

Philippines

Metro Manila Flood Control Project (II)

Report Date: March 2001

Field Survey: September 2000

1. Project Profile and Japan's ODA Loan



Site Map: Manila Metropolitan Area



Bitas Pumping Station

(1) Background

Metro Manila Area is in a tropical monsoon climatic zone, and the combination of typhoons and other climatic conditions with geographical factor of situating 0 meters above sea level causes frequent flooding. On the basis of the "Master Plan for Drainage in the Manila Area" (1952), the Development of Public Works and Highways built pumping stations and independent sluice gates with Japan's ODA. These facilities greatly contributed to reduce flood damage. After that, population concentration and urbanization progressed rapidly in the Metro Manila Area, and the concentration of buildings reduced the land available to absorb rainwater. This left the area more prone to flooding, necessitating expansion of the flood control system and drainage facilities.

Metro Manila Area suffered a major flood in 1985. The Government of the Philippines conducted a survey of this flood damage and a feasibility study on countermeasures in order to draw up a plan for the implementation of the necessary flood control system and drainage projects. This project targeted Vitas and San Andres areas in Manila city, which were recommended in the feasibility study as particularly urgent areas.

(2) Objectives

To mitigate damage from floods in the Vitas and San Andres areas in Manila City, which suffer the worst flood damage in the Metro Manila Area.

(3) Project Scope

The project plan called for the construction of pumping stations (in three locations, the Vitas Pumping Station, the Balut Pumping Station and San Andres Pumping Station), improvement of esteros and drainage mains (in the Vitas and San Andres areas) and the use of consulting services (detailed design and construction supervision). The Japan's ODA loan covered the entire foreign currency portion and a part of the local currency portion.

(4) Borrower/Executing Agency

Republic of the Philippines / Department of Public Works and Highways (DPWH)

(5) Outline of Loan Agreement

| | |
|-----------------------------------|---|
| Loan Amount/Loan Disbursed Amount | ¥10,818 million / ¥9,058 million |
| Exchange of Notes/Loan Agreement | December 1987 / January 1988 |
| Terms and Conditions | Interest rate: 3%, Repayment period: 30 years (10 years for grace period), General Untied (partially untied for Consulting Services) |
| Final Disbursement Date | April 1998 |

2. Results and Evaluation

(1) Relevance

The medium-term Philippines development plan (1999~2004) aims to reduce flood damage through a combination of structural measures and non-structural measures (non-structural measures include flood warnings and tree planting). Structural measures intend to keep flooding in the Metro Manila Area within tolerable levels by implementing the additional construction and installation of embankments, drainage channels or pumping stations. Therefore this project was in line with the Philippines' development plans, and its relevance is recognized today¹.

(2) Efficiency

(i) Construction delays and changes in project scope

The initial completion schedule for the project was March 1994, but the land acquisition for esteros and drainage mains took time and was completed in February 1998. The land acquisition process which led to the construction delay took place from January 1989 to December 1997, because out of 4,500 squatter households subject to relocation, 300~500 took time to relocate. To cope with the land acquisition problem, the design for the river improvement was altered and part of it was removed from the project, and the Burakan main esteros was removed from the project. The location of the San Andres pumping station was also altered. According to the executing agency, there are now no major problems with the relocated

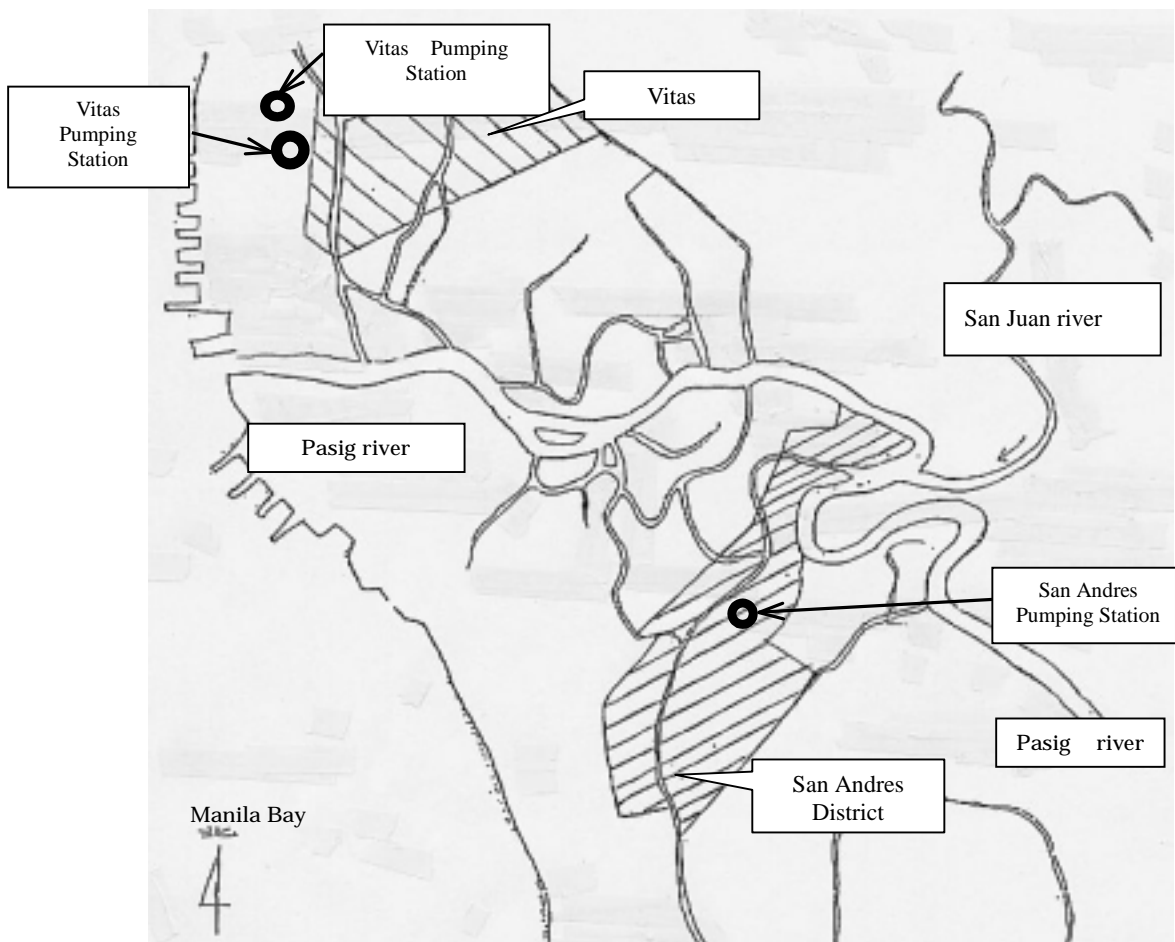
¹ The population of Manila City was 1,599,000 in 1990, rising to 1,655,000 by 1995, with an average annual growth rate of 0.7% over the period. The meteorological station at Port Area in Manila City, near the project site, recorded average annual rainfall of 2,060mm between 1961 and 1999, with the maximum level of 3,333mm in 1972. Average annual rainfall between 1988, when the loan agreement was signed, and 1999 was 2,143mm, with the maximum level in that period of 2,741mm in 1999. Thus the annual average rainfall has been over 2,000mm.

residents. (Refer to the impact section for details)

(ii) Project Cost

The initially planned project cost was ¥12.781 billion, but the actual cost was ¥17.069 billion, a cost overrun of over 30%. The initial project cost included the cost of squatter relocation, but not the cost of land acquisition², thus the project cost increased by that amount. Other than land acquisition cost, the cost of civil works (particularly the foreign currency portion) increased for both the Vitas and Balut pumping stations.

Site Map



(3) Effectiveness

(i) Pump operation

The duration of pump operation varies from year to year as required, for instance, in 1999, the Vitas pumping station worked at full capacity for over three months, the Balut pumping station for less than two months and the San Andres pumping station for over one month.

² The planned cost of land acquisition was ¥39.9 million (5.7 million Pesos at the exchange rate of the time), but the actual cost rose to ¥4,0667 million (784.9 million Pesos by the exchange rate used by the Department of Public Works and Highways).

Table 1: Annual Hours of Engine Operation at Each Pumping Station and Annual Rainfall

Units: Hours for operation time, mm for annual rainfall.

| Pumping station | 1997 | 1998 | 1999 |
|-----------------|---------|---------|---------|
| Vitas | 878.7 | 1,696.7 | 2,409.8 |
| Balut | 447.0 | 830.3 | 1,161.0 |
| San Andres | 50.0 | 517.5 | 776.5 |
| Annual rainfall | 2,297.6 | 2,095.6 | 2,740.5 |

Source: Operation hours from DPWH documents, rainfall from the Philippines National Meteorological Agency.

- Notes 1) The hours of engine operation for each pumping station are totals of the hours of operation for all the engines installed at the pumping station. Vitas pumping station has five engines, Balut has two and San Andres has four.
- 2) Annual rainfall figures are data measured by the meteorological station in Port Area in Manila City .

(ii) Flood reduction effect

Construction of the Vitas and Balut pumping stations was completed in December 1996, and the San Andres pumping station was completed in June 1997. The table below shows the yearly flood discharge, maximum high water level, maximum flood depth and flood duration. Compared to before the implementation of the project, the maximum flood depth and the flood duration have been greatly reduced, indicating the project's efficacy in reducing the extent of floods.

Table 2: Flood Reduction Effect

| | 1995 (Before the project) | 1998 | 1999 | 2000 |
|---|------------------------------|------------|------------|------------|
| Yearly flood discharge ⁽¹⁾ (m ³ /year) | | | | |
| Vitas | - | 22,527,360 | 55,520,640 | 68,135,040 |
| Balut | - | 1,831,500 | 4,178,700 | 5,785,200 |
| San Andres | - | N.A. | 13,278,835 | 14,880,930 |
| Maximum high water level ⁽²⁾ (cm) | | | | |
| Vitas | - | 10.5 | 10.5 | 10.5 |
| Balut | - | 10.5 | 10.5 | 11.8 |
| San Andres | - | 11.7 | 11.6 | 11.8 |
| Maximum flood depth ⁽³⁾ (cm) | | | | |
| Vitas | 100 | 30 | 30 | 20 |
| Balut | 100 | 30 | 30 | 30 |
| San Andres | 80 | 30 | 20 | 20 |
| Flood duration ⁽⁴⁾ (hour) | | | | |
| Vitas | 10 | 5 | 5 | 5 |
| Balut | 10 | 5 | 5 | 5 |
| San Andres | 6 | 2 | 2 | 2 |

Source: DPWH documents.

- Notes 1) Water discharge over the year from the Vitas , Balut and San Andres pumping stations.
- 2) Maximum high water level relative to the reference point in the estero.
- 3) Relative to the road level in the affected area.
- 4) Maximum flood duration per flood.

(iii) Direct reduction of flood damage

Table 3 shows the numbers of people evacuated due to flooding in the Vitas area (with the Vitas and Balut pumping stations) and the San Andres area³.

Evacuee numbers are lower than before the implementation of the project, with the exception of 1998⁴, suggesting a positive effect from the project.

Table 3: Numbers of Evacuees Due to Floods

| Year | No. of evacuated households | No of evacuated people | Fatalities |
|------|-----------------------------|------------------------|---------------|
| 1996 | 492 | 2,460 | None reported |
| 1997 | 330 | 1,650 | 4 fatalities |
| 1998 | 949 | 4,745 | None reported |
| 1999 | 280 | 1,400 | None reported |
| 2000 | 266 | 1,330 | None reported |

Source: Manila City

Data on the value of flood damage in Manila City was not available. Therefore Economic Internal Rate of Return (EIRR) was not recalculated.

As described before, the scope of this project was changed, but the water control and drainage effects were realized in the target areas.

(4) Impact

Social impact

According to the DPWH the resident relocations which delayed this project were carried out based on the Republic Law and there are now no major related problems. Most of the squatters subject to relocation were relocated to North Hills Village in Bulacan district, to the north of Manila. Related costs were covered by the DPWH. Relocated residents were provided with a house and land and had to repay funds to the Home Guarantee Corporation over a long period of 25 years. Some of the relocated residents found jobs in the area, others opened shops or continued working in Manila, returning to the village on weekends.

(5) Sustainability

Operation and maintenance of the project is under the National Capital Region Office (NCR) of the DPWH, with the pumping stations handled by the Pumping Station and Floodgate Division and the esteros handled by the Flood Control and Drainage Division.

The facilities constructed under the project are well maintained. The staff received training from the equipment supplier on how to operate the equipment and deal with breakdowns, and DPWH engineers working on older pumping stations provided staff with on the job training (OJT) in maintenance work.

³ The water catchment area of the San Andres pumping station includes Paco, Pandakan and San Andres, and had a population of 234,000 people and 49,000 households in 1995. The water catchment area of the Vitas and Balut pumping stations includes Santa Cruz and Binondo, and had a population of 134,000 people and 28,000 households in 1995.

⁴ Manila City recorded damage from three typhoons in September and October 1998.

However, considering the three-shift system and the additional garbage collection work, the staff allocation is not adequate. The staff at the Vitas, Balut and San Andres pumping stations are 19, 6 and 17 respectively as of 2000, but the Vitas pumping station, for example, appears to require 25 staff⁵. The shortage of staff could be a serious problem especially when there is torrential rain or flooding.

Meanwhile, as Table 4 shows, the operation and maintenance costs for the pumping stations have been rising continuously to date. According to the executing agency, the budget is prone to shortfalls, but they are trying to cope by saving on electricity and fuel costs.

Table 4: Operation and Maintenance Costs for Pumping Stations

Unit: million peso

| | 1998 | 1999 | 2000 |
|----------------------------|------|------|------|
| Vitas Pumping Station | 2.2 | 4.1 | 6.3 |
| Balut Pumping Station | 0.5 | 1.3 | 1.7 |
| San Andres Pumping Station | 1.7 | 2.2 | 3.2 |

Source: DPWH materials

Note: Operation and maintenance costs are recorded costs expended by the Pumping Station and Floodgate Division on the pumping stations built under the Japan's ODA loan. The costs include personnel costs, electricity, telephone and water bills, and the costs of diesel, materials and spare parts. Authority over the project was transferred to the Pumping Station and Floodgate Division at the start of 1998.

The personnel and budget for the pumping stations may not always be adequate, but a strong management effort is being made to make effective use of the limited resources available.

The major problem with the operation and maintenance of this project is the handling of waste discarded in the esteros. At the time of the appraisal, it was concerned that the large volume of wastes generated had been impeding the operation of the pumping stations, resulting from the disposal of wastes into the esteros by large numbers of squatters concentrated along the esteros. The site study confirmed that the Vitas and San Andres pumping stations were equipped with waste extractors, but there was clearly a problem with the disposal of that wastes, which was allowed to lie around the pumping station for long periods. In addition to the waste collection problem, there is a shortage of dump trucks⁶ to carry the wastes and there are problems with the disposal sites⁷. The DPWH says that the local government is running an information campaign to educate residents in the project area about waste problems, but this is not a problem that can be solved in the way attempted in this project, by simply installing waste extractors. The problem requires a systematic effort by the Government of the Philippines in cooperation with the local government.

⁵ The DPWH says that three operators are required for five pumps, and one utility worker is required for each pump (for cleaning and waste collection). The pumping stations run on a three-shift system, which means that the pumping station requires 25 workers in total, including a station foreman. The impact of budget cuts in the National Capital Region (NCR) led to a reduction of workers employed as day laborers in 1999. In addition, Administrative Order No.100 of December 1999 ordered a freeze on new appointments.

⁶ On the day when we visited the Vitas pumping station, workers were loading the wastes collected by the waste extractor onto a truck, but a mountain of collected wastes apparently sufficient to fill 40 trucks had accumulated at the San Andres pumping station. The person in charge stated from memory that the last time trucks had collected wastes there was around one and a half months earlier.

⁷ Wastes from the Vitas pumping station is disposed of at the Bosoboso dump in San Mateo, Rizal. Bosobosa is a four hour drive away, thus it is impossible to carry more than a few truck loads a day for such a distance. Furthermore the dump was to be closed in December 2000 in the face of opposition from local residents. The alternative plan was to redirect the wastes to Cavite, but that is also running into opposition from local residents.

Comparison of Original and Actual Scope

| Item | Plan | Actual |
|------------------------------------|----------------------------|-----------------------|
| Project Scope | | |
| 1. Construction of pumping station | | |
| Vitas | 31.8 m ³ /s | 30 m ³ /s |
| Balut | 2.0 m ³ /s | No changes |
| San Andres | 17.4 m ³ /s | 19 m ³ /s |
| 2. Esteros and drainage mains | | |
| Vitas | 7.6 km | 4.994km |
| San Andres | 4.9 km | 3.3km |
| 3. Consulting Service | | |
| Detailed design | Foreign Local | No changes |
| Construction supervision | 89 115 | |
| | 145 170 | |
| | Total 519 M/M | |
| Implementation Schedule | | |
| 1. Loan agreement | Jan. 1988 | Jan. 1988 |
| 2. Consultant | | |
| Detailed design | Aug. 1988 ~ Sep. 1989 | Jan. 1989 ~ Aug. 1990 |
| Construction supervision | May 1990 ~ Apr. 1993 | Sep 1990 ~ May 1998 |
| 3. Construction of pumping station | | |
| Vitas, Balut | Jul. 1990 ~ Apr. 1993 | Sep. 1994 ~ Dec. 1996 |
| San Andres | May 1990 ~ Feb. 1992 | Oct. 1994 ~ Jun. 1997 |
| 4. Esteros and drainage mains | | |
| Vitas | Aug. 1990 ~ Apr. 1993 | Sep. 1994 ~ Feb. 1998 |
| San Andres | Apr. 1990 ~ Jul 1992 | Oct. 1994 ~ Feb. 1998 |
| Local portion | Jun. 1988 ~ Mar. 1994 | Sep. 1994 ~ Feb. 1998 |
| 5. Land acquisition | Feb. 1988 ~ Aug. 1990 | Jan. 1989 ~ Dec. 1997 |
| Project Cost | | |
| Foreign currency | ¥7,573 million | ¥8,932 million |
| Local currency | 744 million peso | 1,570 million peso |
| Total | ¥12,781 million | ¥17,069 million |
| ODA Loan portion | ¥10,818 million | ¥9,058 million |
| Exchange rate | 1 peso = ¥ 7 (May 1987) | 1 peso = ¥5.1813 |