the progress of the civil works in many of the packages.

typical characteristics of works inside the inner city<sup>12</sup>; (iv) delays in land acquisition due to delays in obtaining project boundary approval and difficulties in compensation negotiations with affected households<sup>13</sup>, and (v) additional time required for preparing the feasibility study for phase 2 of this project which was an additional scope for the consulting services.

According to the Study Report on Special Assistance for Project Implementation (SAPI) for this project in 2000, inappropriate management by the Project Management Board (PMB)<sup>14</sup> and the Hanoi People's Committee (HPC)<sup>15</sup> delayed the project implementation. The SAPI report pointed out that, for example, although PMB was empowered by HPC under the Decision by the Prime Minister<sup>16</sup>, in practice PMB decision making on any aspect of project management was limited because of PMB's position in the organizational structure of HPC being at a lower level than the other related organizations communicated with the project implementation. Coupled with the shortage of capable staff in PMB and limited capacity in coordination and communication with related organizations, this management issue of PMB affected project implementation. Similarly, due to a misunderstanding of the roles and responsibilities of the executing agency by HPC, HPC did not play a proactive role in overall project management as well as suffering from limited staff capacity.

Based on the recommendations from the SAPI, a number of actions have been taken by GoV, HPC, HAPI, TUPWS and PMB to improve their institutional capacity through the establishment of specialized divisions under HPC, the issuance and adjustment of Government Decrees and regulations, training for PMB staff, regular meetings for sharing information, regulations on administration procedures, decentralization of project approval authority, etc.

#### 3.2.2.2 Project Cost

The actual project cost was 21,227 million Yen against 22,887 million Yen of the planned cost, which was mostly as planned (Table 3). The actual cost for land acquisition and compensation exceeded the planned cost about three times despite the fact that the total acquired land area decreased from 504 ha to 470 ha. This was because the policy and regulations for land acquisition and compensation were changed several times by HPC during the project implementation together with the increase in the compensation rate. The actual cost for land acquisition and compensation was also larger than the original estimation. However this was balanced out by additional counterpart funds as well as cost saving from the construction works.

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<sup>12</sup> As the site of sewer rehabilitation and construction in package 2 was located in the inner city, the works had to be done during night time. In addition, the sewer was laid down in narrow streets and alleys. Therefore, the works were difficult and time consuming.

<sup>13</sup> This project covered a large area of Hanoi city including the inner districts of Ba Dinh, Dong Da, Hai Ba Trung, Hoan Kiem (old districts), Thanh Xuan, Tay Ho, Cau Giay (newly established), and the suburb districts of Thanh Tri and Tu Liem. During implementation, there were many difficulties in land acquisitions such as in the compensation policy and procedures, identifying the number of affected households and insufficient operation of the agencies responsible. The actual period for land acquisition and resettlement was 103 months (from February 1997 to August 2005) against 47 months (from July 1995 to May 2000).

<sup>14</sup> The SAPI report concluded that the inappropriate management of PMB was caused by factors such as the low status of PMB, a shortage of capable staff and insufficient capabilities of staff, insufficient communication with the organizations concerned.

<sup>15</sup> The SAPI report concluded that the inappropriate management of HPC was caused by factors such as inappropriate understanding of the "Executing Agency", inappropriate overall management systems, and a lack of supporting organization and staff.

<sup>16</sup> Decision No. 112/TTg dated February 15, 1996 by the Prime Minister.

Table 3: Comparison of Planned and Actual Project Costs

Items	Plan*			Actual		
	Foreign Currency (Mil. JPY)	Local Currency (Mil. VND)	Total (mil. JPY)	Foreign Currency (mil. JPY)	Local Currency (Mil. VND)	Total (mil. JPY)
1. Construction works	10,605	340,547	14,010	11,194	110,000	12,074
2. Dredging equipment	1,198		1,198	1,162		1,162
3. Consulting services	882	53,098	1,413	2,066		2,066
4. Contingency	1,114	58,375	1,698			0
5. Price escalation	351	15,438	505			0
6. Administration costs	1,010	75,200	1,762		60,000	480
7. Land acquisition and compensation		178,100	1,781		605,000	4,840
8. Import taxes		51,900	519		110,000	880
Total	15,160	772,658	22,887	14,422	885,000	21,227

Note 1: Planned project costs are based on the cost estimation at the appraisal of Phase I-2 (VNV-1) in 1998.

Note 2: Exchange rate used: 1 VND = 0.010 JPY in 1997 for planned cost, 1 VND= 0.008 JPY in annual average between 1995 and 2005 for Actual cost.

Although the project period was significantly longer than planned, the project cost was mostly as planned, therefore efficiency of this project is fair.

### 3.3 Effectiveness (Rating: a)

#### 3.3.1 Quantitative Effects

##### 3.3.1.1 Results from Operation and Effect Indicators

###### (1) Reduction in Inundation Time

Table 4 indicates inundation time in Hanoi on selected days of heavy rain, and suggests that inundation time was dramatically reduced after 2001. For example, there were 7 days of inundation time in Hanoi when it experienced 248.8mm rainfall in 2 days from May 19 to 20, 1994. However, there were 2 days of inundation time in 2001 when the rainfall was 306.5mm during August 3-4, 2001. When the rainfall level is less than 200mm, flooded water is usually drained within 2-3 hours. Although the project was completed in August 2005, the project effects were observed after 2000 when the Yen So Pumping Station started operation. An exceptional case was the three days of heavy rain during October 31 and November 2, 2008, which was the heaviest rain in Hanoi since official recording started in 1960. It took 5 days to draining the water.

In general, before the completion of this project, many places had 3-5 days inundation after heavy rains. At present, floods occur in 2-3 hours after rain with similar intensity.

According to data from the Hanoi Sewerage and Drainage Company (HSDC), the annual average inundation before the completion of this project was 0.5-0.8m with a draining time of 1-2 days after rains exceeding 50mm. After project completion, the annual average inundation has become 0.2-0.3m and the draining time 0.5-1 hour after the same amount of rain. The primary target of this project, which was to improve the drainage systems of the target area in Hanoi dealing with 172mm per 2 days of rainfall with a return period of 2 years, has been achieved.

This result was due to the improvement of the drainage systems in the target area of Hanoi through this project. Before the project, the total drainage system of Hanoi was operated

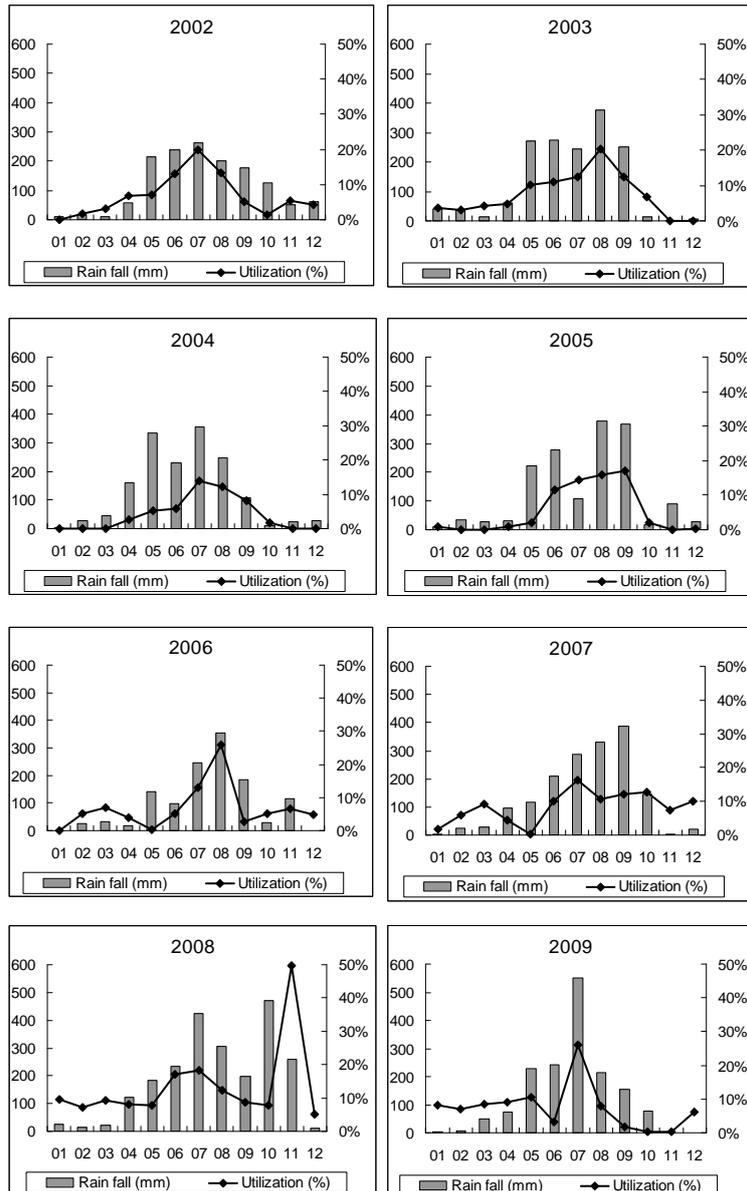
through natural gravity, where water flowed through the Nhue River to the Thanh Liet flood gate. The highest rate of flow was 15m<sup>3</sup>/s, but this worked only when the natural water level in the Nhue River was lower than the water level in the To Lich River. After completion of this project, the newly constructed Yen So Pumping Station, with a maximum capacity of 45m<sup>3</sup>/s, helped to discharge water into the Red River, particularly in the rainy season. As shown in Figure 2 below, utilization of the Yen So Pumping Station increased during the rainy season between May and October.

Table 4: Table 4: Inundation Time in Hanoi on Selected Days of Heavy Rain

Date (d/m/y)	Rainfall (mm)	Inundation time (days or hours)
Target	172 per 2 days	-
11/06/1991	121.4	7 days
12/06/1991	79.3	
	<b>200.7</b>	
29/06/1992	68.4	8 days
30/06/1992	165.3	
	<b>233.7</b>	
29/09/1993	36.7	5 days
30/09/1993	143.4	
	<b>180.1</b>	
19/05/1994	69.2	7 days
20/05/1994	179.6	
	<b>248.8</b>	
04/11/1996	48.2	5 days
05/11/1996	145.3	
	<b>193.5</b>	
25/06/1998	48.5	6 days
26/06/1998	148.0	
	<b>196.5</b>	
15/07/1999	150.9	3 days
03/08/2001	169.8	2 days
04/08/2001	136.7	
	<b>306.5</b>	
27/09/2005	<b>144.1</b>	2 hours
16/07/2008	95.3	2 hours
18/07/2008	135.6	3 hours
	<b>230.9</b>	n.a.
31/10/2008	347.0	5 days
01/11/2008	128.2	
02/11/2008	88.1	
	<b>563.3</b>	
17/07/2009	<b>119.2</b>	2 hours

Source: Hanoi Department of Construction.

Note: Inundation time from 31/10/2008 to 02/11/ 2008 is based on information from the local newspaper.



Source: Hanoi Sewerage and Drainage Company (HSDC).

Note: Utilization (%) = Actual pumped water volume per month / Maximum pumped water volume per month x 100

Figure 2: Operation of the Yen So Pumping Station (2002-2009)

In addition to the operation of the Yen So Pumping Station, improved carrying capacity of existing drainage, including rivers, channels, culverts, and tubes as well as the newly constructed 5 reservoirs, and the dredged 6 lakes and reservoirs was increased to a total 5.3 million m<sup>3</sup> by this project (Table 5).

Table 5: Status of Drainage Systems in Hanoi

	1997	2005
Total length of drains	262.53 km	513.99 km
Total length of channels	32.5 km	89.1 km
Total length of rivers	38.9 km	45.8 km

Source: Hanoi Sewerage and Drainage Company (HSDC).

Note 1: The figure provided above is for the area under the control of HSDC.

Note 2: The expanded length of drains, channels, and rivers was for 1997 to 2005 can also be attributed to other projects.

Since 2006, the Second Hanoi Drainage Project for Environmental Improvement (I) (II) has been implemented by the HPC using a Japanese ODA loan, based upon the master plan. This second phase project provides an additional 45m<sup>3</sup>/s capacity in the Yen So Pumping Station, wastewater treatment plants with a capacity of 13,300m<sup>3</sup>/day, the rehabilitation and improvement of 10 lakes and 2 reservoirs, drainage and sewerage channels and so on. It is envisaged that the second phase project will solve the problem of inundation with a rainfall of 310 mm per 2 days and with a return period of 10 years.

## (2) Operation of Pilot Wastewater Treatment Plants

Two small-scale wastewater treatment plants were constructed through this project at Kim Lien and Truc Bach, for the pilot application of “activated sludge technology” in Hanoi. This was an important milestone as there were no such wastewater treatment plants in Hanoi in the past. The performance of the pilot plants were utilized in consideration of the development of full-scale wastewater treatment plants in future projects, including the on-going phase 2 of this project.

Since the start of operations in 2005, the two pilot plants have been performing well and they achieved almost 100% of facility utilization in 2008. The elimination efficiency of treated water at the outlet is 87%, which meets the requirement of 85% stipulated in government environmental standards (Table 6).

Table 6: Operation of Pilot Wastewater Treatment Plants

Plant	Item	2005	2006	2007	2008
<b>Kim Lien</b> Capacity: 3,700m <sup>3</sup> /day	Average daily treated water volume (m <sup>3</sup> /day)	2,743	3,247	3,641	3,700
	Plant utilization (%)	74.1	87.8	98.4	100.0
<b>Truc Back</b> Capacity: 2,300m <sup>3</sup> /day	Average daily treated water volume (m <sup>3</sup> /day)	2,300	2,300	2,300	2,300
	Plant utilization (%)	100.0	100.0	100.0	100.0

Source: Hanoi Sewerage Drainage Company (HSDC).

Note: The operation of Kim Lien and Truc Back wastewater treatment plants started from September 2005.

According to the HPC and HSDC, the performance of the two pilot wastewater plants proved the newly introduced activated sludge technology to be adaptable in Hanoi. Also, through operation and maintenance of the pilot plants, the technical capacity of HSDC staff has been improved in terms of the management, operation and maintenance of wastewater treatment plants.

After this project, the Hanoi authority promoted the further development of wastewater treatment plants in line with the Hanoi Master Plan toward 2020. Four new wastewater treatment plants<sup>17</sup> are to be constructed in the city, including a wastewater treatment plant at Thong Nhat Park with a capacity of 13,300m<sup>3</sup>/day under the second phase of this project. All of the new wastewater treatment plants are to apply activated sludge technology.

### 3.3.1.2 Results of Calculations of Internal Rates of Return (IRR)

At the time of appraisal, cost-benefit analysis of this project was examined and the Economic Internal Rate of Return (EIRR) of this project was found to be 17.3%. This calculation was based upon the preconditions below:

(Costs) Project cost and O&M cost

(Benefit) Decrease of flood damage and improvement of living and hygiene conditions.

Due to the fact that data needed for quantitative analysis was not available, analysis for the internal rate of return of the time of ex-post evaluation was not possible.

### 3.3.2 Qualitative Effects

#### (1) Capacity Development of O&M Staff

For the purpose of capacity development, this project provided technical training for the O&M staff of HSDC as well as for PMB staff. As indicated in Table 2, a total of 377 people benefitted from training, including 34 engineers and staff for O&M training at the Yen So Pumping Station, 288 engineers and staff for O&M training for drainage systems and 55 engineers and staff for O&M training at the pilot wastewater treatment plants. They took both theoretical and practical courses and examinations to check their understanding and they received certificates after completion.

According to the results of a Focus Group Discussion with 10 HSDC staff, including managers and engineers from different departments, “improved performance and effectiveness” and a “deeper understanding of the requirements of the current work/job” were commonly perceived as advantages. Other advantages were “increased working productivity” and “increased advanced knowledge of the work”. According to the HSDC self-evaluation on the effect of capacity development which was obtained through the questionnaire and interview survey with HSDC, the technical capacity and skills of trained HSDC staff had improved. It was commented that trained staff had played the main role in transferring knowledge and skills to the other staff in the organization as well as in operating and maintaining the modern equipment provided by this project.

#### (2) Satisfaction of Beneficiaries

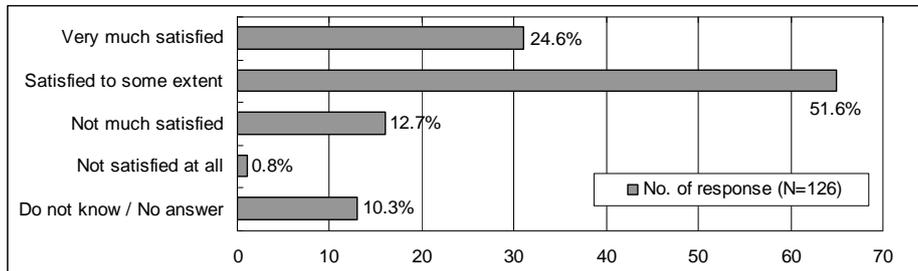
According to the results of the satisfaction survey for beneficiaries which included 103 Hanoi residents<sup>18</sup>, 12 commercial and business companies, 5 transport companies, 3 health clinics, and

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<sup>17</sup> These are (i) the Yen So wastewater treatment plant with a capacity of 190,000m<sup>3</sup>/day in Hoang Mai district (on-going) which is a BT (Building-Transfer) project of a Malaysian investor, (ii) the Phu Do wastewater treatment plant with a capacity of 71,000m<sup>3</sup>/day in the Tu Liem district (pipe-line), (iii) the Yen Xa wastewater treatment plant with a capacity of 275,000m<sup>3</sup>/day in the Thanh Tri district (pipe-line), and (iv) a wastewater treatment plant at Thong Nhat Park with a capacity of 13,300 m<sup>3</sup>/day in the Hai Ba Trung district (on-going).

<sup>18</sup> Out of 103 samples, 53 samples (51%) were selected from the heavily flooded area within the project target area in Hanoi including Phuong Liet Ward, Tan Mai Ward, and Thanh Liet Ward, and 50 samples (49%) were selected from the relatively less flooded area including Dong Tam Ward, Khuong Dinh Ward, Khuong Trung Ward, Thanh Xuan Ward, Truong Dinh Ward, and Tuong Mai Ward. The target Wards of this beneficiary survey were randomly selected with the consideration of their population size and the locations of the project facilities. However, the selection of the sample households in each ward was not randomly done but the sample was selected from a list of candidate households who were selected by each ward in advance due to the limited field survey period and some Vietnamese political reasons.

3 schools, 24.6% of respondents (31 respondents) said that they were “Very much satisfied” and 51.6% of respondents (65 respondents) said that they were “Satisfied to some extent” (Figure 3).



Source: The results of a beneficiary survey conducted by the joint evaluation team.

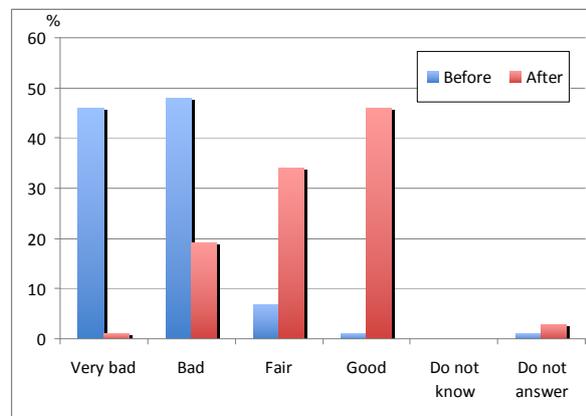
Note: Out of 126 responses, 103 are from Hanoi residents, 12 are from commercial and business companies, 5 are from transport companies, 3 are from health clinics, and 3 are from schools in the project area.

Figure 3: Satisfaction of Beneficiaries

A total of 103 Hanoi residents were asked to assess the condition of the drainage systems in Hanoi, comparing the situation before and after project completion, and the results of their responses are shown in Figure 4. Before project completion, 44.7% of respondents (46 respondents) and 46.6% of respondents (48 respondents) perceived the drainage systems to be “very bad” and “bad” respectively. Their assessment after project completion, however, was reversed. Now 44.7% (46 respondents) answered “Good” and 33.0% (34 respondents) said “Fair”.

The above results suggest that the effects of this project have been commonly recognized by Hanoi residents and also that this project has met the needs of the beneficiaries. At the same time, despite the improved drainage conditions, there still exists a great demand among local residents for further improvement of the drainage and sewerage systems in Hanoi, including better water quality of rivers and lakes in the city.

This project has largely achieved its objectives, therefore its effectiveness is high.



Source: The results of a beneficiary survey conducted by the joint evaluation team.

Note: Total number of respondents: 103 Hanoi residents.

Figure 4: Perception of Beneficiaries on Drainage Conditions before and after the Project

## Photographs of Beneficiary Survey



Interview to a Hanoi resident



Interview to a clinic



Interview to a primary school

### 3.4 Impact

#### 3.4.1 Intended Impacts

##### (1) Impact on the Decrease of Flood Damage

According to the results of the beneficiary survey with 103 Hanoi residents, 69.9% of respondents (72 respondents) perceived a decrease in loss caused by floods after project completion. Some of the transport companies interviewed reported fewer losses caused by vehicle damage and loss of customers during the floods, as well as a reduction in maintenance costs of damaged vehicles after the project. Businesses used to suffer considerable damage to workshops, machinery and products, but the frequency of this has decreased. Many of the beneficiaries interviewed recognized a decrease in flood damage in comparison with the situation before project completion. However, due to the unavailability of statistical data for the costs of damage and loss caused by floods in Hanoi, the degree of impact can not be analyzed in a quantitative manner.

##### (2) Impact on the Improvement in Health and Living Conditions

Firstly, according to the results of the beneficiary survey with 103 Hanoi residents, 68.9% of the respondents (71 respondents) asserted that water-borne diseases had decreased. However, a half of the respondents in Phuong Liet Ward (53.8%) and one third of the respondents in Thanh Liet Ward (33.3%) claimed an increase in water-born diseases. This may be because these areas still have some swamps. According to an interview survey with three health clinics, a positive impact on health and hygiene conditions was perceived in the respective areas. Tan Mai Clinic observed that there had been a decrease in the number of patients with water-borne diseases in their area. However, due to the unavailability of statistical data, a direct link between the decrease in water-born diseases and this project is uncertain and a further detailed technical study is necessary.

Secondly, 83.5% of respondents (86 respondents) said that there had been an “improvement in hygiene conditions” and 77.7% of respondents (80 respondents) stated that a “decrease in the appearance of mosquitoes had affected people’s living comfort following project completion.

Thirdly, improvement in traffic conditions was perceived by most respondents as a positive impact of this project (60.2% of respondents). Some of the schools and transport companies interviewed had a similar perception. This is because a large part of the rivers and open channels of Lu and Set were now covered by box culverts and culverts, with roads built on top. Traffic conditions improved in many of the locations where this project constructed paved roads in Hanoi, both in terms of improvements in accessibility to the roads as well as an increased number of vehicles.<sup>19</sup>

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<sup>19</sup> About one third of the respondents in Khuong Trung and Phuong Liet wards still stated that traffic conditions had worsened. Especially in Tuong Mai and Thanh Liet where traffic flow had been changed, traffic conditions were ranked unchanged.

In sum, it is likely that this project has contributed to some aspects of an improvement in some aspects of living conditions, especially hygiene conditions and transport convenience.

### (3) Impact on the Natural Environment

The Environmental Impact Assessment (EIA) of this project excluding the pilot wastewater treatment plants was approved by Ministry of Science, Technology and Environment (MOSTE)<sup>20</sup> in October 2002. The EIA of the pilot wastewater treatment plants was approved in July 2003 by HPC which received delegated responsibility from MOSTE. According to the Environmental Monitoring Report drafted by consulting services in this project in October 2005, it was reported that the aquatic ecosystem of the lakes became stable after project implementation. Sludge inside the sewer line and sediment at the Yen So Pumping Station were appropriately disposed of at the Yen My site according to the Vietnamese environmental regulations. Similarly excavated soil was disposed of appropriately at the Van Phuc disposal site.

The dumping of illegal solid waste into the rivers decreased after the dredging and embankment work of the rivers including the construction of roads at river side. Particularly, the environment of the upper Kim Nguu River side was remarkably improved by this project. This is because road development restricts residents in discarding their waste.

According to the results of a beneficiary survey with 103 Hanoi residents, the following environmental impacts are widely perceived by the beneficiaries: “Decrease in bad odors” (73.8% of respondents), “Decrease in waste in the drainage system” (79.6% of respondents), and “Improvement of scenery” (75.7% of respondents). However, again, one third of the respondents in Phuong Liet and Thanh Liet (38.5% and 33.3%) stated that bad odors had increased in their area. This may be because these areas have some swamps where anti-septic reaction to wastewater causes odor.

Factors for the above impacts perceived by the Hanoi residents were considered to be: (i) more frequent waste water collection by HSDC, and more importantly, (ii) changes in people’s behavior. The construction of roads along the lakes and embankment along the river and canal sides have prevented people from dumping waste into the lakes, rivers and canals.

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<sup>20</sup> MOSTE is reformed to the Ministry of Natural Resource and Environment (MONRE) and the Ministry of Science and Technology (MOST).

Photographs of Rivers and Drainage Channels in Hanoi at Selected Project Locations



However, the impact on the improvement of the water quality of rivers and lakes in Hanoi is far from adequate. Generally, lakes and rivers in Hanoi are polluted and do not meet the Vietnamese Normative Standards for the environment. The Kim Nguu River and the To Lich River are the most polluted, as shown in Table 7 below. The Department of Natural Resource and Environment (DONRE) of HPC is in charge of the environmental monitoring for the lakes and rivers in Hanoi. However, due to budget constraints, DONRE has not carried out the environmental monitoring activities properly. They usually conducted the ad-hoc environmental monitoring and the sampling spots were not selected at the same place for every time. Therefore, due to the difficulty in collecting the consistent water quality data for the lake and rivers in Hanoi during and after the project implementation, Table 7 presents only the water quality data for 2007 and 2008. The comparative analysis of water quality before and after the project was not available in this evaluation.

Table 7: Environmental Monitoring Data at Selected Lakes and Rivers in Hanoi

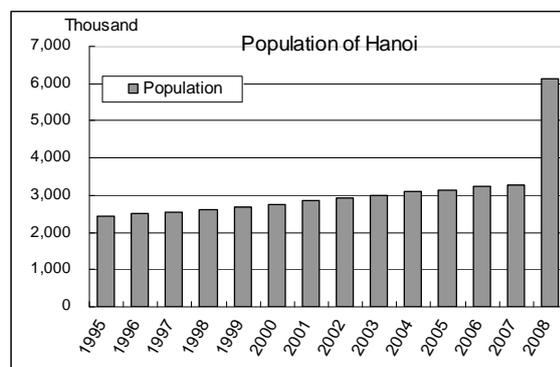
Lake and River	Parameter	Unit	2007		2008		VN Normative Standards 08-2008 (Column B)
			Dry season	Rainy season	Dry Season	Rainy season	
Hoan Kiem Lake	pH	-	7.9 - 9.5	9.0 - 9.5	6.6 - 7.5	8.3 - 8.7	5.5 - 9
	DO	mg/l	8.8 - 10.1	10.2 - 10.6	4.5 - 4.8	7.3 - 8.2	≥ 2
	BOD5	mg/l	38 - 41	31 - 38	25 - 28	18 - 28	15 - 25
	COD	mg/l	61 - 133	60 - 74	41 - 48	33 - 46	30 - 50
	TSS	mg/l	285 - 306	89 - 96	27 - 33	54 - 58	50 - 100
Bai Mau River	pH	-	7.4 - 7.8	7.6 - 7.8	6.9 - 7.2	8.6 - 8.8	5.5 - 9
	DO	mg/l	2.3 - 6.9	2.3 - 6.8	2.8 - 5.0	11.9 - 12.2	≥ 2
	BOD5	mg/l	13 - 18	19 - 28	9 - 14	25 - 29	15 - 25
	COD	mg/l	31 - 41	47 - 68	13 - 28	40 - 46	30 - 50
	TSS	mg/l	41 - 73	32 - 49	15 - 33	40 - 59	50 - 100

Lake and River	Parameter	Unit	2007		2008		VN Normative Standards 08-2008 (Column B)
			Dry season	Rainy season	Dry Season	Rainy season	
Kim Nguu River	pH	-	6.9 - 7.1	7.1 - 7.7	6.6 - 6.9	6.3 - 6.4	5.5 - 9
	DO	mg/l	0.1 - 0.2	2.8 - 4.1	0.8 - 1.9	0.07 - 0.16	≥ 2
	BOD5	mg/l	121 - 266	61 - 83	41 - 69	83 - 290	15 - 25
	COD	mg/l	269 - 422	123 - 145	60 - 150	197 - 308	30 - 50
	TSS	mg/l	115 - 299	83 - 119	45 - 81	129 - 180	50 - 100
Lu River	pH	-	7.1 - 7.4	6.9 - 7.8	6.7 - 7.2	6.5 - 6.8	5.5 - 9
	DO	mg/l	0.2 - 0.7	2.6 - 3.1	0.7 - 1.2	0.11 - 0.3	≥ 2
	BOD5	mg/l	101 - 156	33 - 59	67 - 133	32 - 64	15 - 25
	COD	mg/l	286 - 328	76 - 91	96 - 262	83 - 97	30 - 50
	TSS	mg/l	55 - 78	32 - 69	30 - 46	41 - 55	50 - 100
To Lich River	pH	-	7.1 - 7.4	6.0 - 7.6	6.5 - 7.1	6.5 - 7.1	5.5 - 9
	DO	mg/l	0.5 - 1.6	1.1 - 1.7	0.3 - 1.4	0.01 - 0.26	≥ 2
	BOD5	mg/l	128 - 284	61 - 187	95 - 188	46 - 130	15 - 25
	COD	mg/l	388 - 476	121 - 222	110 - 200	93 - 158	30 - 50
	TSS	mg/l	131 - 192	40 - 108	45 - 123	25 - 68	50 - 100

Source: Ministry of National Resources and Environmental Protection (MONRE).

Note: Vietnamese Normative Standards 08- 2008 (Column B - for the purpose of irrigation, waterway transport and other purposes with requirements for low water quality).

Contamination of DO, BOD, COD, and TSS<sup>21</sup> particularly increases in the dry season, when the water quality becomes seriously bad. The primary reason for the bad water quality of lakes and rivers in Hanoi is that since Hanoi city does not have a separate sewerage system and wastewater treatment plants except for the two pilot treatment plants and one plant in North Thang Long zone<sup>22</sup>, all wastewater is discharged into the rivers and lakes. In Hanoi approximately 500,000 m<sup>3</sup> of wastewater, of which approximately 400,000 m<sup>3</sup> is domestic wastewater, is discharged everyday. Only 9-11 % of this is treated at the existing wastewater treatment plants. The situation has deteriorated with the rapid growth of population in Hanoi<sup>23</sup> as well as with the progress of urbanization and industrialization in the city (Figure 5). Furthermore, weak enforcement of environmental protection measures for industries has resulted in discharge of a large volume of untreated industrial wastewater, seriously affecting the water quality in rivers and lakes. Hanoi PC makes



Source: General Statistic Office (GSO).

Figure 5: Population of Hanoi

<sup>21</sup> DO: Dissolved Oxygen, BOD: Biochemical Oxygen Demand, COD: Chemical Oxygen Demand, and TSS: Total Suspended Solid.

<sup>22</sup> This wastewater treatment plant was constructed by Japanese ODA loan project “Hanoi Urban Infrastructure Development Project” and put into operation in 2008. The capacity of the plant is 40,000m<sup>3</sup>/day.

<sup>23</sup> In August 2008, Hanoi expanded by merging with the neighboring districts and villages of Ha Tay, Vinh Phuc, Hoa Binh Provinces, and its area extended to 3,345 km<sup>2</sup> which was 3.6 times larger than the existing area with a total population of about 6.23 million.

continuous efforts to develop the sewerage system, which is one of the biggest challenges in Hanoi.

In sum, this project has produced certain positive environmental impacts such as a decrease in bad odors, a decrease in waste in drains, open channels, and rivers, and improvement in the scenery in areas near the drainage facilities. Also there has been no major negative environmental impact during implementation. However, considering the objective and scope of this project, that is, the main purpose of this project is improving the existing drainage facility for flood control, it seems that the contribution to the improvement of water quality of rivers and lakes has been very limited. The fundamental improvement of the water quality of the rivers and lakes will not be achieved without measures such as the construction of large-scale of wastewater treatment facilities and development of a separate sewerage system in Hanoi.

### 3.4.2 Other Impacts

#### (1) Impact of Land Acquisition and Resettlement

The actual acquired land area was 470 ha and the actual number of resettled households was 327. This was less than in the plan. Among the resettled 327 households, 104 households were provided with a housing plot in the Dong Tau resettlement zone and 223 households were provided with flats in the Dam Trau area<sup>24</sup>. The construction of resettlement areas of 10.8ha, the provision of community roads, drainage systems and electricity and water supply services, but not the construction of houses, were components of this project (Table 8).

There was a difficulty in persuading and negotiating with the households affected to accept the compensation due to (i) difficulty in identifying the affected households due to the delay in finalizing the project boundary and detailed design, (ii) frequent change in the compensation rates and calculation methods according to the changes in HPC's policy and regulations on land acquisition and resettlement and (iii) insufficient operation of Site Clearance Council (SCC) including a lack of clear and detailed explanation provided to households. Hence, the actual implementation period for land acquisition and resettlement took more than two times longer than the planned period.

Table 8: Land Acquisition and Resettlement

Item	Plan	Actual
1. Acquired land area (ha)	504	470
2. No. of households compensated (No.)	n.a.	3,270
3. No. of households resettled (No.)	300*	327
4. Infrastructure at the Dong Tau resettlement area		
a) Area (ha)	10.3	10.8
b) Length of roads (m)	2,345.95	2,345.95
c) Length of drainage systems (m)	4,122.5	4,122.5
d) Number of electricity subscribers (No.)	104	104
e) Number of water supply subscribers (No.)	104	104

Source: Hanoi Sewerage Drainage-Project Management Board (HSD-PMB).

Note: Although the resettlement plan was prepared at the early stage of this project, it did not identify the number of resettled households. Therefore, information on the planned number of resettled households (300 households) was quoted from the JICA's appraisal document of I-2 (VNV-1).

<sup>24</sup> It is not necessarily the case that the 327 households originally resettled are still living in the Dong Tau resettlement area and the Dam Trau area as quite a few households sold their property rights to others and moved to other places.

The acquired land area decreased from 504 ha to 470ha. This is because work items including Linh Dam Lake and the construction of Linh Dam channel connecting Linh Dam Lake with the Yen So Pumping Station was excluded from this project,. As a result, this project required less land acquisition than was expected. On the other hand, the number of resettled households increased from 300 households to 327 households.

Photograph of Resettlement Area



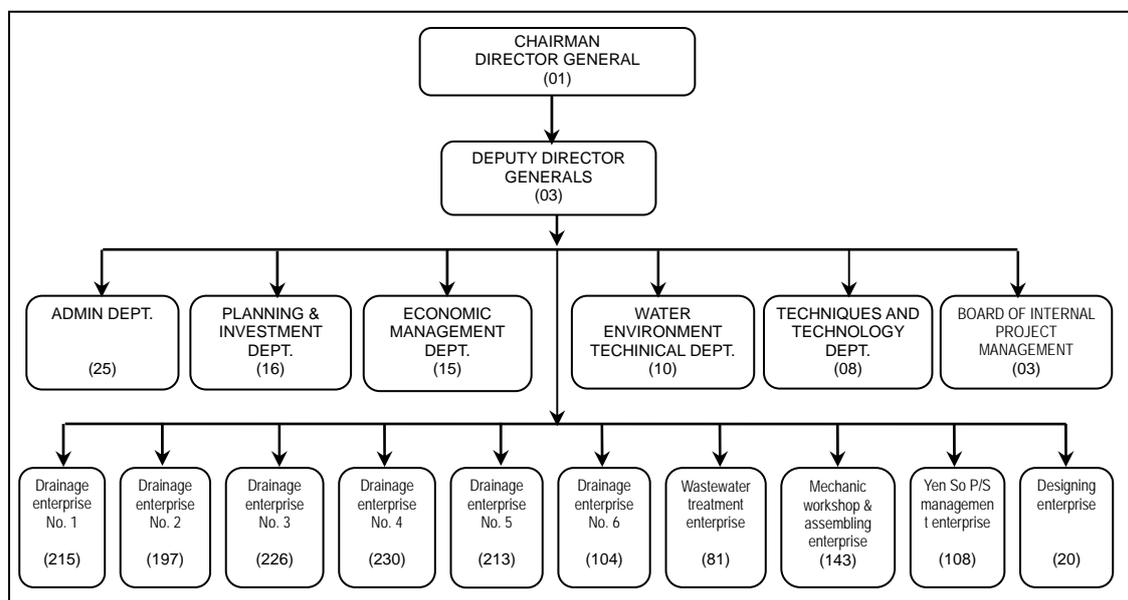
Dong Tau resettlement Area

According to the results of a Focus Group of 13 resettled households, all were satisfied with the resettlement (11 out of 13 households were very satisfied; 2 out of 13 were satisfied to some extent). Major changes perceived after the project by the 13 households interviewed were: (i) better scenery, (ii) inundation problems solved, (iii) improved traffic convenience, (iv) improved housing infrastructure and facilities, (v) better livelihoods, and (vi) improved environmental and hygiene conditions. No particular negative impacts on resettled households were observed.

### 3.5 Sustainability (Rating: a)

#### 3.5.1 Structural Aspects of Operation and Maintenance

The operation and maintenance agency for project facilities is the Hanoi Sewerage and Drainage Company (HSDC), which is a public corporation established in 1993. HSDC has 6 departments and 10 enterprises<sup>25</sup> and its total number of employees is 1,618 as of January 2010. Figure 6 shows the organization chart of HSDC.



Source: Hanoi Sewerage and Drainage Company (HSDC).

Figure 6: Organization Chart of HSDC

<sup>25</sup> The enterprises of HSDC are part of the organizational units at department level and not independent companies.

In addition, roads and bridges constructed by this project are maintained by the Hanoi Transport Works Company No. 3 (Company No. 3) which is a public corporation established in 1965.

### 3.5.2 Technical Aspects of Operation and Maintenance

HSDC directly conducts small scale and periodic maintenance in accordance with the approved standards and guidelines established by the manufacturers as well as by the contractor and consultant of this project. However, large scale maintenance for those facilities such as pumping stations and wastewater treatment plants is usually conducted in cooperation with the manufacturers of the facilities due to the limited number of trained staff for electricity, mechanics and wastewater treatment engineering.

As mentioned earlier, a total 377 HSDC staff were trained during this project. At the same time, the ongoing second phase of this project includes a three-year O&M capacity development for 2007 to 2010 and many HSDC staff are continuously being trained by the project.

In addition, the Chiba Prefectural Government has supported the O&M capacity development of HSDC staff between 2007 and 2010 through the JICA Partnership Program. This includes the dispatch short-term of Japanese technical experts to HSDC as well as hands-on training of HSDC staff in Japan<sup>26</sup>. HSDC also cooperated with the Chiba Prefectural Government in Japan for capacity development of staff through short-term overseas training held in Japan.

### 3.5.3 Financial Aspects of Operation and Maintenance

The annual HSDC budget, including the O&M costs of the project facilities is provided by the HPC. As their activities, as well as their service territory, has expanded, the annual budget has increased year by year. In particular, after the expansion of Hanoi's administrative territory in August 2008, it was elevated to twice that of before (Table 9).

Table 9: Annual Budget of HSDC

	Unit: million VND			
	2007	2008	2009	2010
Annual budget	121,000	136,000	290,000	320,000

Source: Hanoi Sewerage and Drainage Company (HSDC).

In 2007, the Government announced Decree 88/2007/ND-CP on wastewater fees payment whereby all organizations and households discharging wastewater into the drainage and sewerage system must pay at least 10% of water supply fees as wastewater fees. The purpose of this Decree was to recover 100% of the O&M costs for the drainage and sewerage systems through wastewater fees payment. However, this regulation has not yet been implemented in Hanoi city<sup>27</sup>. At present, the O&M cost of the drainage and sewerage systems in Hanoi is allocated from the collection of the existing environmental protection fees from water users<sup>28</sup>. However, only approximately 30% of the total O&M cost is recovered. The environmental

<sup>26</sup> Strengthening Capacity in Operation and Management Works at Sewerage Treatment Facilities and Water Environment Enlightenment in Hanoi (April 2007-Mar 2010). In this program, three Japanese technical experts from the Chiba Prefectural Government were dispatched to HSDC in July 2007, March and July 2008 while at the same time three members of HSDC staff were invited to undertake technical training at a waste water treatment plant in the Chiba Prefecture in November 2007 and 2008.

<sup>27</sup> The second phase of this project includes a study on the wastewater tariff system in Hanoi as a part of the consulting service component. The results of this study are to be utilized for the establishment of a new wastewater tariff system in Hanoi in line with Decree 88/2007/ND-CP.

<sup>28</sup> Stipulated in Government Degree No.67/2003/ND-CP dated June 13, 2003, and Decree 04/2007/ ND-CP dated January 8, 2007.

protection fees collected are not directly returned to HSDC, and the O&M budget comes from the HPC. According to HSDC's self-evaluation, the amount of allocated O&M budget is generally adequate.

#### 3.5.4 Current Status of Operation and Maintenance

After 10 years of operation for the Yen So Pumping Station, in 2009, HSDC conducted maintenance work replacing ball bearings, seals, etc. for 5 ordinary pumps in order to fix problems in the electric control box. All equipment in the drainage segment has been repaired. All spare parts procured by this project have been used for repairs and maintenance. Most of the spare parts for the Kim Lien and Truc Bach wastewater treatment plants were used to replace broken parts such as belts, ball bearings, seals, etc. Thanks to proper and timely maintenance activities, the majority of project facilities are in general maintained in good condition.



Photograph of O&M Work  
Maintenance of drain by HSDC staff

No major problems have been observed in the operation and maintenance system, therefore sustainability of this project is high.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

In light of the above, this project is evaluated to be highly satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendations for the related agencies

##### (1) Recommendation to Hanoi People's Committee (HPC)

Since this project was the first large-scale infrastructure development project covering a number of districts of Hanoi city and involving the many central and local government agencies, this project had a problem in coordination among the stakeholders. For example, there was a weak coordination and information sharing between this project and other on-going projects and there was a duplication of some project components and locations between this project and other on-going projects. This problem was mostly caused by the inappropriate project management system and capacity of HPC. The SAPI study pointed out some factors in the inappropriate project management of HPC such as the inappropriate understanding of the role and responsibilities of HPC as an executing agency of the project, the limited power and functions of PMB in project implementation, and the lack of human resources. Therefore, HPC did not play a proactive role in overall project management and coordination.

In order to improve such problems in the second phase of this project, HPC must pay attention to defining the coordination mechanism, roles and responsibility, and the decision-making flow among the stakeholders prior to project implementation.

##### (2) Recommendation to Hanoi People's Committee (HPC), Project Management Board (PMB) and Site Clearance Council (SCC)

Delay in land acquisition was identified as one of the five main causes that prolonged project implementation and incurred additional costs, as analyzed in Section 3.2.2.1. In the land acquisition process, there was a difficulty in persuading and negotiating with the affected households for acceptance of compensation due to (i) difficulty in identifying the households

affected due to the delay in finalizing the project boundary and detailed design, (ii) frequent changes in the compensation rates and calculation methods according to changes in HPC policy and regulations on the land acquisition and resettlement and (iii) insufficient operation of the Site Clearance Council (SCC) including a lack of provision of clear and detailed explanations to households.

Particularly the issues (i) and (iii) were related to the lack of information sharing among the relevant stakeholders especially the project, the local authorities and the people.

In order to improve such problems in the second phase of this project, HPC as well as PMB and SCC should improve information sharing among the project, the local authorities and the people by strengthening public relations. For example, provision of information to the local authorities and the people on the objectives, importance, and achievements of the project as well as information on land acquisition and resettlement through the mass media and community meetings may help to promote their consensus and support for the project, thus ensuring the progress of the project.

#### 4.2.2 Recommendation for JICA

Not specifically.

### **4.3 Lessons Learned**

(1) Lessons learned for information sharing and public relations regarding the land acquisition  
In order to facilitate the land acquisition process, the executing agency of the project as well as the local authorities in charge of land acquisition should promote information sharing and public relations through the mass media and community meetings to the project affected people including the provision of information on the objectives of the project, social benefits of the project as well as information on land acquisition and compensation policy, etc. In order to do so, the close coordination, information sharing, and a sense of common responsibility between the executing agency of the project and the local authority are indispensable. These measures may promote the understanding and cooperation of the affected people towards the project

## Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
<b>1. Project Outputs</b>		
1) Construction of Yen So Pumping Station cluster	<ul style="list-style-type: none"> <li>• Construction of Yen So Pumping Station: capacity of 45m<sup>3</sup>/s</li> <li>• Construction of regulating reservoirs: storage capacity of 4.9 mil. m<sup>3</sup></li> <li>• Spillways: 3</li> <li>• Inlet channel: 1.2km</li> <li>• Outlet channel: 1.6km</li> <li>• Yen So channel: 3.4km</li> <li>• 8 bridges and 6 culverts</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned except the number of culvert was reduced from 6 to 5.</li> </ul>
2) River improvement	<ul style="list-style-type: none"> <li>• Dredging and embanking of To Lich River, Lu River, Set River, Lu-Set floodway, Upper and Lower Kim Nguu River (33.8km)</li> <li>• Construction of 29 bridges and culverts</li> </ul>	<ul style="list-style-type: none"> <li>• Dredging and embankment was completed almost as planned (31.1km)</li> <li>• Construction of 7 bridges and culverts</li> <li>• Additional: 6km road construction along the To Lich River</li> </ul>
3) Construction of flood and control gates	<ul style="list-style-type: none"> <li>• 7 locations</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned</li> </ul>
4) Lake improvement	<ul style="list-style-type: none"> <li>• Dredging of 4 lakes (Giang Vo, Thanh Nhan 1, Thanh Nhan 2a, Thanh Nhan 2b)</li> <li>• Aeration applied in Thanh Cong Lake and Thien Quang Lake</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned</li> <li>• Dredging of Thanh Cong Lake and Thien Quang Lake was implemented instead of aeration</li> </ul>
5) Drainage channel improvement	<ul style="list-style-type: none"> <li>• Construction of bridges and culverts at 54 locations</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned</li> </ul>
6) Construction and rehabilitation of Sewers	<ul style="list-style-type: none"> <li>• West Lake basin, To Lich basin, Set River basin, Upper Lu River basin, and Kim Nguu River basin</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned</li> </ul>
7) Construction of pilot waste water treatment plants at Kim Lien and Truc Bach	<ul style="list-style-type: none"> <li>• Capacity of Kim Lien WWT plant: 3,700m<sup>3</sup>/day</li> <li>• Capacity of Truc Bach WWT plant 2,300m<sup>3</sup>/day</li> <li>• Activated sludge method applied</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned.</li> </ul>
8) Procurement of dredging equipment and facilities	<ul style="list-style-type: none"> <li>• 1 batch/package of 63 equipments units</li> </ul>	<ul style="list-style-type: none"> <li>• 1 batch as planned, and 1 additional package (total 88 equipment units)</li> </ul>
9) Development of resettlement area	<ul style="list-style-type: none"> <li>• 10.3 ha at Dong Tau resettlement zone</li> </ul>	<ul style="list-style-type: none"> <li>• 10.8 ha</li> </ul>
10) Training	<ul style="list-style-type: none"> <li>• No. of staff trained</li> <li>• O&amp;M of Yen So Pumping Station: 34</li> <li>• O&amp;M for drainage systems: 288</li> <li>• O&amp;M for WWT plants: 55</li> </ul>	<ul style="list-style-type: none"> <li>• Same as planned</li> </ul>
11) Consultant services	<ul style="list-style-type: none"> <li>• International consultant: 368 M/M</li> <li>• National consultant: 1,092 M/M</li> </ul>	<ul style="list-style-type: none"> <li>• International consultant: 507.8 M/M</li> <li>• National consultant: 1,651.9 M/M</li> </ul>
<b>2. Project Period</b>	April 1995 – April 2000 (61 months)	April 1995 – August 2005 (125 months)
<b>3. Project Cost</b>		
Amount paid in Foreign currency	15,160 million yen	14,422 million yen
Amount paid in Local currency	7,727 million yen (772,658 million VND)	7,080 million yen (885,000 million VND)
Total	22,887 million yen	21,502 million yen
Japanese ODA loan portion	18,571 million yen	15,288 million yen
Exchange rate	1 VND = 0.010 yen (As of October 1997) Note: Based on the cost estimation of Phase I-2 (VNV-1)	1 VND = 0.008 yen (Average in 1995-2005)