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The World Bank

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Report No. 10833

PROJECT COMPLETION REPORT

KOREA

NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

JUNE 30, 1992

Infrastructure Operations Division
Country Department II
Asia Regional Office

CURRENCY EQUIVALENTS

Currency Unit = Won (W)

Average used in Appraisal Estimates (June 1985): US$1.00 = W 816

Actual yearly average market values: 1/

US$1.00	=	W 870 (1985 average)
	=	W 881 (1986 average)
	=	W 823 (1987 average)
	=	W 731 (1988 average)
	=	W 671 (1989 average)

FISCAL YEAR

January 1 to December 31

WEIGHTS AND MEASURES

m	=	meter	= 3.28 feet
km	=	kilometer	= 0.62 miles
sq km	=	square kilometer	= 0.39 square miles
cu m	=	cubic meter	= 264 US gallons of water
			= 1.0 metric ton of water
cu m/d	=	cubic meters per day	
l	=	liter	= 0.26 US gallons
mt	=	metric ton	= 2,205 pounds
			= 1.0 cubic meters of water
mt/d	=	metric ton per day	

ABBREVIATIONS AND ACRONYMS

ADB	=	Asian Development Bank
ERR	=	Economic rate of return
ICB	=	International competitive bidding
IFRR	=	Incremental financial rate of return
ISWACO	=	Industrial Sites and Water Resources Development Corp.
KOWACO	=	Korea Water Resources Corp. (replaced ISWACO in 1988 as agency responsible for water resource development and management).
MOC	=	Ministry of Construction
MOF	=	Ministry of Finance
MOHA	=	Ministry of Home Affairs
NRS	=	Namgang Regional Water System
OSROK	=	Office of Supply, Republic of Korea
RCMA	=	Regional Construction and Management Agency of MOC
TWB	=	Taegu City Water Bureau
TWS	=	Taegu Water System
TWSB	=	Taegu Water Supply and Sewerage Bureau
WB	=	Water Bureau

1/ Average market (rf) values from "International Financial Statistics", published by the International Monetary fund.

THE WORLD BANK
Washington, D.C. 20433
U.S.A.

Office of Director-General
Operations Evaluation

June 30, 1992

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Completion Report on Korea Namgang and Taegu Water Supply Project (Loan 2615-KO)

Attached, for information, is a copy of a report entitled "Project Completion Report on Korea Namgang and Taegu Water Supply Project (Loan 2615-KO)" prepared by the Asia Regional Office with Part of the report contributed by the Borrower. No audit of this project has been made by the Operations Evaluation Department at this time.

Attachment

PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

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PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

PREFACE

This is the Project Completion Report (PCR) for the Namgang and Taegu Water Supply Project in Korea, for which Loan 2615-KO in the amount of US$38.0 million to the Republic of Korea was approved on August 27, 1985. This was the fourth Korean project exclusively for community water supply financed by the Bank (Part III, Section 1).

The project had two components. One was for the Namgang Regional Water System, for which US$15.0 million of the loan was allocated. The other was for the Taegu Water System, for which US$23.0 million of the loan was relent to the City of Taegu under a Subsidiary Loan Agreement.

During project implementation, US$3.87 million of the loan amount was canceled at the request of the Borrower. The loan was closed on schedule on June 30, 1990 and the undisbursed balance of US$0.12 million was canceled on July 2, 1990. The final disbursed amount was US$34.01 million.

Complimentary distribution networks in the two main project cities of the Namgang Regional Water System were part of an entirely separate project financed through a loan by the Asian Development Bank. Distribution facilities for the other communities to be served by the Namgang System were financed from funds made available through the Ministry of Home Affairs.

The PCR has been prepared jointly by the Infrastructure Operations Division of the Asia Regional Office (Preface, Evaluation Summary and Parts I and III) and the Ministry of Construction and Taegu City's Water Supply Agency which contributed the information for Part II.

PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

EVALUATION SUMMARY

The Project and Its Objectives

i. The project was the fourth in a line of Bank financed Korean projects exclusively for community water supplies, all the result of the increased priority being given by the Government since the late 1970's to upgrading and expanding water services in water-scarce regions and urban areas and to make better use of limited national water resources (Part I, paras. 1 and 2; Part III, Section 1).

ii. The project consisted of two water supply components: the Namgang Regional Water System (NRS) component to serve communities in Kyeongnam Province; and the Taegu Water System (TWS) component for Taegu City. Annex 1 is the description of the project as given in Schedule 2 of the Loan Agreement. As a whole, the project was expected to improve water services to about two million people and provide public water service for the first time to about 520,000 additional persons by 1991 (Part I, paras. 7 and 9; Annex 1).

iii. The objectives of the NRS component were to provide adequate and reliable treated water to 13 cities, towns and villages, 9 of which had no public water service, located in a poor area of the country where water shortages had been a major hindrance to development and the cause of serious conflicts between municipalities over the use of limited ground water resources (Part I, para. 7). Complimentary distribution networks in the two main project cities of the NRS were part of an entirely separate project financed through a loan by the Asian Development Bank. Distribution facilities for the other communities to be served by the NRS were financed from funds made available through the Ministry of Home Affairs.

iv. The TWS component was intended to increase water supply coverage in Taegu, ensure adequate water service particularly to the low-income population, reduce unaccounted-for water from about 40% of production to about 30% by 1990 and improve the organization of water supply and sewer services in Taegu. Other project objectives were to extend the scope of a national bulk water tariff study to include the NRS, and generally to promote sector development through expanded dialogue with the Government (Part I, para.8).

v. While generally conventional, the project included some important features which were innovative for Korea: the treatment of water before distribution in bulk to the communities served by the NRS; and the objective of combining the water supply and sewerage service operations in Taegu. The project was expected to be completed by December 31, 1988 at a total cost, based on June 1985 prices, of W 84.5 billion, or US$ 103.7 million equivalent (Part I, paras. 5, 9 and 13).

Implementation Experience

i. Appraisal, negotiations and Board approval of the loan (in August, 1985) took place about five months ahead of the Bank's timetable for the project. The loan became effective two months after loan approval. By the time the loan was approved, the project was in an advanced stage of preparation. General Procurement Notices had been advertised, pre-qualification of contractors for civil works had been carried out, detailed design was substantially completed, and some contracts had been bid and were ready for award (Part I, paras. 6, 18 and 19; Part III, Section 2a).

vii. Designs, procurement procedures, project management and construction quality were very good for both project components. The TWS component was completed on schedule. Implementation of the NRS component was marred by planning errors. Land acquisition problems, which should have been resolved at the planning stage, required relocation and redesign of the water treatment plant and portions of the transmission mains. A belated decision by the Water Resources Bureau of the Ministry of Construction (MOC) to consider raising the level of the existing dam, caused a long delay in setting the elevation of the water intake. The possibility of such a change had not been brought up when the project was prepared and appraised due to poor coordination between government agencies. These problems were the principal cause of delay of final completion of the NRS component by about 21 months (Part I, paras. 16, 17 and 20-23; Part II, paras. 1.5-1.7).

viii. Procurement went smoothly. Although all contracts for supply of goods and all major construction contracts were open for international competition, there was limited interest by foreign firms and few were successful in winning contracts. This is attributed to the competitiveness of Korean firms and the local availability and good quality of most goods and services required for the project (Part I, paras. 22-24).

ix. The reported total actual cost of the project was W 66,400 million (US$84.3 million equivalent), or about 78% of the appraisal estimates when expressed in won and about 81% when expressed in US$. For the NRS component, the actual costs were about 84% of the appraisal estimates when expressed in won, or about 89%, expressed in US$. For the TWS component, the reported total actual costs were about 75% of the estimates when expressed in won, or about 77, expressed in US$ (Part I, paras. 25-30; Part III, Section 5a).

x. Because of the low level of involvement by foreign contractors and suppliers, direct foreign exchange expenditures on the project were unexpectedly low at only about 6% of total costs and indirect foreign exchange costs for imported inputs for local goods used in the project probably were higher than estimated at appraisal (Part I, paras. 26, 27 and 34; Part III, Section 5a).

xi. Project cost savings resulted from a number of factors, principally: the very active local competition for contracts; good contract documents, procurement procedures and project management; and a very low and unexpected level of reliance on imported goods. The appraisal estimates were based on actual MOC experience with Japanese contractors and suppliers winning most contracts and could not anticipate the tremendous development of Korean industry and its efficiency during the implementation period (Part I, paras. 26 and 34; Part III, Section 5a).

Project Results

xii. The project can be expected to meet substantially all of the physical objectives by 1995, although improvements resulting from the NRS component started about one year late. By 1995 about 950,000 additional persons should have public water service, of which about 90,000 had not previously had access to any public water service prior to the project, and the total population served by the two water supply systems should be close to 3.4 million. In addition, unaccounted-for, or non-revenue water in Taegu had been reduced from about 38% of production in 1984 to about 29% in 1990, which was better than the project objective and an excellent example of a successful loss reduction program (Part I, para 37; Part III, Section 6a).

xiii. The financial results of the project were less satisfactory. A government freeze on tariff increases - part of a price stabilization policy - blocked efforts to raise tariffs necessary to achieve satisfactory levels of performance by both water supply agencies as specified in the loan agreement. The Taegu City Water Bureau (TWB) appears to have managed the tariff constraint problem better then the Korea Water Resources Corporation (KOWACO), the agency responsible for NRS operations, by keeping its operating expenses under control (Part I, paras. 38 and 39: Part III, Section 6c).

xiv. Considering the financial results, the economic results were reasonably good. The recalculated incremental financial rates of return (IFRR) for the two systems (about 2% for Namgang and about 16% for Taegu) are substantially the same or only slightly lower than the appraisal estimates. It is clear that the recalculated returns benefitted considerably from the reductions in project costs. Also, continuation of restrictions on tariff increases, together with increasing operating expenses, could easily result in a negative IFRR for the NRS component. In this case, however, the economic rate of return (ERR), rather than the IFRR, is a better basis for evaluation, and while the ERR has not been recalculated, there is nothing to indicate that it would be significantly different from the 6% calculated during appraisal (Part I, paras. 40-42; Part III, Section 6b).

xv. The project's success in meeting the objective of improving the combined efficiency of Taegu's water supply and sewerage services was limited. Bank insistence on the need for reorganization of the services did help to promote policy discussions and analyses of possible sector organizations at the national level, however, and for a few years during project implementation the Taegu water and sewerage services had the same director. But in 1990, there was a major reorganization of the water supply sector and Taegu's water and sewerage services were separated again. Nevertheless, the 1990 reorganization could lead to sewerage services becoming self-financing and becoming part of the newly established water supply corporations (Part I, paras. 43-45).

Sustainability

xvi. The major recognizable risk to the project's achievement and enhancement of its potential benefits is continuation of the Government's resistance to allowing the water supply agencies to set tariffs and other charges at necessary levels. Another risk is that continued delay in acquiring land necessary for optimum operation of the NRS reservoir could limit the systems capacity to meet future demands (Part I, para. 46).

Findings and Lessons Learned

xvii. This was a very successful project by any standard. It was well conceived and timely and the benefits upon completion are high. Preparation and loan effectiveness were accomplished in record times. Designs were excellent. The project was carried out economically, substantially below the estimated costs and, except for the problems which hampered the Namgang component, implementation was efficient.

xviii. The principal lessons emerging from the project experience are:

a) thorough project preparation by an efficient and technically qualified implementing agency can lead to a very successful project, but, as in the case of the Namgang component, failure to make thorough pre-design investigations or to make timely decisions, can cause avoidable delays (Part I, para. 17; Part II, paras. 1.6-1.9);

b) we'l designed contract documents, quick and efficient procurement procedures and good tight project management can keep project costs under control by reducing delays, changes, disputes, misunderstandings and contractor claims for extra compensation (Part I, para. 25);

c) cooperative, understanding and receptive attitudes by staff on both sides - the executing agencies and the Bank - can result in efficient communication and quick resolution of most differences which can arise during project preparation and implementation (Part I, paras. 48-49; Part II, para. 5.2);

d) determination and efficiency in applying leak detection technology and applying other measures for reducing unaccounted-for or non-revenue water can be very successful even in a large system containing significant amounts of old distribution pipelines (Part I, paras. 8 and 37; Part II, para 10.1);

e) appraisal teams on any project which might conflict with the interests of other government agencies, or other parts of the implementing agency, should assure that other development plans or activities are unlikely to disrupt implementation of the proposed project (Part I, para. 17; Part II, paras. 1.8, 2.2 and 2.4);

f) Bank supervision missions should carefully review all project cost, forecasting and reporting procedures to assure that there is a clear understanding of how the records should be kept and reported for Bank purposes (Part I, para. 52); and

g) if internal financial or economic rates of return are to be recalculated upon project completion, then it is essential for Bank staff to assure that up-to-date records of the necessary inputs are maintained and available for the Bank when the project is completed (Part I, paras. 40-42, Part III, Section 6b).

PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

PART I: PROJECT REVIEW FROM BANK'S PERSPECTIVE

Project Identity

Project Name:	Namgang and Taegu Water Supply Project
Loan Number:	2615-KO
RVP Unit:	Asia Regional Office
Country:	Republic of Korea
Borrower:	Republic of Korea
Sector:	Water Supply

Background

1. Sector Development Objectives. Korea, with one of the world's highest population densities (410 persons/sq km in 1984) is also one of the most urbanized of the developing countries. Urban population in the early 1980s was increasing about 5% per year, or about three times the estimated growth rate of the total population. This rapid urbanization along with remarkable economic growth beginning in the 1960s overextended all urban services, particularly water supply and waste disposal. The relatively low priority that had been given to the water supply sector and the piecemeal approach to improvements that had been followed did not meet the growing needs and resulted in rapidly decreasing levels of service.

2. In the late 1970s, the Government began to give increased priority to social infrastructure, started to make substantial higher investments in the water supply sector and approached multilateral agencies for assistance with the financial, management, operational, project planning and water resource exploitation problems of the water supply sector. The objectives were to upgrade and expand water services in water-scarce regions and urban areas and to make better use of limited national water resources. This led to a Bank loan for the First Water Supply Project (Loan 2072-KO) which was approved in December 1981 and which was soon followed by Loan 2350-KO for the Second Water Supply Project, approved in October 1983, and Loan 2491-KO for the Metropolitan Region Water Supply Project, approved in February 1985 (Part III, Section 1).

3. Project Preparation. The project was identified and feasibility studies completed as part of the First Water Supply Project (Loan 2072-KO). Detailed engineering for the Namgang Regional Water System (NRS) component of the project was financed by the Ministry of Construction (MOC) and carried out by a local consulting firm in association with a French firm. Detailed engineering for the Taegu Water System (TWS) component was financed by Taegu City and prepared by another local consulting firm with the assistance of two firms from Japan.

4. Project preparation proceeded quickly and NRS and TWS components were identified as suitable for Bank financing by a Bank mission in November 1984. A proposed third component for the Geum Ho Region was also evaluated by the mission which concluded that it was not economically justified at that time and not suitable for Bank financing, a conclusion which the Government accepted (Part III, Section 2b).

5. An important innovation for Korea was the design decision to treat water provided by the NRS component prior to distribution to the beneficiary communities, rather than to follow the usual practice in Korea of requiring each community to treat the bulk water delivered to it. This improved the economy of the project and reduced the cost of water to the consumers.

6. Pre-appraisal was in February 1985, at which time there were a number of issues (Part III, Section 2b), including, for the TWS, the lack of a satisfactory investment plan for expansion of sewerage and the feasibility of integrating water supply and sewer services of the city. For the NRS, the most important issues were about adequacy of plans for constructing water distribution facilities in the 13 communities to be served and about land acquisition required to operate the existing Namgang Reservoir at elevations required to meet future water demands. These issues were resolved satisfactorily, for the time being, during appraisal, which took place in April 1985 and during negotiations in July 1985. Appraisal, negotiations and Board approval of the loan (in August, 1985) took place about five months ahead of the Bank's timetable for the project (Part III, Section 2a).

Project Objectives and Description

7. Objectives. The project consisted of two water supply components: the NRS component to serve communities in Kyeongnam Province; and the TWS component for Taegu City. As a whole, the project was expected to improve water services to about two million people and provide public water service for the first time to about 520,000 additional persons by 1991. The objectives of the NRS component were to provide adequate and reliable treated water to 13 cities, towns and villages, 9 of which had no public water service, located in a poor area of the country where water shortages had been a major hindrance to development and where the cause of serious conflicts between municipalities over the use of limited ground water resources.

8. The TWS component was intended to increase water supply coverage in Taegu, ensure adequate water service particularly to the low-income population, reduce unaccounted-for water from about 40% of production to about 30% by 1990 and improve the organization of water supply and sewer services in Taegu. Other project objectives were to extend the scope of a national bulk water tariff study to include the NRS, and generally to promote sector development through expanded dialogue with the Government.

9. Project Description. Annex 1 is the description of the project as given in Schedule 2 of the Loan Agreement. The NRS component included a water intake at Namgang Reservoir, about 80 km of transmission pipelines with a capacity of 115,000 cubic meters per day (cu m/d), a treatment plant with a first stage capacity of 75,000 cu m/d and storage reservoirs of 12,000 cu m capacity. Distribution networks in the two main cities were part of an entirely separate project financed by the Asian Development Bank, and distribution in the other communities was to be coordinated by the Ministry of Home Affairs (MOHA) and financed from a fund established by MOHA for water supply investments in small communities.

10. The TWS component included a water intake on the Nakdong River, transmission facilities, a 400,000 cu m/d treatment plant, storage reservoirs of 80,000 cu m capacity, rehabilitation and expansion of distribution networks and a study for improving the organization of water and sewerage services.

11. The project was expected to be completed by December 31, 1988 at a total cost, based on June 1985 prices, of W 84.5 billion (US$ 103.7 million equivalent), including allowances for physical and price contingencies.

Project Organization and Design

12. Organization. The NRS component was to be implemented by MOC and supervised by its Pusan Regional Construction and Management Agency (RCMA) with the support of the consultants engaged for detailed design (para. 3), the appointment of which was a condition for loan disbursements for this component. Bidding and contract awards were to be the responsibility of the Office of Supply (OSROK), the Government's procurement agency. MOC's Water and Sewerage Bureau was to provide coordination from Seoul as well as coordination with the Bank. After completion of the NRS facilities, the assets and liabilities were to be transferred to the Industrial Sites and Water Resources Development Corporation (ISWACO) which was to be responsible for operation, maintenance and debt payment. ISWACO was an agency established by the Government in 1974 for the promotion of industrial sites and water resources development, and was satisfactorily operating 9 other regional water supply systems.

13. The TWS component was to be implemented by the Taegu City Water Bureau (TWB) with the aid of the same consultants that were engaged for detailed design (para. 3). Bidding and contract awards were to be the responsibility of TWB with the support of OSROK. MOHA was to review the organization of the Taegu water supply and sewerage services and evaluate the feasibility of their integration. The concept of integrating these services was innovative for Korea where only Seoul had a similar system.

14. The organizational arrangements, although complex because of the vertical organization of the Government which tends to create coordination problems, worked out satisfactorily. The only notable problem was a lack of communication between MOC and RCMA. It appears that the consulting contract for supervision of construction of the NRS component, a condition for disbursements for that component, had been signed in August 1986 and was in RMCA's possession, but was not forwarded to the Bank through MOC until March 1987. This could have delayed disbursements for the NRS component but for the fact that MOC elected not to request disbursements for civil works (para. 32).

15. During project implementation, there were organizational changes, but these did not affect the project. For Taegu, MOHA decided that, based on experience in Seoul, there were advantages to combining the water supply and sewerage agencies, and the TWB was reorganized into the Taegu Water Supply and Sewerage Bureau (TWSB) effective April 1, 1987, a move strongly supported by the Bank. Also, in July 1988 the Government decided to split ISWACO into two organizations, one of which, the Korean Water Resources Corporation (KOWACO), assumed responsibility for water resources. The Bank had no objection to this change and the completed NRS component was transferred to KOWACO under a Transfer and Operations Agreement finalized in December 1989.

16. Project Design. Planning and design of the TWS component was carried out very efficiently with good quality; factors which contributed to substantial completion of this component on schedule.

17. Design of the NRS component was also very good, but marred by planning factors. Firstly, the planned site of the water treatment plant had

to be changed because the original site included a burial ground. Regardless of compensation, there was unexpected resistance to removal of tombs. A new site had to be acquired and designs of the plant and portions of the transmission mains had to be revised, resulting in a delay of several months before construction could start (Part II, paras.1.5-1.7). There also were delays in the acquisition of land required for some critical pipelines. And finally, there was an extended delay in establishing the elevation of the water intake at the Namgang Reservoir. This was caused by a belated decision by the Water Resources Bureau of MOC to raise the crest of the dam and revise the design operating level of the reservoir, a possibility which had not been brought up at the time of project preparation and appraisal. Taken together, these planning shortcomings were the principal cause of delay of final completion of the NRS component by about 21 months.

Project Implementation

18. Loan Effectiveness and Project Start-up. There were no difficulties in meeting the conditions of effectiveness, and the loan became effective on November 18, 1985, about one month ahead of the latest date for effectiveness given in the loan agreement.

19. By the time the loan was approved, the project was in an advanced stage of preparation. General Procurement Notices had been advertised, pre-qualification of contractors for civil works had been carried out, detailed design was substantially completed, and some contracts had been bid and were ready for award by the time the loan was effective.

20. The TWS component proceeded quickly on schedule from that point. Consultants for assistance with project construction supervision were appointed in December 1985. Procurement and construction proceeded substantially on schedule, or slightly ahead of schedule.

21. The NRS component, however, stalled almost immediately because of the problem with water treatment plant site acquisition and then because of the decision to revise the operating level of the reservoir (para. 17). Because procurement for the NRS component was delayed, signing of the consultant contract for construction supervision was put off until August 1986. Once construction of the water treatment plant and intake got underway, progress was faster than scheduled. Land acquisition to permit optimum reservoir operation has been slow, however; by June 1991 only 33% of the required land was acquired (para. 6; Part II, para. 2.5).

22. Procurement. Procurement documents prepared by the consultants for each project component benefitted from the experience of the consultants and implementing agencies on other Bank financed projects and were generally very good. Few comments on draft documents were required by Bank staff.

23. Pre-qualification, bidding, bid evaluations and contract award procedures were carried out promptly and efficiently. A few times, however, the Bank had to object to a proposed award to a company other than the low evaluated bidder. These occurred under Local Competitive Bidding procedures where, under certain circumstances, the national Budget Law allowed that bids below 85% of the official cost estimate could be disqualified because of the risk of substandard performance. Once, involving a contract valued below the limit requiring the Bank's prior approval of award, the Bank approved the award on an exceptional basis so as not to delay the project.

24. Although all contracts for supply of goods and all major construction contracts were open for international competition, there was limited interest by foreign firms and few were successful in winning contracts. In most cases, foreign suppliers and contractors did not even respond to invitations to pre-qualify. For the NRS component, the only imported goods and services were small amounts of consulting services and specialized mechanical and electrical equipment.

25. Project Costs. Appraisal estimates and actual costs of the project are compared in Part III, Section 5a. The actual costs of the NRS component totaled about W 27,330 million (US$ 35.2 million equivalent). These totals are about 84% of the appraisal estimates when expressed in won, or about 89% of the estimates when expressed in US$. Significant factors in the cost savings for the NRS component were: very active competition for contracts by qualified firms; well designed contract documents, generally efficient procurement and implementation and good tight project management which prevented costly claims for extra work because of misunderstandings, delays and changes; and a very low and unexpected level of reliance on imported goods and services, including consulting services. The only cost component which exceeds estimates is for land acquisition.

26. The foreign exchange expenditures for goods and services directly imported for Namgang were unexpectedly low; only about 9% of the total costs. This can not be compared with the appraisal estimate of a 43% total foreign cost component, however. The appraisal estimate also included the considerable cost of imported inputs for goods produced in Korea and was the result of a comprehensive analysis of the foreign cost of goods produced locally and which might be used in the project. That type of analysis has not been repeated for the PCR. Since the use of local goods and services was much more than had been anticipated, it is probable that the actual indirect foreign costs were also higher than the estimates, and that the proportion of the actual total foreign cost component in the total project costs was approximately the same as the estimates.

27. For Taegu, the reduction in actual costs compared to the appraisal estimates was even more striking; the reported total actual costs were about W39,100 million (US$49.1 million equivalent), or only about 75% of the estimates, and the direct foreign exchange expenditures, only about 4% of the total, compared to an estimated total foreign component of 41%. The reasons for the cost reduction appear to include all of the factors mentioned above for Namgang. In addition, however, it appears that refinements were made in the final designs and cost estimates after the appraisal estimates were made, and that these resulted in a cost reduction of about W 2,000 million (US$2.45 million) below the appraisal estimates. It may be also that all of the costs for the TWS component have not been properly charged to the project; there is some uncertainty cost distribution between project and non-project capital improvements for the Taegu water system during the project period.

28. The total actual costs of the entire project were W66,400 million (US$84.3 million equivalent) or about 81% of the appraisal estimates. The major savings were in the costs of materials and equipment (27%), civil works (14.5%) and duties and taxes (53%). The only increase in actual costs compared to the appraisal estimates were for land acquisition (97%).

29. The only conclusion that appears to emerge from examination of the appraisal estimates and actual cost data is that the estimates could not

anticipate two key factors: the keen local competition for contracts which not only kept local costs down but also virtually excluded foreign competition for both supply and construction contracts; and the generally high level of efficiency which was realized in procurement and project implementation.

30. Project Financing. Part III, Section 5b, compares the appraisal estimates and actual sources and amounts of financing required for the project. Although actual Bank loan disbursements for both the Namgang and Taegu components were lower than the appraisal forecasts, the proportion of total actual expenditures financed from the loan for each component was somewhat higher. For Namgang, the loan financed about 42% of total expenditures rather than the estimated 38%. And for Taegu, 39% of expenditures, rather than 36%, were financed.

31. There were no delays or shortfalls in project funds provided from local sources to cover the balance of the project costs.

32. Loan Allocations and Disbursements. The period between June 1987 and June 1988 was the only time when disbursements equaled or exceeded the appraisal forecasts (Part III, Section 3a). Disbursements started slowly mainly because of the delays on the NRS component and a decision by MOC not to use Bank loan funds for civil works or consulting services (Part III, Section 3b), apparently because of concern that the cost of equipment and materials would exceed estimates. MOC also delayed the establishment of a Special Account and after it was opened it was seldom utilized (Part III, Section 7).

33. During the disbursement period, TWB promptly recognized the probability of substantial cost savings and in February 1987 requested cancellation of nearly US$2.3 million from Part B of the loan. MOC, however, may have realized that the total cost of equipment and materials would be lower than estimated, but it elected to finance substantially the total cost of this category from the loan and ended up using about 35% more than had been allocated to the category originally. The difference came from the unused amounts allocated for civil works, consulting fees and unallocated categories.

34. The project appraisal estimated that 100% of the Bank loan would be disbursed for direct and indirect foreign exchange expenditures, although the allocation procedures allowed for disbursement against local currency expenditures. In fact, because of the very low direct foreign currency expenditures for the project (paras. 26-27), about 84% of the loan was disbursed for local currency expenditures, which, however, included mainly the indirect foreign costs of goods produced locally.

35. There were major differences between the actual final allocations of the proceeds of the loan and what was anticipated when the loan was made (Part III, Section 3b). For Namgang, as noted, no disbursements were made for civil works. For Taegu, however, most of the civil works contracts were partially financed (35% of expenditures) from the loan. Very little use was made of the loan to finance consulting services for Namgang, and Taegu did not use this category at all.

36. The loan closing date of June 30, 1990 corresponded with the country profile for disbursements for Bank-financed projects in Korea and there was no problem in meeting it. In fact, the final withdrawal application was received more than four months before the closing date.

Project Results

37. Physical Results. The project met substantially all of the physical objectives, although late for Namgang (Part III, Section 6a). By 1990, both components provided convenient reliable service to nearly 250,000 additional persons - about 80% of the objectives for that date - of which about 90,000 had not previously had access to public water service of any type. Overall results by then would have been better except that distribution works in some smaller communities served by NRS were completed late (Part III, Section 7). By 1995, the total served by the two systems should number about 3.4 million, an increase of nearly 1.0 million persons over pre-project levels. In addition, unaccounted-for, or non-revenue water in Taegu had been reduced from about 38% of production in 1984 to about 29% in 1990, which was even better than the project objective (Part II, para. 10.1). The combined results of the two components by 1995, however, could depend on the success of acquiring for NRS the land required to operate the reservoir at optimum levels (paras. 6 and 21).

38. Financial Results. The financial results were significantly below the appraisal forecasts (Part III, Section 6c). For KOWACO, responsible for the NRS bulk water supply system operations, net operating income for 1989 was only about 30% of forecasts, and the rate of return on net fixed assets in operation was about 2% compared to the loan covenant requirement of 5%. Debt service coverage was less than 1.0. Much of the problem with KOWACO's financial performance stems from a Government freeze on tariff increases, beginning in 1987, as part of its price stabilization policy. The project monitoring indicators (Part III, Section 4) show, however, that some of the problem may lie with KOWACO. In 1990, for example, KOWACO's personnel had increased about 66% since 1985, compared to the appraisal forecast of about 15%, and personnel costs were about 18% of operating expenses, compared to the 10% forecast.

39. Financial performance of the TWS was also diminished by the Government freeze on tariff increases (Part III, Sections 4 and 6c). The rate of return on net fixed assets in operation had fallen to about 4% by 1990, compared to a loan covenant requirement of 8%. Taegu appears to have maintained better control over its financial position than KOWACO, however, and its net operating revenue was about 70% of forecasts for 1990. The number of employees was about 10% below forecasts for 1990 and the actual increase since 1984 was only about 4%.

40. Economic Results. In spite of financial performance which have been below expectations by both water supply agencies, the economic results of the two project components appear to be reasonably close to what was predicted, although the recalculated rates of return are admittedly based on incomplete data (Part III, Section 6b). For the NRS component, the recalculated incremental financial rate of return (IFRR), used as a proxy for the economic rate of return (ERR) is about 2%, substantially the same as the appraisal forecast. Like the appraisal forecast, this is based on the bulk water supply aspects of the NRS only. In the event that bulk water tariffs are not raised considerably above the 1990/1991 levels, the IFRR would fall well below 1%, and, in combination with rising operating costs the IFRR could be negative. The IFRR can not be taken as the only criteria to judge a project with a useful life of 30 or more years, however. In a case like this, the ERR is a more significant measure.

41. The appraisal forecast for the ERR of the NRS component was about 6%. This was based on the retail water aspects of the NRS operations and expected increases in the value of properties served. The ERR has not been recalculated because continuous records on the finances of the 13 communities responsible for distribution to the ultimate consumers and the effect the project may have had on the values of the properties served have not been obtained. Nevertheless, there is no evidence to indicate that the recalculated ERR would be less than the 6% estimated at appraisal.

42. For the TWS component, the appraisal used only the IFRR as a proxy for the ERR. This has been recalculated from data and assumptions close to what were used in the appraisal forecasts, and the results indicate a return of about 16%, compared to the forecast of 18%. As in the case of Namgang, the recalculated IFRR benefitted considerably from the savings in project costs compared to the appraisal estimates.

43. Institutional Results. The objective of combining Taegu City's water supply and sewerage services to improve coordination and the efficiency of planning, investments, use of resources and operations (paras. 8 and 15) was important because in 1985 the city was starting to implement a sewerage master plan and to levy sewer service charges. A loan covenant (Part III, Section 7) required a review of the Taegu organizations by MOHA in cooperation with the City Administration and the Directors General of the relevant bureaus. A report, including final recommendations and implementing guidelines, was to be prepared for review by the Bank by the end of 1986. The study objectives and scope of work were described in an annex to the appraisal report, and were an issue during the project appraisal and loan review periods, particularly as to the prospect for implementation of any of the study's recommendations (Part III, Section 2b).

44. Actually, the study and the actions taken were not at all what had been envisioned by the Bank. There was only an internal study based on a review of experience in Seoul. No formal study report was presented to the Bank, although Bank missions did discuss the matter extensively in Korea, and in 1987, MOHA decided to combine the water supply and sewerage services in Taegu and several other cities. The opinion of the Taegu authorities (Part II, para. 8.1) is that the formation of the Taegu Water Supply and Sewerage Bureau really was a combination in name only; the single result was that the Sewerage Bureau came under the control of the Director of the Water Bureau.

45. This occurred during a period when there were extensive and politically sensitive studies of the water sector organization in Korea and the Bank was insisting on the need to reorganize management of both water supply and sewerage services. There was thought to establishment of regional water authorities, but there also were strong pressures for decentralization of government. In 1990, there was a major reorganization of the water supply sector and water corporations were created for the first time in Korea. Unfortunately, this included separation of management of water and sewerage services, at least until such time as sewerage becomes self-financing and could be included in the corporations. Thus, the Taegu Water Supply and Sewerage Bureau was divided and the sewerage section was transferred to the Construction Bureau. The result of all this was that the project contribution to significant institutional changes which could lead to more efficient coordination of Taegu's water supply and sewerage development and operations was minimal.

Project Sustainability

46. The principal recognizable risk to the project's achievement and enhancement of its potential benefits has been the Government's resistance to allowing the water supply agencies to set tariffs and other charges at reasonable levels to enable them to operate efficiently and economically, service their debt obligations and make significant contributions to the costs of improving and expanding services. Sustainability could be jeopardized also by a failure to acquire for the NRS the land necessary to operate the reservoir at levels necessary to meet future water demands (paras. 6, 21 and 37).

Bank Performance

47. Project preparation, appraisal and processing of the loan was very efficient and proceeded quickly in spite of a large number of issues which had to be resolved during those stages (Part III, Section 2b). The loan was approved about five months ahead of the original project timetable.

48. The records show that communication between Bank staff and their Korean counterparts was prompt and forthright and that Bank staff were understanding and receptive to changes where needed. Nevertheless, there were some communication problems, principally in the field, because of the language barrier. This was overcome somewhat by engaging local consultants to assist Bank missions in collecting information.

49. The Bank budgeted limited resources for project supervision because of the expected capability of the implementing agencies. The supervision missions - only seven over the five-year implementation period - were widely spaced and all missions had multiple projects with which to deal. Not all missions visited the sites because of time constraints; instead mission members concentrated on discussions at the head offices of government departments, implementing agencies and consultants in Pusan and Seoul. Because of the competence and experience of the implementing agencies and consultants and the very constructive relationship which prevailed between the Bank and representatives of the local agencies, however, the limited supervision did not appear to have had an adverse effect on the physical outcomes of the two project components.

Borrower/Implementing Agency Performance

50. Performance of the Borrower and the implementing agencies in carrying out the project and satisfying the principal covenants in the loan documents was generally very good (Part III, Section 7). The notable exceptions were the planning and decision making problems relating to the NRS component (paras. 17 and 21), the slow progress in acquiring land for optimum operation of the NRS reservoir (paras. 21, 37 and 46) and the failure by the Government to abide by the agreement to maintain water tariffs at necessary levels (paras. 38-39; and Part III, Section 7).

51. Performance of the implementing agencies in their roles on procurement and project administration was generally excellent. Bank records indicate, however, that problems existed; the agencies tended to delegate too much responsibility to their engineering consultants in communicating with the Bank on matters of management, operations, financial performance and project expenditures and projections. The concerns, opinions and performance data of

the responsible agencies appear seldom to have been communicated directly to the Bank.

52. Another similar problem was that the consultants tended, as usual, to maintain cost records on one basis while the agency accountants may use another, particularly with reference to the allocations of costs, the times when obligations were incurred or payments made, and the methods used in converting values from one currency to another. Neither basis may be incorrect, but in a short time the reconciliation of figures, which should be the responsibility of the agencies, becomes almost impossible. This difficulty was particularly apparent on this project; the records show that Bank supervision missions often were unable to report with reasonable accuracy on the actual expenditures and expected total costs of the two project components, and this has proved to be an obstacle in preparing periodic and the final evaluations of project performance.

Performance of Consultants

53. The consultants were well qualified and experienced in working with the executing agencies and the Bank. Cooperation between the parties and the quality of the work was good. The consultants took the initiative and had no hesitation in calling in outside technical assistance when needed on specialized work, such as the testing and start-up of water treatment plants.

Performance of Suppliers and Contractors

54. Performance of all suppliers and contractors was generally good, although there were some minor delays resulting from strikes at suppliers' plants. Construction quality was good.

Project Documentation and Data

55. The legal documents (Loan Agreement, Project Agreement and Subsidiary Loan Agreement) were appropriate for this project. The Staff Appraisal Report (SAR) served as a useful guide to Bank staff during implementation. There is no evidence, however, that the implementing agencies, their consultants or their auditors made much use of the (SAR). For example, the SAR includes clear examples of the content and format of the project monitoring indicators which were to be covered in the periodic progress reports, but the reports, although detailed, seldom included that information in useable form.

56. One item missing from the legal documents was a specific commitment requiring the implementing agencies to prepare project completion reports and furnish them to the Bank. This added to the difficulty of trying to convey to the agencies the intent and significance of the effort to prepare a retrospective assessment of the project as a means of understanding and benefiting from the project experience. This is particularly true in the case of Taegu (Part II, Section B).

Conclusions and Lessons Learned

57. This was a well conceived, timely and very successful project by any standard, and the benefits upon completion are high. Preparation and loan effectiveness were accomplished in record time. Designs were excellent. Planning was marred only by two problems on the Namgang component: the

original site of the water treatment plant was not selected with appropriate examination and the decision about raising the dam and operating level of the reservoir should have made earlier. The project was carried out economically, substantially below the estimated costs and, except for the problems mentioned above which hampered the Namgang component, implementation was efficient.

58. The principal lessons emerging from the project experience are:

a) thorough project preparation by an efficient and technically qualified implementing agency can lead to a very successful project, but, as in the case of the Namgang component, failure to make a thorough field examination of design decisions to assure land availability or to make timely decisions relative to critical project components, can cause avoidable delays (Part I, para. 17; Part II, paras. 1.6-1.9);

b) well designed contract documents, quick and efficient procurement procedures and good tight project management can keep project costs under control by reducing delays, changes, disputes, misunderstandings and contractor claims for extra compensation (Part I, para. 25);

c) cooperative, understanding and receptive attitudes by staff on both sides - the executing agencies and the Bank - can result in efficient communication and quick resolution of most differences which can arise during project preparation and implementation (Part I, paras. 48-49; Part II, para. 5.2);

d) determination and efficiency in applying leak detection technology and applying other measures for reducing unaccounted-for or non-revenue water can be very successful even in a large system containing significant amounts of old distribution pipelines (Part I, paras. 8 and 37; Part II, para 10.1);

e) appraisal teams on any project which might conflict with the interests of other government agencies, or other parts of the implementing agency, should assure that other development plans or activities are unlikely to disrupt implementation of the proposed project (Part I, para. 17; Part II, paras. 1.8, 2.2 and 2.4);

f) Bank supervision missions should carefully review all project cost, forecasting and reporting procedures to assure that there is a clear understanding of how the records should be kept and reported for Bank purposes (Part I, para. 52); and

g) if the internal financial or economic rates of return are to be recalculated upon project completion, then it is essential for Bank staff to assure that up-to-date records of the necessary inputs are available and obtained when the project is completed (Part I, paras. 40-42, Part III, Section 6b).

PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

PART II: PROJECT REVIEW FROM BORROWER'S PERSPECTIVE

A. NAMGANG WATER SUPPLY COMPONENT 1/

1. Project Preparation, Organization and Design

1.1 The master plan and feasibility study engineering for this project were completed in August 1983 by a French consulting engineering firm in association with two local firms . Detailed design was carried out by a local consulting firm with the assistance of a French firm and a local firm, and was completed in September 1985.

1.2 During preappraisal by a Bank mission in February 1985, the most important issue was about additional land acquisition required to operate the existing Jinyaug Reservoir (Namgang Dam) at the original design level so as to meet the major municipal and industrial water demands in the area to be served. The issue was concluded with a loan covenant requiring completion of land acquisition in accordance with a satisfactory schedule.

1.3 The project was implemented by the Ministry of Construction (MOC) and supervised by its Pusan Regional Construction and Management Agency (RCMA). Bidding and contract awards were implemented by the Office of Supply (OSROK). After completion of the project, the Industrial Sites and Water Resources Development Corporation (ISWACO), now replaced by the Korea Water Resources Corporation (KOWACO) was to be responsible for operation, maintenance and debt payment. Although the organization was complicated, the project worked out satisfactorily except for a lack of communication between the agencies.

1.4 Design of the project facilities was very good, but the original sites of both the water treatment plant and the raw water intake station had to be changed because of site acquisition problems and the Namgang new dam program.

1.5 The water treatment plant site was selected from three proposed sites including the site near the Sacheon Air Force Base where the plant was finally constructed. At the master plan and detailed design stages, however, the military authorities did not agree to the selection of that site because of

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1/ This is the Completion Report for the Namgang component provided to the Bank by KOWACO and its consultants in July 1991. The text has been altered by inserting some supplementary background information which was provided later by KOWACO and which is considered by Bank staff to be useful for the purposes of the PCR. An additional report, "Project Completion Report for Construction" (December 1989), of 268 pages was provided by the consulting engineers for this component but has not been reproduced here although some of the consultant's comments have been inserted herein and some data from that report have been incorporated in the statistical information in Part III of this report.

the military safety regulations of the base. Therefore, another site, which included an informal burial ground, was surveyed and selected after receipt of a letter from the local Sacheon-Gun office recommending the site.

1.6 About two years from the time of the original treatment plant site selection, land acquisition work was started by RCMA. But the families concerned with the burial ground delayed schedules for compensation negotiations and finally refused all of RCMA's offers.

1.7 In consideration for the overall construction schedule, MOC and RCMA resolved to change the site and again contacted the military authorities with revised technical data for the treatment plant facilities. After several meetings, the military authority agreed to the new site with the condition that elevations of several buildings be lowered. The local consultants engaged for field supervision then made the design revisions required for both the treatment plant and the related transmission mains in three months.

1.8 The design for the raw water intake station site was based on a flood water level (FWL) of 40.5m and a low water level (LWL) of 32.0m at the existing Namgang Dam, and the original site was about 1 km upstream from the supplementary spillway into Sacheon Bay. The Water Resources Bureau of MOC, however, then established the new Namgang Dam program to raise the dam height about 8m above the existing crest. During the planning for this new program, the water level of the raw water intake for the Namgang Regional Water Supply System project was changed from elevation 29.0m to elevation 36m and finally decided at elevation 32m.

1.9 With the proposed new FWL at elevation 46.0m, the originally designed intake station would be submerged. Therefore, the intake station had to be relocated to a site about 80m upstream from the original site in order to intake safely at the operating levels of both the existing and the new dams. While the consultants performed design revisions of the intake pumping station and the raw water transmission mains in two months, the construction work could not start timely because the final policy decisions for the new dam had been delayed by reviews of the vast investment problems and additional land acquisition requirements.

2. Project Implementation and Performance

2.1 The construction work (treatment plant and transmission mains) was carried out in two groups (Lot 1 and Lot 2). Lot 1 was implemented in four separate contracts between December 1985 and May 1989. Lot 2 was implemented in three separate contracts between October 1986 and May 1989. Procurement of equipment and materials (including some installation) was carried out under six different contracts. As of December 1989, installation of equipment was substantially complete and commissioning was in progress, but final completion would not take place until the last half of 1990 because of delays in some specialized wiring work.

2.2 There were no difficulties in implementing the project until Lot # 1 was contracted in December 1985 and RCMA started negotiations for the water treatment plant site. Then the project bogged down because of the land acquisition problem and the delayed decisions on the new Namgang Dam program and the operating level of the new dam.

2.3 Performance of the Bank on project preparation, appraisal and processing of the loan was carried out efficiently in spite of a large number of issues.

2.4 Performance of the Government and the implementing agencies was generally very good except on the planning and decision making relating both to the treatment plant site and the Namgang dam.

2.5 KOWACO currently is executing the Namgang New Dam project and has a program for acquiring 10.42 sq km of land (elevations 39.00m to 49.00m). As of June 1991, KOWACO performed 32.6% progress on the land acquisition up to about elevation 41.00, which means the existing dam can be operated about at the original design water level during dry or flood conditions.

2.6 According to the ISWACO Study of Bulk Water Tariffs, the water tariffs should have been raised about 20% annually to maintain a sound financial balance. However, KOWACO was unable to maintain the tariffs at the necessary levels because of the Government policy for public price stabilization. The current water tariffs (effective in February 1991) are 43.16 won per cu m for raw water and 87.55 won per cu m for treated water. The total raises in rates since 1986 are only about 16% for treated water and about 22% for raw water. A Government program for increasing water tariffs calls for raises for both raw water and treated water categories of 13.5% in 1992 and 7% per year in 1983, 1984 and 1985.

3. Project Cost 1/

3.1 The investment for the Nam River Project as forecast at the time of the feasibility study and compared with the actual is as follows:

Appraisal		Actual	
Million US$	Million Won	Million US$	Million Won
39.51	32,273	35.12	26,888

3.2 The above difference between appraisal and actual can be analyzed as follows:

(a) actual total investment amounted to W26,888 million, which is about 83.3% of the of the planned investment of W32,273 million at the stage of the feasibility study;

(b) due to the revaluation of the Korean won against the US$ during the project period, the actual investment amount of the foreign components was significantly reduced compared with those planned;

(c) through the bidding system in Korea, contracts have been awarded to the lowest bid price. Consequently the actual expenditure is much lower than the appraisal amount.

1/ This section added by Bank staff from consultant's "Project Completion Report for Construction Supervision", December 1989.

4. Significance and Effect of the Project

4.1 The Nam River Water Supply Project involves two cities, two "eups" (towns) and 13 "myuns" (rural communities). For a good water supply and balanced development of these areas, the MOC established a master plan for water supply (75,000 cu m/d capacity in the first phase and 121,000 cu m/d in the second)and completed the first phase in May 1989. The second phase is planned to start in 1994 and to reach its full capacity in 1996.

4.2 The project has been designed so that the raw water intake, the treatment processes and treated water transmission can be completely controlled by a telemetry/computer system newly developed for the pumping station at the Jinyang (Namgang) reservoir, the Sacheon water treatment plant and the 99.7 km of pipeline. With completion, the project is significant in that it can supply good and sufficient water to the residents, thus improving public health and community development.

4.3 The new Namgang Dam program is significant because of its effect on the reservoir for the Namgang water supply project. It reinforced the existing concrete faced rockfill dam, constructed in 1969, and increased the height by 8m to improve flood control of the Nam River and Sacheon Bay, and guarantee adequate water supply for domestic, industrial and irrigation use in the area west of Kyungnam. It also involved development of water resources for hydroelectric power generation.

5. Conclusions and Lessons Learned

5.1 The implementing agency can carry out a very successful project. Failure to make a thorough field survey, however, or failure by related authorities to make timely decisions about critical project matters can lower the overall quality of the project performance.

5.2 Cooperative and understanding attitudes between the Bank and implementing agencies can make efficient communication and quick resolution of critical issues.

B. TAEGU WATER SYSTEM 1/

6. Background

6.1 The Taegu Water Supply Fourth Extension Project, immediately following the third extension project financed by an IBRD loan, was to extend the water supply system capacity by 400,000 cu m/d to meet the demand of Taegu City in 1990. The project was partially financed by an IBRD loan and the basic design and detailed design have been carried out by a Korean consulting engineering firm in association with the original Japanese consultants (who prepared the master plan and feasibility studies) 2/. The project included expansions of the intake pumping station, the treatment plant and the water transmission and distribution systems.

7. Project History

7.1 The feasibility study of the Taegu Water Supply Fourth Extension Project was made during the Third Extension Project (financed from Bank loan 2072-KO). The results of the study were reviewed by the consultants on the basis of more recent water supply data. This review was completed on August 18, 1984 and the feasibility of the project was identified by the IBRD. The IBRD loan agreement for the project, together with the Namgang water supply extension project, was signed on September 23, 1985. The City of Taegu was to execute the project under a subsidiary loan agreement with the Government, and the amount of the loan allocated for the project was US$23.0 million. The basic and detailed design were completed by the consultants on July 2, 1985.

7.2 The project history can be summarized as follows:

June 19, 1984:	Consultant services for feasibility studies and detailed design commenced.
Nov. 27, 1984:	Project approved (identified by Bank mission) 2/.
Dec. 30, 1984:	Prequalification of bidders advertised.
Jul. 12, 1985:	Basic design and detailed design completed.
Sep. 23, 1985:	Loan Agreement signed.
Oct. 5, 1985:	Contract for Lot No. 3 (transmission pipeline) signed.
Oct. 11, 1985:	Bidding for Lot No. 2 (treatment plant construction).
Nov. 24, 1985:	Subsidiary Loan Agreement signed.
Nov. 26, 1985:	Contract for Lot No. 2 signed.
Dec. 13, 1985:	Consulting contract for construction supervision signed.

1/ Contributions to the PCR by Taegu City's Water Supply Agency are limited to a largely technical 31 page Construction Supervision Completion Report dated 1989 and prepared by the engineering consultants for the Taegu component and supplementary information provided to the Bank in July and August 1991. Information from these sources has been compiled by Bank staff into a semblance of a suitable contribution to this completion report. In doing so, only information considered appropriate for a completion report has been included and no expressions of opinion have been changed or eliminated. Some data from these sources has been incorporated in the statistical information in Part III.

2/ Comment in brackets added by Bank staff.

Apr. 8, 1986:	Contract for Lot No. 1 (intake pumping station construction) signed.
May 24, 1986:	Contract for Lot No. 2 (treatment plant construction, phase 2) signed.
June 12, 1986:	First distribution system construction contract (two sections of Lot No. 4) signed.
Dec. 15, 1986:	Contract for Lot No. 2 (river improvement works) signed.
Dec. 17, 1986:	Last contract for transmission pipeline construction (Lot No. 3) signed.
June 16, 1987:	Last contract for water treatment plant construction (Lot No. 2, phase 3) signed.
Sep, 7, 1987:	First contract for service reservoir construction work (Lot No. 4, Sang-Ri reservoir) signed.
June 14, 1988:	Contract for booster pumping stations (Daemyeong and Chilgok) signed.
Aug. 3, 1988:	Last contract for service reservoir construction (Chisan and Apsan) signed.
Dec. 19, 1988:	Contract for power transmission main (Lot No. 1) signed.
May 14, 1989:	Construction supervision completed.

8. Organization

8.1 The combining of the Water Supply and Sewerage Bureaus in 1987 was not actually a combining; the Sewerage Bureau, responsible for the sewerage projects of the city, came under the control of the director of the Water Supply Bureau, and the name of the Water Supply Bureau was changed to Water Supply and Sewerage Bureau. It was no more than a simple name change of city organizations. The special accounts for water supply and sewerage projects continued to be absolutely separated.

8.2 The Water Supply and Sewerage Bureau was separated again in 1990 when the water supply project operation organization was reorganized as the Water Supply Project Head Office on September 1, 1989. Accordingly, the sewerage section was transferred to the control of the Construction Bureau.

9. Water Tariffs and Production Costs

9.1 For 1989, the status of water production costs and tariffs for Taegu City was as follows:

Production cost:	246.7 won/cu m
Selling unit price:	198.9 won/cu m a/
Deficit per cubic meter:	47.8 won
Annual deficit:	9,251 million won
Deficit ratio:	24.5%

a/ Levels of water tariffs in other cities was:
Pusan City: 223.0 won/cu m
Incheon: 233.8 won/cu m

9.2 In 1990 the average production cost was 276 won/cu m while the average selling price was 202 won/cu m and the deficit for the year was won 12,623 million.

9.3 Effective February 1, 1991, Taegu City's average water tariff was increased 12.1% representing a revenue increase of won 5.3 billion. Financial pressure has increased due to the rapid increase of debt for water supply. The deficits went up due to the water tariff freeze policy from 1985 to 1990. An additional increase of the water tariff - more than 24.5% - could be well managed: for example a 10% increase in 1992 and 1993.

10. Taegu's Water Leak Prevention Project

10.1 The water leak prevention project was executed in accordance with an IBRD loan water supply leak prevention project which was carried out by the Ministry of Home Affairs from March 1985 to September 1986, as follows:

(a) introduction of new leak detection equipment and techniques;
(b) planned replacement of old pipelines;
(c) utilization of corrosion resisting materials and improvement of pipe-joint methods;
(d) thoughtful execution of pipeline works;
(e) control of water pressure: improvement of water treatment plant operation and control of gate valves in high and low areas; and
(f) improved maintenance of water supply distribution network.

10.2 The ratio of revenue water to water produced has been gradually improved from 65.2% in 1986 to 71.5% in 1990 as shown below:

Year:	1986	1987	1988	1989	1990
Achievement:	65.2%	67.3%	70.3%	71.0%	71.5%

PROJECT COMPLETION REPORT

KOREA
NAMGANG AND TAEGU WATER SUPPLY PROJECT
(LOAN 2615-KO)

PART III: STATISTICAL INFORMATION

1. Related Bank Loans

Title	Purpose	Approved	Status	Comment
First Water Supply Project (Ln. 2072-KO)	Expansion of water supply service in five cities and improvement of sector organization and project preparation.	12/17/81	Complete 06/30/86. (PPAR No. 8174).	Project was first stage of Bank involvement with long term program of sector reforms. Project included works for Taegu City including identification and feasibility studies for Namgang and Taegu Water Project.
Second Water Supply Project (Ln. 2350-KO)	Improve availability and quality of water supply for cities in the Nakdong River basin, implement leak detection programs, improve financial management of Water Bureaus and improve pricing policies.	10/18/83	Complete 06/30/89. (PCR No. 8675).	Project continued sector reform programs, including development of MIS systems for all Water Bureaus.
Metropolitan Region Water Supply Project (Ln. 2491-KO)	To provide water to 25 municipalities, evaluate bulk water tariff policies and organization of water services in the metropolitan area and improve financial management of the Industrial Sites and Water Resources Development Corp. (ISWACO).	02/05/85	Complete 12/30/90. PCR in preparation	Project included strengthening of ISWACO and studies to identify more rational policies and criteria for tariffs for raw and treated bulk water supplies.

2. Project Timetable and Issues Raised

a) Project Timetable

Activity/ Event	Date Planned	Date Revised	Date Actual
Project Identification	--	--	11/84
Preappraisal Mission	01/85	02/85	02/85
Appraisal Mission	04/85	--	04/85
Negotiations	12/85	07/85	07/08-11/85
Board Approval	01/86	08/85	08/27/85
Loan/Credit Signature	--	09/23/85	09/23/85
Loan/Credit Effectiveness	10/31/85	12/23/85	11/18/85
Closing Date	06/30/90	--	06/30/90
Final Disbursement	10/31/90	--	02/15/90
Project Completion	12/31/88	06/30/90	09/30/90

b) Issues Raised (Preappraisal through Board Presentation)

Identification Stage:

Project Content: The project as originally proposed by the Korean authorities included a Geum River component. The Bank's project identification mission, however, concluded that this component was not economic at that time and not justified for Bank financing. The Government subsequently agreed to delete the Geum River component.

Construction Supervision: Timing for the establishment of project offices and appointment of consultants for construction supervision was uncertain at the time of the preappraisal mission. During the appraisal it was agreed that the consultants for Taegu would be appointed prior to award of the first construction contract, and for Namgang, prior to any loan withdrawals for this project component.

Preappraisal Stage:

Project Costs: Both project components were considered by Bank staff to require refinement of designs to improve phasing, take advantage of possible economies and reduce costs. By the time of appraisal, both components had been reduced in size, by reduction of excess capacity, and made more economic and efficient.

2. Project Timetable and Issues Raised (Continued)

b) Issues Raised (Preappraisal through Board Presentation)

Preappraisal Stage: (Continued)

Taegu Subproject:

Water Demand Forecasts: Bank staff considered the demand forecasts to be unrealistic. Demand forecasts were improved following the preappraisal and were accepted by the appraisal mission.

Distribution Network: Information about the existing network and proposed additions was inadequate to demonstrate that system would be adequate to utilize the additional water supply and to provide water to all unserved low-income areas. Computer simulations of the existing distribution network and planned improvements, prepared after the preappraisal, demonstrated that the proposed project would be able to provide water to all city areas for at least the next seven years.

Sewerage: Bank staff considered that planning for increases in sewerage capacity to handle the increased waste water that would result form the project were too indefinite. The Bank engaged an independent local consultant to review Taegu Sewerage Master Plan and recommend investments. During appraisal, review of the sewerage investment program and tariffs (to be implemented in July 1985) satisfied the appraisal team that the program was adequate to maintain a satisfactory sanitation status in the city.

Integration of Water Supply and Sewerage Operations: Bank staff considered that the feasibility of integration of these services for Taegu as a means of improving the allocation of resources and the efficiency and economy of operations and expansions should be studied, although this was not the practice in Korea. Taegu City, however, was reluctant to undertake a study, partly because MOHA, not the City, had authority over organizational matters but were not involved in the project for Taegu. By the time of appraisal there was consensus by MOF, MOC and MOHA there were advantages to integration and that a study could be done by expanding the term of reference of the consultants that would provide technical assistance for project implementation.

2. Project Timetable and Issues Raised (Continued)

b) Issues Raised (Preappraisal through Board Presentation)

Preappraisal Stage: (Continued)

Namgang Subproject:

Water Demand, Allocations and Distribution: The water demand and capacity allocations for each of the municipalities to be served were considered by Bank staff to be too preliminary. Also, plans for construction of distribution systems in the 13 communities were uncertain. By the time of appraisal, plans had been made to finance distribution works in the two main cities through a loan from the Asian Development Bank, and MOHA had agreed to coordinate the distribution improvements in the other 11 municipalities with financing from a fund established by MOHA for water supply investments in small towns (the Eups' Water Fund).

Availability of Water Resources: Additional studies needed to determine whether the capacity of the Namgang reservoir would have to be increased to meet demands after 1991, and how this might be accomplished. By the time of appraisal, studies showed that if the reservoir were operated as originally designed - particularly by allowing the reservoir to fill to the maximum design levels - there would be sufficient water to all projected demands. But this would require additional land acquisition and priority for satisfaction of demands would have to be given to public and municipal use. The appraisal team concluded that it would be necessary to have a loan covenant requiring the land acquisition to be completed by the end of 1988. This proposed covenant was changed later. (See Negotiations, below.)

Appraisal Stage:

Taegu Subproject:

The TWB's investment program and financial projections required revisions based on the appraisal mission's recommendation that the TWB should achieve a rate of return of 8% on revalued fixed assets, starting in 1986, and that certain investments should be postponed for about two years. A revised investment program, financial projections and commitments with regard to financial performance were accepted by the Bank during negotiations.

Post-Appraisal:

The Large Number of Project Issues: At the decision meeting, the appraisal team explained that while there were many conditions, there was basic agreement with the concerned ministries concerning the team's recommendations. There was some uncertainty, however, about the feasibility study of the integration of Taegu's water and sewerage services (see under Preappraisal Stage above), but although the environment for implementation seemed unfavorable because the prospect for applicability to other cities could arouse political sensitivities, on balance, the prospect for implementation of the study's recommendations remained good.

2. Project Timetable and Issues Raised (Continued)

b) Issues Raised (Preappraisal through Board Presentation)

Post-Appraisal: (Continued)

Legal Documents: For the Taegu component, the proposed use of Subsidiary Loan Agreement between the Government and the City of Taegu rather than a Project Agreement between the Bank and the City was questioned. Because there was uncertainty whether a Project Agreement with the City could be signed, however, it was agreed that a Subsidiary Loan Agreement, continuing the procedure used in previous loans to Korea for water supply projects, would be satisfactory, and that execution of that agreement would be a condition of loan effectiveness.

Management Review:

Unaccounted-for Water: Bank management, which questioned the target for reduction of unaccounted-for water from about 40% to about 30% as being inadequate, was satisfied with the response that reduction of more than 2% per year would be an unrealistic goal for Taegu's water system.

Negotiations:

Loan Amount: Rather than a loan of $42.5 million as proposed by the Bank, the Korean delegation proposed, and Bank staff agreed to, a loan of US$38.0 million, based on revised cost estimates which took account of the Government's success in controlling inflation and the current competitiveness in the construction sector.

Land Acquisition for Namgang Reservoir: The Korean delegation persuaded the Bank to delete reference in the Loan Agreement to a specific date for completing land acquisition around the reservoir, and to replace it with a statement to the effect that the program of land acquisition would be completed according to a schedule satisfactory to the Bank.

Study of Integration of Taegu's Water Supply and Sewerage Services: Rather than have the City of Taegu responsible for the study, as had been suggested by the Bank, the Korean delegation proposed, and the Bank agreed, that the study would be undertaken by MOHA which oversees the organization of local governments.

Retroactive Financing: Provisions in the loan documents for retroactive financing were deleted because the Bank's rapid progress in processing the loan made it unnecessary.

Board Presentation: There were no staff presentations and no discussion by the Executive Directors during the Board meeting when this loan was approved.

3. Loan Disbursements

a) Cumulative Estimated and Actual Disbursements

(US $ '000)

IBRD FY and Semester Ending	Appraisal Estimate Amount	Actual Amount	Actual % of Appraisal Estimate
1986			
12/31/85	0.0		
06/30/86	3.0	1.50	50%
1987			
12/31/86	6.3	1.50	24%
06/30/87	11.8	3.90	33%
1988			
12/31/87	19.1	12.99	68%
06/30/88	26.6	22.43	84%
1989			
12/31/88	31.6	30.29	96%
06/30/89	36.4	33.21	91%
1990			
12/31/89	38.0	33.29	88%
06/30/90		34.01	90%
1991			
12/31/90		34.01	90%

Cancellations:	
On February 12, 1987	$ 2,262,000.00
On April 3, 1989	194,000.00
On June 1, 1989	1,411,935.13
On July 2, 1990	122,191.01
Total Cancelled:	3,990,126.14
Net Amount of Loan:	$ 34,009,873.86

Closing Date:	Original:	June 30, 1990
	Revised:	No revisions
	Final:	June 30, 1990
	Loan Account Closed:	July 2, 1990

3. Loan Disbursements (Continued)

b) Original and Final Allocation of Proceeds
(US$ Equivalent)

Category	Loan Agreement: Amount of Loan Allocated	Loan Agreement: % of Expenditures To Be Financed	Actual Amount Disbursed
Part A:			
(1) Civil works	2,900,000	35%	-0-
(2) Equipment and materials	10,600,000	100% of foreign expenditures and 100% of local expenditures (ex-factory cost)	14,612,981
(3) Consultants' services	500,000	50%	65,958
(4) Unallocated for Part A	1,000,000		-0-
Part B:			
(5) Civil works	5,500,000	35%	7,232,245
(6) Equipment and materials	15,000,000	100% of foreign expenditures and 100% of local expenditures (ex-factory cost)	12,104,690
(7) Consultants' services	500,000	50%	-0-
(8) Unallocated Part B	2,000,000		-0-
Special Account MOC (Part A)	--		4,870
Special Account Taegu (Part B)	--		-10,870
TOTAL	38.000.000		34,009,874

4. Project Implementation

Monitoring Indicators

A. KOWACO (ISWACO) WATER DIVISION

Indicator	Schedule 1/			Actual 2/			% of Appraisal Estimate		
	1988	1989	1990	1988	1989	1990	1988	1989	1990
DEMAND (million cu m)									
Raw water sold	1263	1465	1561	1164	1345	1531	92%	92%	98%
Treated water sold	167	366	449	188	288	372	113%	79%	83%
Total water sold	1430	1831	2010	1352	1633	1903	95%	89%	95%
Water production	1505	1928	2115	1423	1719	2003	95%	89%	95%
MANAGEMENT									
Days accounts receivable	37	37	37	40	43	42	108%	116%	114%
Number of employees	830	830	830	1067	1194	1194	129%	144%	144%
% increase of employees	15.3%	0.0%	0.0%	10.7%	11.9%	0.0%	--	--	--
Employee increase since '85	15.3%	15.3%	15.3%	48.2%	65.8%	65.8%	315%	430%	430%
Personnel cost (% of total)	13%	11%	10%	16%	18%	18%	123%	164%	180%
FINANCIAL									
Average water charges (W/cu m)									
Raw water	41.85	39.94	42.51	40.39	40.56	39.54	97%	102%	93%
Treated water	96.42	92.47	98.44	87.53	83.63	81.87	91%	90%	83%
Total average	48.0	50.40	55.00	46.90	48.20	48.60	98%	96%	88%
Increase in total average	13.3%	5.0%	9.0%	7.1%	2.6%	1.0%	54%	52%	11%
Working ratio	63.9%	61.8%	59.4%	77.1%	76.4%	70.0%	120%	124%	118%
Rate of return	5.0%	5.0%	5.0%	2.1%	1.3%	2.1%	42%	26%	42%
Debt service ratio	3.8	1.8	2.2	1.2	0.6	0.6	32%	33%	27%
Debt on debt plus equity	18%	16%	13%	24%	15%	8%	133%	94%	62%

1/ Forecasts are taken from Staff Appraisal Report, Annex 5, Table 7.

2/ Actuals are taken from a completion report on the Namgang component of the projest provided to the Bank in July 1991 by KOWACO and its consultants.

4. Project Implementation

Monitoring Indicators (Continued)

B. TAEGU WATER SYSTEM COMPONENT

Indicator	1/ Schedule			2/ Actual			% of Appraisal Estimate		
	1988	1989	1990	1988	1989	1990	1988	1989	1990
DEMAND									
Population (000)	2342	2428	2514	2239	2289	2228	96%	94%	89%
Population served (000)	2237	2353	2451	2149	2212	2165	96%	94%	88%
% Population served	95.5%	97.0%	97.5%	96%	96%	97%	--	--	--
Water sold (mil. cu m)	159.2	174.4	188.7	170	193	218	107%	111%	116%
Water Production (mil. cu m)	238	256	274	245.5	271.6	312.0	103%	106%	114%
MANAGEMENT									
Days accounts receivable	6	6	7	37	37	35	616%	616%	500%
Number of employees	868	873	950	849	840	850	98%	96%	89%
% increase in employees	4%	1%	9%	7%	-1%	1%	--	--	--
% employee increase since '85	6%	7%	16%	4%	2%	4%	--	--	--
employees per 1000 connections	3.5	3.4	3.5	3.3	3.1	3.0	94%	91%	86%
FINANCIAL									
Avg. water charges (W/cu m)	234.1	244.6	245.7	203.8	199.0	202.6	87%	81%	82%
Avg. water charge increase	6.7%	4.5%	0.5%	0.7%	-2.4%	1.8%	--	--	--
Working ratio	50%	49%	50%	57%	59%	61%	--	--	--
Contribution to investment	41%	65%	133%	-143%	-49%	20%	--	--	--
Rate of return	8.4%	8.0%	8.0%	5.9%	5.4%	4.0%	70%	68%	50%
Debt servic ratio	1.6	1.4	2.1	0.4	0.8	1.1	--	--	--
Debt on debt plus equity	35%	30%	27%	41%	39%	26%	--	--	--

1/ Forecasts are taken from Staff Appraisal Report, Annex 10, Table 5.

2/ Actuals are taken from material on performance of the Taegu Water Bureau provided to the Bank in August 1991.

5. Project Costs and Financing

a) Project Costs
(million won)

Project Component	Appraisal Estimate 1/ Local	Foreign	Total	Actual Costs 2/ 3/ 4/ Local	Foreign	Total
A. Naegang Regional System		5/			5/	
Civil Works	8,968	3,770	12,738	12,080	0	12,080
Materials & Equipment	4,382	10,053	14,435	8,820	2,345	11,165
Engineering & technical assistance	930	245	1,175	847	44	891
	14,280	14,068	28,348	21,747	2,389	24,136
Land acquisition	653	0	653	1,723	0	1,723
Taxes/duties/other	3,386	0	3,386	1,472	0	1,472
Total Naegang System	18,319	14,068	32,387	24,942	2,389	27,331
B. Taegu Water System						
Civil works	19,649	8,894	28,543	23,212	0	23,212
Materials & equipment	4,986	12,240	17,226	10,274	1,620	11,894
Engineering & technical assistance	816	457	1,273	440	0	440
	25,451	21,591	47,042	33,926	1,620	35,546
Land acquisition	898	0	898	1,330	0	1,330
Taxes/duties/other	4,406	0	4,406	2,198	0	2,198
Total Taegu System	30,755	21,591	52,346	37,454	1,620	39,074
C. TOTALS						
Civil works	28,617	12,664	41,281	35,292	0	35,292
Materials & equipment	9,368	22,293	31,661	19,094	3,965	23,059
Engineering & technical assistance	1,746	702	2,448	1,287	44	1,331
	39,731	35,659	75,390	55,673	4,009	59,682
Land acquisition	1,550	0	1,550	3,053	0	3,053
Taxes/duties/other	7,793	0	7,793	3,670	0	3,670
TOTAL PROJECT	49,074	35,659	84,733	62,396	4,009	66,405

1/ Appraisal estimates are recalculated from appraisal data to incorporate physical and price contingencies in the individual cost items using the appraisal assumptions, including the appraisal exchange rate of US$ = W 816.

2/ Actual costs for the Naegang component have been compiled from data in the consultant's "Project Completion Report for Construction" (December 1989), an auditor's "Report on Statement of Cash Receipts and Expenditures for the Period From January 1, 1985 to December 31, 1988", and the Bank's disbursement records.

3/ Actual costs for the Taegu component have been compiled from data in the "Construction Supervision Completion Report" (1989) prepared by the consultants, and in a table, "Project Implementation and Cost Revision", included as Annex 4 in a Bank Supervision Report dated June 13, 1989.

4/ Exchange rates used in converting won to US$ are the market rates on the date of the transaction, if known, or the average market rate during the quarter of the transaction (IMF Financial Statistics, rf market rates).

5/ Foreign costs in appraisal estimates include direct and indirect costs. Actual foreign costs are only for direct imports; indirect foreign costs are included under local costs.

5. Project Costs and Financing

a) Project Costs (Continued)

(million US$)

Project Component	Appraisal Estimate 1/ Local	Appraisal Estimate 1/ Foreign 5/	Appraisal Estimate 1/ Total	Actual Costs 2/ 3/ 4/ Local	Actual Costs 2/ 3/ 4/ Foreign 5/	Actual Costs 2/ 3/ 4/ Total
A. Naegang Regional System						
Civil Works	10.99	4.62	15.61	15,25	0	15.25
Materials & Equipment	5.37	12.32	17.69	11.55	3.06	14.61
Engineering & technical assistance	1.14	0.30	1.44	1.10	0.07	1.17
	17.50	17.24	34.74	27.90	3.13	31.03
Land acquisition	0.80	0	0.80	2.15	0	2.15
Taxes/duties/other	4.15	0	4.15	2.00	0	2.00
Total Naegang System	22.45	17.24	39.69	32.05	3.13	35.18
B. Taegu Water System						
Civil works	24.08	10.90	34.98	29.27	0	29.27
Materials & equipment	6.11	15.00	21.11	12.70	2.20	14.90
Engineering & technical assistance	1.00	0.56	1.56	0.58	0	0.58
	31.19	26.46	57.65	42.55	2.20	44.75
Land acquisition	1.10	0	1.10	1.60	0	1.60
Taxes/duties/other	5.40	0	5.40	2.75	0	2.75
Total Taegu System	37.69	26.46	64.15	46.90	2.20	49.10
C. TOTALS						
Civil works	35.07	15.52	50.59	44.52	0	44.52
Materials & equipment	11.48	27.32	38.80	24.25	5.26	29.51
Engineering & technical assistsnce	2.14	0.86	3.00	1.68	0.07	1.75
	48.69	43.70	92.39	70.45	5.33	75.78
Land acquisition	1.90	0	1.90	3.75	0	3.75
Taxes/duties/other	9.55	0	9.55	4.75	0	4.75
TOTAL PROJECT	60.14	43.70	103.84	78.95	5.33	84.28

1/ Appraisal estimates are recalculated from appraisal data to incorporate physical and price contingencies in the individual cost items using the appraisal assumptions, including the appraisal exchange rate of US$ = W 816.

2/ Actual costs for the Naegang component have been compiled from data in the consultant's "Project Completion Report for Construction" (December 1989), an auditor's "Report on Statement of Cash Receipts and Expenditures for the Period From January 1, 1985 to December 31, 1988", and the Bank's disbursement records.

3/ Actual costs for the Taegu component have been compiled from data in the "Construction Supervision Completion Report" (1989) prepared by the consultants, and in a table, "Project Implementation and Cost Revision", included as Annex 4 in a Bank Supervision Report dated June 13, 1989.

4/ Exchange rates used in converting won to US$ are the market rates on the date of the transaction, if known, or the average market rate during the quarter of the transaction (IMF Financial Statistics, rf market rates).

5/ Foreign costs in appraisal estimates include direct and indirect costs. Actual foreign costs are only for direct imports; indirect foreign costs are included under local costs.

5. Project Costs and Financing

b) Project Financing

	US$ (millions)				Won (millions)			
	Appraisal		Actual		Appraisal		Actual	
	Amount	%	Amount	%	Amount	%	Amount	%
NAMGANG COMPONENT								
Total Project Cost 1/	39.50	100%	35.18	100%	32,387	100%	27,331	100%
Project Financing								
Bank Loan	15.00	38%	14.68	42%	12,130	38%	10,678	39%
Local sources 2/	24.50	62%	20.50	58%	20,257	62%	16,653	61%
Total financing	39.50	100%	35.18	100%	32,387	100%	27,331	100%
TAEGU COMPONENT								
Total Project Cost	64.20	100%	49.10	100%	52,265	100'	38,080	100%
Project Financing								
Bank Loan	23.00	36%	19.33	39%	18,483	35%	14,570	38%
Local sources 3/	41.20	64%	29.77	61%	33,782	65%	23,510	62%
Total financing	64.20	100%	49.10	100%	52,265	100%	38,080	100%

1/ The total costs do not include interest during construction.

2/ Local financing for the Namgang component came entirely as equity contributions by the Government, as planned at the time of appraisal.

3/ Local financing for the Taegu component came from the following various sources, as expected at appraisal: Taegu City bonds; internal cash generation by the Taegu Water Bureau; and government loans. Actual contributions toward the project cost from each of these sources is not possible because these sources are pooled and used for various purposes by the Water Bureau.

6. Project Results

a) Direct Benefits

NAMSANG COMPONENT

	Appraisal Estimate 1/	Actual or Estimate at Project Completion (1990) 2/	Actual or Estimate at Full Development (1995) 3/
Population with Improved Water Service	140,000	140,000	140,000
Additional Communities Proved With Public Water Service	9	9	9
Additional Population Served	91,000	91,000	175,000
Population Served by House Connections	75%	75%	85%

1/ As given in the Appraisal Report for 1989, the first year of full project operation.
2/ Estimate for 1990, first year project actually in full operation.
3/ Estimate for 1995, last full operating year before additional works in operation.

TAEGU COMPONENT

	Project Appraisal Estimate 4/	Actual or Estimate at Project Completion (1990) 5/	Actual or Estimate at Full Development (1995)
Additional Population Served	215,000	154,000	780,000
Total Population Served	2,353,000	2,212,000	3,100,000
Population Served (%)	97%	96%	98%
Non-revenue Water	32%	29%	--

4/ As given in the Appraisal Report for 1989, the first year of full project operation.
5/ Actual for 1989, the first full year of full project operation.

6. Project Results

b) Economic Impact

NAMGANG COMPONENT

	Appraisal Estimate	Actual (At Final Development)
Economic Rate of Return	13%	not available
Incremental Financial Rate of Return	1.5%	2.2%

Underlying Assumptions:

For appraisal estimate: The economic rate of return (ERR) for the Namgang component was based on existing retail water tariffs and the water benefits, including increased values of benefitting properties, and the capital and operating costs for the entire network of municipalities and small communities served by the project in the Namgang system.

The estimate of the incremental financial rate of return (IFRR), however, was based on existing ISWACO tariffs for bulk treated water, which were the same nation-wide regardless of the actual costs in each system operated by ISWACO, and the capital and operating costs of ISWACO's bulk treated water system at Namgang. This gives an apparent low rate of return for Namgang where the cost of water is above the average cost.

For the Project Completion Report: The actual ERR for the completed project can not be calculated because the Bank has insufficient data on the actual retail tariffs and costs of distribution in the served communities, or on any increases in values of benefiting properties.

The actual IFRR for the completed project has been recalculated, at constant 1990 prices, to be about 2%, substantially the same as was predicted, using available (but somewhat uncertain) data. The assumptions include that bulk treated water tariffs will be increased about 13.5% in 1992, and about 7% per year in 1993-1995, which has been reported to the Bank as the Government's intention (Part II, para. 2.6). Should those increases not take place, the IFRR would be about 0.8%. If tariffs are increased as expected but operating and maintenance expenses were to increase by about 30% in real terms, then the IFRR would be negative.

6. Project Results

b) Economic Impact (Continued)

TAEGU COMPONENT

	Appraisal Estimate	Actual (At Final Development)
Economic Rate of Return	17.8%	16%

Underlying Assumptions:

For appraisal estimate: Calculation of the economic rate of return (ERR) for the Taegu component was based on existing tariffs and a small increase (5% in real terms) required to comply with a financial covenant after 1985. Since tariffs were well above the marginal costs, the Incremental financial rate of return (IFRR) was taken as a proxy for the ERR of the Taegu component. The capital costs included complementary distribution and leak detection works, all at 1985 prices. Revenues included user contributions. The incremental operating costs were estimated at 65 w/cu m until 1983, and 80 w/cu m thereafter.

For the Project Completion Report: The actual IFRR has been calculated using the same procedures used for the appraisal estimate, except that all costs and benefits are at 1990 prices rather than 1985 prices. Since there is no reliable data on the costs of complimentary works, the appraisal estimates, converted to 1990 prices have been used.

Increases in actual water sales over 1988 sales have been assumed to equal the incremental water sales for 1989 and 1990. Thereafter, incremental water sales each year have been assumed about the same as the appraisal forecasts. The average water tariffs for 1989, 1990 and 1991 and the incremental operating and maintenance costs for the project for 1989 and 1990 are those reported in project monitoring indicators provided by the Taegu authorities but converted to 1990 prices. The 1990 incremental operating and maintenance costs and the 1991 average tariff, at 1990 prices, have been used throughout the balance of the projection period. Since data on actual incremental user contributions is lacking, they have been omitted from the calculations. This and the fact that tariff increases required to meet the financial covenant have not been made may account for the small reduction in the actual IFRR compared to the appraisal forecasts, in spite of the substantial reduction in actual project costs.

6. Project Results

c) Financial Impact

NAMGANG COMPONENT: (KOWACO OPERATIONS)

	1/ Appraisal Estimate (1990)	2/ 3/ Actual
Raw Water Sold (million cu m)	1,561	1,531
Treated Water Sold (million cu m)	449	372
Raw Water Tariff (W per cu m)	43	39.54
Treated Water Tariff (W per cu m)	98	81.87
Total Operating Revenues (million W)	110,518	(1989) 80,366
Operational Expenses (million W)	65,678	(1989) 62,048
Depreciation (million W)	17,866	(1989) 14,272
Net Operating Income (million W)	14,472	(1989) 4,046
Working Ratio (%)	59.4%	70.0%
Rate of Return on Revalued Assets (%)	5.0%	2.1%
Debt Service Coverage (times)	2.2	0.6
% Debt on Debt plus Equity	13%	8%

TAEGU WATER SUPPLY BUREAU

	1/ Appraisal Estimate (1990)	4/ Actual (1990)
Water Sold (million cu m)	188.7	218
Average Water Tariff (W per cu m)	245.7	202.5
Total Operating Revenues (million W)	53,997	50,787
Operational Expenses (million W)	26,729	32,340
Depreciation (million W)	8,356	8,723
Net Operating Income (million W)	14,478	9,724
Working Capital (%)	49.5%	60.7%
Rate of Return on Revalued Assets (%)	8.0%	4.0%
Debt Service Ratio (times)	2.1	1.13
% Debt on Debt Plus Equity	27%	26.2%

1/ Last year of appraisal forecasts: 1990.
2/ For 1990 except as noted.
3/ Data from "Monitoring Indicators" provided to Bank in July 1991, and from Engineering Consultant's "Project Completion Report for Construction Supervision" (December 1989).
4/ Data from "Monitoring Indicators" provided to Bank in August 1991, and from audit report for period January 1 - December 31, 1990.

7. Status of Major Covenants

Covenant	Subject	Compliance/Comments
Loan Agreement		
Whereas(C)	Upon completion of Part A, Borrower to transfer facilities to ISWACO for operation and maintenance.	Final Transfer Agreement between MOC and KOWACO (which relaced ISWACO) executed on 12/31/89.
2.02 (b)	Borrower to open Special Account for Part A of Project.	Opening of Special Account for Part A, Namgang component, delayed until late in 1987 and was used sparingly.
2.02 (c)	Borrower to open Special Account for Part B of Project.	Special Account for Part B, Taegu component, was opened soon after loan effectiveness and fully utilized during construction.
3.01 (b)	For Part B, Borrower to relend US$23.0m to Taegu under a subsidiary loan agreement.	Subsidiary Loan Agreement is dated October 30, 1985.
3.03	Borrower to maintain a project unit within MOC for implementing Part A.	Satisfactory compliance.
3.05	For operation and maintenance of Part A, Borrower, prior to project completion, to enter into a Transfer and Operations Agreement with ISWACO. Draft of Agreement to be submitted to Bank by 12/31/87 for comment.	Satisfactory compliance, although, because implementation of Part A was delayed, draft agreement was not furnished to Bank until April 1989, about the time the Part A facilities were transferred.
3.06	Borrower to cause NRS municipalities, to carry out, under the coordination of MOC and MOHA, water distribution system improvements by 12/31/88 under a plan satisfactory to Bank.	Mixed performance. Comprehensive improvement plan not provided to Bank. Distribution improvements for two major municipalities using 75% of water were completed before water from project was available, however. But distri- for most smaller communities was not completed until well after water was available.
3.07	To provide adequate water to NRS municipalities, Borrower to complete program of land acquisition according to schedule satisfactory to Bank.	Unsatisfactory compliance. Only vague acquisition programs were presented to Bank periodically. By early 1991, only about 33% of the acquisition was completed.

7. Status of Major Covenants (Continued)

Covenant	Subject	Compliance/Comments
Loan Agreement (Continued)		
3.08	Borrower to cause MOHA to review organization of water and sewerage services in Taegu and, by 12/31/86, submit results of review to Bank for comment.	Unsatisfactory compliance. No formal study report was presented to Bank, although the matter was discussed with Bank missions. In 1987 MOHA decided to combine water and sewerage services in several cities, including Taegu, but results were unsatisfactory.
4.01 (a)	Borrower to maintain, and cause Taegu to maintain, adequate accounts in respect of the project;	Satisfactory compliance.
(b)	have the accounts, including the MOC and Taegu Special Accounts, audited by independent auditors;	
(c)	furnish certified copies of audit reports to Bank within six months of each fiscal year.	
4.02	Borrower to cause Taegu to take steps necessary to set and maintain tariffs, etc, as necessary to produce an annual ROR on TWB's net fixed assets in operation not less than 8%.	Unsatisfactory compliance. The ROR was achieved in 1986 but began to decline in 1987, reaching 5% in 1989 and probably lower in 1990, because of continued Government freeze on utility charges.
5.01 (c)	Any amendment, suspension, repeal, etc., of the Industrial Sites and Water Resources Law, which would adversely affect ISWACO ability to perform its obligations under the Project Agreement would be cause for suspension of disbursements.	Satisfactory compliance. Changes in law under which KOWACO assumed responsibilities of ISWACO relative to this project did not adversely effect the implementation and operation of the project.
Sch. 1	No loan withdrawals for civil works or equipment and materials for Part A to be made until consultants are engaged for construction supervision of Part A.	Satisfactory compliance. Although engagement of consultants was late, and there was further delay in notifying the Bank, withdrawals from the loan for these goods and services were not required during the period of delay, however.

7. **Status of Major Covenants** (Continued)

Covenant	Subject	Compliance/Comments
Project Agreement		
2.02	For purpose of operating and maintaining Part A, ISWACO, prior to project completion, to enter into a Transfer and Operations Agreement, satisfactory to the Bank.	Under draft transfer agreement dated April 8, 1989, NRS facilities transfered to KOWACO in May 1989. Final transfer agreement, satisfactory to Bank, was executed on 12/31/89.
2.05	In consultation with Bank, ISWACO to carry out country-wide study of bulk water tariff policy for raw and treated water, including for NRS water charges, and submit study to Bank by 06/30/86 for review and comment.	Study completed late in 1986.
4.01	ISWACO to maintain adequate records to reflect its operations and financial condition.	Satisfactory compliance.
4.02 (a)	ISWACO to have its accounts and financial statements for each year audited by independent auditors; and	Satisfactory compliance.
(b)	certified copies of financial statements and audit reports to be furnished to Bank within six months of fiscal year end.	Satisfactory compliance.
4.04	ISWACO to set and maintain the tariffs and other charges of its Water and Dams Divisions as necessary to produce a ROR on net fixed assets in operation for each division not less than 5%.	Unsatisfactory compliance. In 1988, partially due to drought, ROR for Dams Division, fell to 2.5% in 1988 and 4.0% in 1989. ROR for Water Division was 2.1% or lower for 1988 through 1990.
4.05	ISWACO to maintain a debt service ratio not less than 1.3.	Unsatisfactory compliance.

7. **Status of Major Covenants** (Continued)

Covenant	Subject	Compliance/Comments
Project Agreement (Continued)		
4.06	ISWACO to furnish to Bank by August 31 each year five-year financial projections for its Water and Dams Divisions.	Satisfactory compliance. ISWACO (KOWACO) staff provide computer projections using computer model provided by the Bank.
4.07	ISWACO to furnish to Bank by August 31 and February 28 each year, financial monitoring indicators for its Water and Dams Divisions.	Generally satisfactory compliance, although indicators provided were not all those desired by the Bank.

8. Use of Bank Resources

a) Bank Staff/Consultant Inputs
(Staff Weeks)

Stage of Project Cycle	Bank Fiscal Year							
	FY85	FY86	FY87	FY88	FY89	FY90	FY91	TOTALS
Preappraisal	22.9							22.9
Appraisal	20.5							20.5
Negs/Admin.	3.8	6.3						10.1
Supervision		8.2	5.6	7.9	4.4	1.9	0.2	28.2
PCR Prep.							5.3	5.3
Other		1.5	0.3					1.8
TOTALS	47.2	16.0	5.9	7.9	4.4	1.9	5.5	88.8

8. Use of Bank Resources

b) Bank Missions 1/

Type of Mission	Dates	Staff	Perform. Ratings 2/	Problem Types
Identify	11/1-16/84	Fin. Analyst Engineer	--	--
Preappraise	2/11-27/85	Fin. Analyst Engineers (2)	--	--
Appraise	4/8-26/85	Fin. Analyst Engineer	--	--
SPN # 1	2/24-3/15/85	Fin. Analyst Engineers (2)	1	--
SPN # 2	6/18-20/86	Engineers (2)	1	Proj. management
SPN # 3	3/16-18/87	Fin. Analyst Engineer	2	Proj. management
SPN # 4	1/4-2/9/88	Fin. Analyst Engineer	1	--
SPN # 5	7/11-16/88	Fin. Analyst	1	--
SPN # 6	4/30-5/9/89	Fin. Analyst Engineer	1	--
SPN # 7	3/26-4/5/90	Engineer	2	Financial Performance

1/ List of missions does not include brief visits by Bank staff with multiple objectives such as by disbursement officer in July 1986, and by a financial analyst August 1987. In additon to Bank staff, local consultants, not listed above, were engaged on occassion to assist with data collection.

2/ Performance Ratings:

1. = Problem Free or Minor Problems
2. = Moderate Problems
3. = Major Problems

Annex 1

1/

Description of the Project

The objectives of the project are to: (a) provide adequate and reliable water supply to the municipalities in the NRS situated in a water scarce area of the country and thus promote their planned social and industrial development; (b) increase water supply coverage in Taegu and ensure adequate water services to the low-income urban population; (c) carry out a review of the organization of water and sewerage services in Taegu; and (d) extend the scope of ISWACO's national bulk water policy study to include the NRS.

The project consists of the following parts, subject to such modifications thereof as the Borrower and the Bank may agree upon from time to time to achieve such objectives:

Part A: NRS:

(i) provision of water intake, and raw water pumping station from the existing Namgang Reservoir, a raw water transmission pipeline to Sacheon, and a new water treatment plant with an initial capacity of 75,000 tpd;

(ii) installation of a main treated water pumping station at Sacheon, and two transmission pipelines;

(iii) provision of consultant's services for construction supervision: and

(iv) undertaking studies for national bulk water pricing policies and their application to NRS.

Part B: TWS:

(i) expansion of the existing water intake pumping station from the Nakdong River and the existing Dasa treatment plant;

(ii) provision of additional transmission and distribution facilities to use this capacity and distribute to all areas of the city;

(iii) provision of additional booster pumping stations and service reservoirs, replacement of old and leaking distribution pipes and the improvement of instrumentation and control of the whole system;

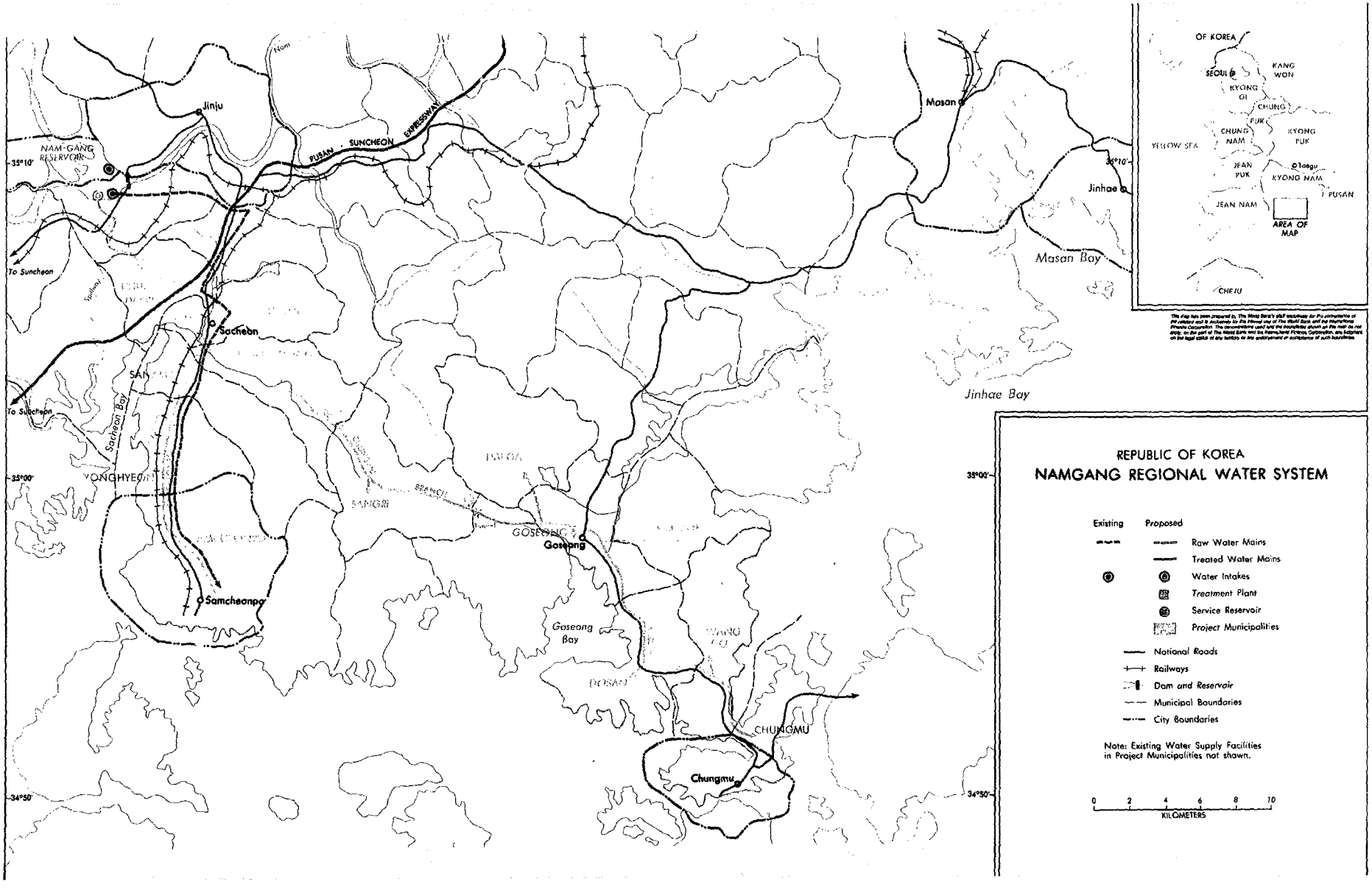
(iv) provision of consulting services for construction supervision; and

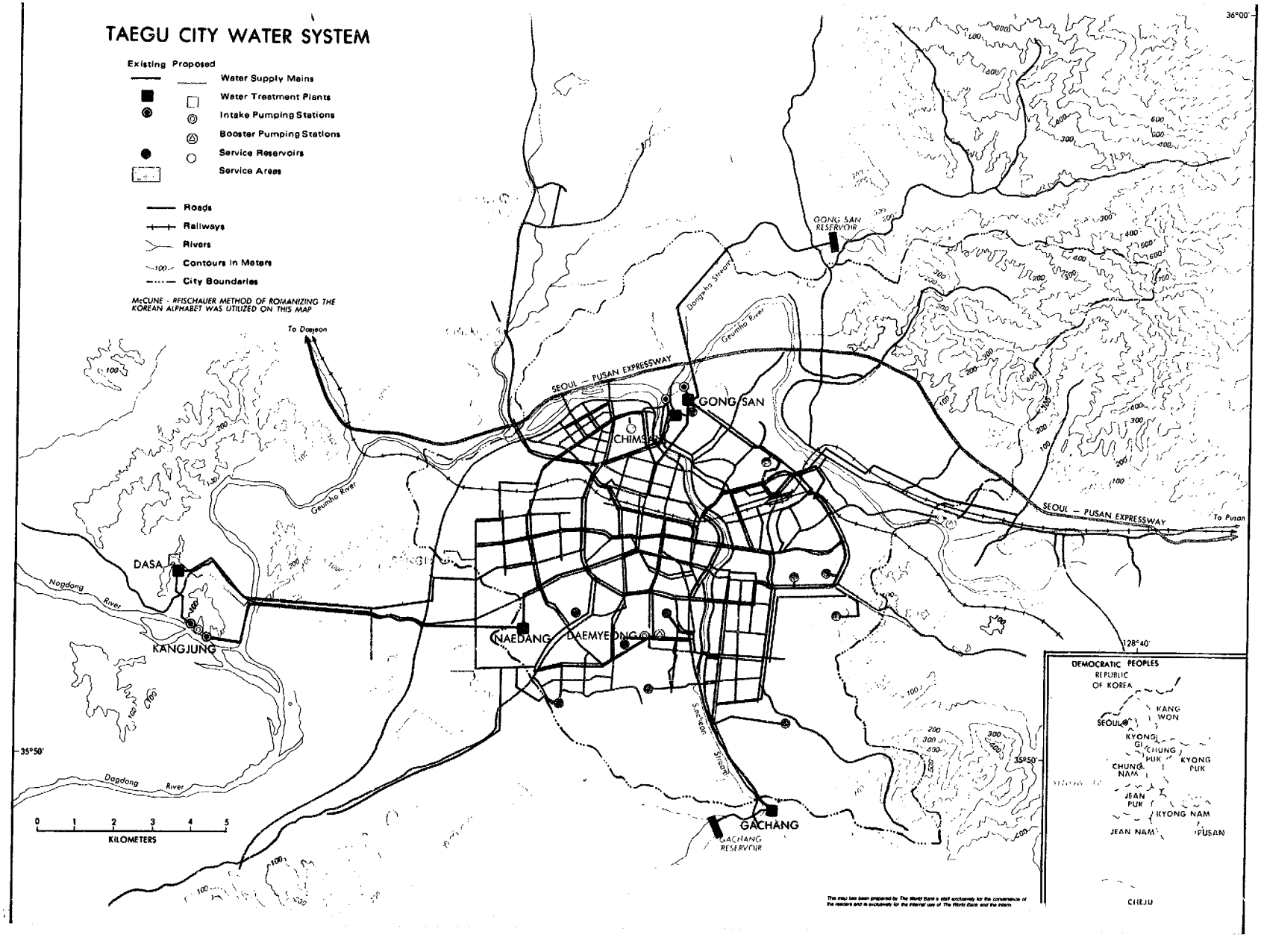
(v) review of the organization of water and sewerage services in Taegu.

* * *

The project is expected to be completed by December 31, 1988.

1/ From Schedule 2 of the Loan Agreement dated September 23, 1985.


Jinju
NAM-GANG RESERVOIR
PUSAN - SUNCHEON EXPRESSWAY
To Suncheon
Sacheon
Sacheon Bay
YONGHYEON
Samcheonpo
Masan
Jinhae
Masan Bay
Jinhae Bay
Gosong
Goseong Bay
CHUNGMU
Chungmu
35°10'
35°00'
25°00'
34°50'
OF KOREA
SEOUL
KANG WON
KYONG GI
CHUNG BUK
CHUNG NAM
KYONG BUK
YELLOW SEA
JEAN BUK
Taegu
KYONG NAM
PUSAN
JEAN NAM
AREA OF MAP
CHEJU
REPUBLIC OF KOREA
NAMGANG REGIONAL WATER SYSTEM
Existing
Proposed
Raw Water Mains
Treated Water Mains
Water Intakes
Treatment Plant
Service Reservoir
Project Municipalities
National Roads
Railways
Dam and Reservoir
Municipal Boundaries
City Boundaries
Note: Existing Water Supply Facilities in Project Municipalities not shown.
0 2 4 6 8 10
KILOMETERS


TAEGU CITY WATER SYSTEM
Existing Proposed
Water Supply Mains
Water Treatment Plants
Intake Pumping Stations
Booster Pumping Stations
Service Reservoirs
Service Areas
Roads
Railways
Rivers
Contours in Meters
City Boundaries
McCUNE - REISCHAUER METHOD OF ROMANIZING THE KOREAN ALPHABET WAS UTILIZED ON THIS MAP
To Daejeon
SEOUL - PUSAN EXPRESSWAY
GONG SAN
GONG SAN RESERVOIR
CHIMSAN
Dongcho Stream
Geumho River
DASA
Nagdong River
KANGJUNG
NAEDANG
DAEMYEONG
Suseong Stream
GACHANG
GACHANG RESERVOIR
Dagdong River
To Pusan
36°00'
35°50'
128°40'
0 1 2 3 4 5
KILOMETERS
DEMOCRATIC PEOPLES REPUBLIC OF KOREA
SEOUL
KANG WON
KYONG GI
CHUNG PUK
KYONG PUK
CHUNG NAM
JEAN PUK
KYONG NAM
JEAN NAM
PUSAN
CHEJU