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PROJECT PERFORMANCE AUDIT REPORT

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTE WATER PROJECT

(LOAN 1066-YU)

June 27, 1986

Operations Evaluation Department

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

Office of Director-General
Operations Evaluation

June 27, 1986

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Performance Audit Report on Yugoslavia - Dubrovnik Water Supply and Waste Water Project (Loan 1066-YU)

Attached, for information, is a copy of a report entitled "Project Performance Audit Report on Yugoslavia - Dubrovnik Water Supply and Waste Water Project (Loan 1066-YU)" prepared by the Operations Evaluation Department.

Attachment

PROJECT PERFORMANCE AUDIT REPORT

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DUBROVNIK WATER SUPPLY AND WASTE WATER PROJECT (LOAN 1066-YU)

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DUBROVNIK WATER SUPPLY AND WASTE WATER PROJECT (LOAN 1066-YU)

PREFACE

This report presents the results of a performance audit of the Dubrovnik Water Supply and Wastewater Project for which Loan 1066-YU of US$ 6.0 million equivalent was approved on December 19, 1974. The loan was guaranteed by the Socialist Republic of Yugoslavia. Vodovod Dubrovnik was the executing agency. The loan was intended to cover about 55 percent of the total project costs of US$10.5 million including US$1.2 million interest during construction. Actual costs of construction probably exceed US$13.8 million. The loan was closed December 31, 1981 and the final disbursement was on April 30, 1982 when US$0.13 million was cancelled. Substantial additional money was expended after those dates by Vodovod Dubrovnik to complete the ocean outfall, and remedial repairs to the outfall were ongoing at the time of the audit (January 1986).

The Project Performance Audit Report (PPAR) consists of a Project Performance Audit Memorandum (PPAM) prepared by the Operations Evaluation Department (OED) and a Project Completion Report (PCR) prepared by Europe Middle East Projects Water Supply (EMPWS). OED has reviewed the PCR, the Appraisal Report, the President's Report, and the Loan Agreement. Documents in the Bank's project files have been extensively reviewed including the tender documents where available. An OED mission visited Dubrovnik in January 1986, inspected the constructed facilities and had extended discussion and review of Tender Documents with the Vodovod staff. Particular emphasis was placed on the history of the non-functioning ocean outfall and the poor performance of the contractor.

The audit finds that in many respects the PCR accurately describes the project experience. Where new or more current information was obtained it is included in the PPAM. Areas where there is variance between the PCR and the findings of the audit are discussed in detail in the Supplementary Comments.

Following OED procedures, copies of the draft PPAR were sent to Vodovod Dubrovnik and the Government for comments, but none were received.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTE WATER PROJECT (LOAN 1066-YU)

KEY PROJECT DATA

	Appraisal Estimate	Actual or Current Estimate
Total Project Cost (US$ million)	9.6	13.8 /a
Project Cost Overrun (%)		44
Loan Amount (US$ million)	6.0	6.0
Loan Disbursed (US$ million)		5.87
Loan Cancelled (US$ million)		0.13
Date Physical Components Completed		
Water	06/76	09/79
Sewerage	06/78	06/84 /b
Proportion of Physical Components Completed by Original Completion Date (%)	100	20
Time Overrun (%)		
Water		130
Sewerage		170
Final Performance		
Financial	Good	Satisfactory
Institutional	Good	Good
Economic Rate of Return (%)	n.a.	n.a.
Financial Rate of Return (%)	n.a.	n.a.

CUMULATIVE DISBURSEMENTS
(US$ Million)

Fiscal Year	Appraisal Estimate	Actual
FY 1975	0.70	—
FY 1976	2.70	0.05
FY 1977	4.80	0.22
FY 1978	5.80	0.99
FY 1979	6.00	2.60
FY 1980	—	3.49
FY 1981	—	4.43
FY 1982	—	5.87

/a Does not include system control center, but includes U.S.$1.0 million for outfall repair.

/b Sewage outfall not functioning January, 1986.

STAFF INPUT /a
(Man-weeks)

FYs	70	71	72	73	74	75	76	77
Pre-Appraisal	2.0	6.4	7.5	3.4	2.0	0.8		
Appraisal				10.4	29.5	1.4		
Negotiations					1.1	12.1		
Supervision						4.6	2.2	5.9
	2.0	6.4	7.5	13.8	32.6	18.9	2.2	5.9

FYs	78	79	80	81	82	83	84	85	TOTAL
Pre-Appraisal									22.1
Appraisal									41.3
Negotiations									13.2
Supervision	6.5	3.4	5.9	3.4	4.5	16.8	4.7		57.9
	6.5	3.4	5.9	3.4	4.5	16.8	4.7		134.5

OTHER PROJECT DATA

Item	Appraisal Estimate	Revisions	Actual
First Mention in Timetable	--		11/09/70
Government Application	--		07/18/73
Negotiations	--		09/06/74
Board Approval	--		12/19/74
Loan Agreement Date	--		12/24/74
Effective Date	06/26/75		06/26/75
Closing Date	12/31/78	12/31/81	12/31/81
Borrower	Dubrovnik Water and Wastewater Enterprise, Vodovod Dubrovnik		
Guarantor	Republic of Yugoslavia		
Executing Agency	Vodovod Dubrovnik		
Follow-on Projects	None		

/a 1970, 1971 from PCR; 1972-1985 from Time Recording System.

MISSION DATA

		Month/year	No. of Days	No. of Persons	Man Weeks	Date of Report
Reconnaissance		10/70	10	1	2.0	11/09/70
Preparation		01/71	5	1	1.0	02/05/71
Preparation		05/71	9	1	1.8	07/23/71
Preparation		09/71	18	1	3.6	11/02/71
Preparation		07/72	2	1	0.4	07/19/72
Preparation		05/73	8	2	3.2	06/30/73
Pre-appraisal		09/73	4	1	0.8	10/30/73
Appraisal		06/74	8	2	3.2	10/09/74
Supervision	I	02/75	2	1	0.4	02/05/75
Supervision	II	05/75	2	2	0.8	06/06/75
Supervision	III	10/75	2	1	0.4	10/13/75
Supervision	IV	05/76	2	1	0.4	06/21/76
Supervision	V	09/76	3	3	1.8	09/27/76
Supervision	VI	04/77	4	2	1.6	04/21/77
Supervision	VII	09/77	5	2	2.0	10/17/77
Supervision	VIII	07/78	6	1	1.2	07/14/78
Supervision	IX	12/78	4	1	0.8	01/05/79
Supervision	X	09/79	6	1	1.2	10/02/79
Supervision	XI	10/79	6	2	2.4	10/31/79
Supervision	XII	07/80	5	1	1.0	07/25/80
Supervision	XIII	04/81	3	1	0.6	04/24/81
Supervision	XIV	02/82	3	2	1.2	02/26/82
Supervision	XV	07/82	3	2	1.2	07/30/82
Completion		01/83	10	2	4.0	
Total					37.0	

EXCHANGE RATES

Currency Unit	Dinar
Appraisal Year Average (1974)	US$ 1.0 = D 15.2
Average Over Project Period	US$ 1.0 = D 29.0
Completion Year Average (1982-83)	US$ 1.0 = D 59.0

Exchange Rates:

1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
15.25	17.4	18.2	18.3	18.6	19.0	24.9	35.5	50.5	67.5

PROJECT PERFORMANCE AUDIT REPORT

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT (LOAN 1066-YU)

EVALUATION SUMMARY

Introduction

i. The Dubrovnik Water Supply and Wastewater Project approved in December 1974, supplemented other projects, some Bank assisted, in the Dubrovnik area. The principal project for tourism industry expansion was the Babin Kuk tourism complex for which the Bank made a loan of US$20 million in 1971 (Ln. 782-YU). When this loan was made, the government started plans for infrastructure improvements to serve the new complex plus other improvements for the harbor area, the historic walled city and Dubrovnik town. Loan 782-YU provided funds for infrastructure planning and studies. The Water Supply and Wastewater Project (Ln. 1066-YU) was envisioned in the initial studies and comprised facilities necessary for adequate safe water supply and for collecting and disposal of wastewater.

Objectives

ii. The major objectives of the project were: (i) to improve and expand the water supply and distribution facilities of Dubrovnik and the surrounding tourist zones; and (ii) to abate the pollution of the shores, beaches and harbour by constructing a sewerage collection system and an ocean outfall for disposal of sewage to deep ocean water at a location remote from recreational beaches (PPAM, para. 2).

iii. In the Appraisal Report the strengthening of Vodovod Dubrovnik as an operating agency does not seem to be a major objective. Project success and financial viability was based on Vodovod Dubrovnik's acquisition of additional staff, adoption of regulations for wastewater use, assuming responsibilities for septic tank pumping, and collecting increased tariffs. These corollary objectives for Vodovod are detailed in the PCR (para. 2.07) and in the SAR (para. 4.06). Major changes in the organization and structure of Vodovod Dubrovnik were not thought to be required (PCR, para. 5.04).

Implementation Experience

iv. Project implementation was delayed and hindered by events that were partially beyond the control of Vodovod Dubrovnik. These events include delays in the design and construction of sewers for the old walled city due to the archeological importance of preserving the old town streets, abandonment of the sewer outfall construction by the contractor, delays in producing tender documents by the consultants, and extensive delays in receiving tenders and awarding contracts. The audit team, from review of the files and

its field inspection, generally agrees with the completion dates given in the PCR (para. 3.02) with the exception of the outfall sewer. When the sewage treatment plant went into operation (mid 1983) it was discovered that the underwater outfall was structurally defective. Extensive repairs were not completed until mid 1984. Since then there have been repeated failures of the outfall and it was not functioning at the time of the audit mission in January 1986 (PPAM, paras. 12, 17, 32 and 40-41 and Annex 1).

v. Vodovod Dubrovnik carried out the design of the facilities through consultants. Plans and specifications produced by the consultants were complete, well detailed and suitable for international bidding. The exception to this is the design for the ocean outfall sewer which is discussed in detail in the PPAM. Cost estimates in dinars were affected by the decline in currency value over the life of the project. An evaluation of the accuracy of the cost estimates for the project can be obtained from the PCR, Annex 2 which gives costs in US$. Estimates of cost at the time of appraisal for the water supply component were very accurate; the total cost overrun was less than ten percent. The major cost overrun (433%) occurred on the outfall sewer; the appraisal estimate for this component was clearly too low (PPAM, para. 22).

Results

vi. The major objectives of the water supply component of the project (approximately 15% of the funds expended) were completed at a cost close to the appraisal estimate and the system is well constructed and functioning satisfactorily. Adequate water supply and storage are available to the Dubrovnik town for at least the year 2000 projected population (estimated 60,000 (PPAM, para. 43). Completion was approximately 30 months behind the Appraisal Report schedule (PCR, para. 3.02). The wastewater components now constructed (approximately 66% of the funds expended) were completed at least 5 years later than anticipated in the appraisal report. Work on design and construction of sewers for the historic walled city is only now beginning and is not expected to be completed until after 1990.

vii. Except for the ocean outfall and the system control center, the project functions as planned. The system control center is not necessary for satisfactory operation. Because of the failure of the ocean outfall only limited improvements to the receiving water have been attained.

Findings and Lessons

viii. Delays on the project were caused by poor project management and by lack of staff resources. There were extensive delays in preparation of plans and specifications and tender documents (three years for the treatment plant and ocean outfall [Tender 4]) and delays in award after receiving bids (two and one-half years for the system control center [Tender 5]). Poor control and scheduling are at least partially responsible for this delay (file search).

ix. There are two reports by Vodovod Dubrovnik and by the consultants in the Banks files recommending award of the ocean outfall to a firm which

was not awarded the contract. Vodovod management told the audit team they were pressured into making the award to another contractor they felt was unqualified, but there is no evidence to support this claim. Bank staff contend that the recommendations for award were not consistent with Bank procurement guidelines (PPAM, paras. 15 and 32-33).

x. Bank files on the project are incomplete. Tender documents for Tender 1, Babin Kuk Reservoir, and for Tender 5, system control center, are not in the files.

xi. Because of a shortage of local funds, the Borrower decided to cancel the contracts for the system control center, on which expenditures of US$2.7 million were reported as having been spent (PCR, Annex 2). Actually, these were estimated costs yet to be incurred, but were not and, therefore, the total project costs as reported in the PCR have been reduced accordingly for the Basic Data Sheet (pg. ii; PPAM, paras. 8, 9 and 34-35).

xii. The PCR is silent on the magnitude of the construction problems on the outfall and reports that the outfall was completed in January 1983; actually, the connection 200 meters from shore was not constructed properly and repairs were not completed until the middle of 1984.

xiii. The PCR states that Vodovod took over responsibility for septic tanks emptying, as required by the loan agreement (PCR, para. 2.07[d]). This information was provided to Bank staff by Vodovod. To the audit mission, however, Vodovod affirmed that this service is and has been throughout provided by a separate organization, "Sanitat".

xiv. In hindsight, most of the above problems would have been lessened by the Bank's insistence on the borrower retaining an experienced project manager to control and schedule the consulting engineers, assist in pre-qualifying contractors and direct project inspection and certification of progress payments to contractors. A construction schedule appears in the SAR (Annex 5). A file search does not disclose any other documents on progress or scheduling.

PROJECT PERFORMANCE AUDIT MEMORANDUM

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTE WATER PROJECT (LOAN 1066-YU)

I. INTRODUCTION

1. The Dubrovnik Water Supply and Wastewater Project (Loan 1066-YU) signed on December 24, 1974 was part of an overall effort by Yugoslavia and the Bank to support tourism in the area of Dubrovnik. The loan was for US$6.0 million equivalent. Dubrovnik[1]/ with its historical walled city has long been the centerpiece of tourist development on the Adriatic coast. This project provides infrastructure support for a broad program of recently constructed tourist facilities including hotels, resorts, highways and a major tourist complex at Babin Kuk in Dubrovnik (Ln. 782-YU).

II. OBJECTIVES

2. Prior to the project the source of water supply was barely able to meet the maximum daily demands of Dubrovnik town. Wastewater discharged to Gruz Harbour and adjacent recreational beaches and harbor areas from at least 33 separate outfalls. The sewers in the Old City were combined sewers discharging sewage and storm waters directly to the old harbor and to the perimeter waters of the old city. The objectives of the project were generally to (i) improve and expand the water supply and distribution facilities of Dubrovnik and the surrounding tourist zones, and (ii) to abate pollution of the shores' beaches and harbor by construction of sewers and pumping stations and disposal of wastewater at sea through an ocean outfall. Additional objectives were the improvement in tariff structure and collections, assigning the responsibility for managing septic tank pumping and septage disposal to Vodovod, and implied but not specified strengthening of Vodovod's management capabilities. Changes agreed upon during negotiations included the hiring of a finance director, adopting wastewater regulations and instituting a program to reduce receivables (SAR, para. 8.01).

1/ A Commune, in Yugoslavia, is an administrative area. The Dubrovnik Commune covers Dubrovnik town and its surrounding communities. In this report, unless otherwise specified, the expression "Dubrovnik" refers to the town and "Dubrovnik Commune" or "the Commune" to either the administrative area or its responsible governing authority.

III. THE PROJECT

3. The project will be adequate to supply water and collect and dispose of wastewater until the Dubrovnik population reaches approximately 60,000 persons. Water supply is adequate to extend the service area beyond the town to some areas of the commune presently served by ground water.

4. The water supply components include three new vertical turbine pumps and a new water intake structure and chlorination station at Komolac. This water is conveyed in a 600 mm transmission main from the new pumping station to the Mount Srdj tunnel. Additional works are a 2000 cubic meter water reservoir at Babin Kuk and approximately 2.7 km additions to the distribution system and replacement of two kilometers of old lines.

5. The wastewater components collect sewage from existing and proposed branch sewers to a grit removal and skimming facility at Lapad. Six new pumping stations were constructed to convey the sewage to Lapad. From Lapad the sewage flows through an existing tunnel 550 meters long to an almost vertical rock cliff on the ocean. From this point a 1.4 kilometer, 800 mm diameter ocean outfall carries the wastewater to a point of deep ocean disposal through a diffuser at a depth of 100+ meters. This diffuser plus subsequent dispersion and bacterial die-off is designed to meet Croatian Class B water standards on adjacent recreational beaches.

6. The project has its origins in the Babin Kuk hotel complex project (Loan 782-YU). This loan was to provide funds for planning. The Babin Kuk hotel complex also provided funds to Vodovod Dubrovnik for construction of the 2000 cubic meter water storage reservoir at Babin Kuk. Planning started as early as 1970 (SAR, para. 1.03-1.04). Prior to Bank involvement Yugoslav consultants had prepared a master plan and feasibility study for wastewater at Dubrovnik. The Institute of Oceanography and the Hydrographic Institute at Split participated in this study. This study determined collection system alternatives, length of outfall, location of the treatment plant and environmental effects of wastewater disposal to the ocean. The Bank files do not contain a copy of this study or a review of the findings of the study by the Institute of Civil Engineering Faculty of the University of Zagreb. The Project appraisal accepts the location of the outfall and the 100+ meter depth of outfall termination as fixed.

IV. IMPLEMENTATION

7. The project was implemented by Dubrovnik Vodovod utilizing a Yugoslav consulting engineering firm and the Faculty of the College of Civil Engineering at Zagreb University as consultants. The project was divided into six contracts for Bank participation in financing. The loan provided for financing of 35 percent of the civil works and 100 percent of equipment and materials, consultants services, and interest during construction (Loan Agreement, Schedule 1). The six contracts are:

- Tender 1. Babin Kuk Water Reservoir
- Tender 2. Water Pumping Station and Intake at Komolac
- Tender 3. Wastewater Pumping Station and Collection System
- Tender 4. Treatment Plant and Ocean Outfall
- Tender 5. System Control Room and Equipment for Telemetry
- Tender 6. Design of Sewers for Old City

8. The project was essentially executed as planned except for the following:

a. Two additional wastewater pumping stations were added during design to provide more economical pumping heads and to better serve the old walled city.

b. The sewers in the old city were never laid because of archeological considerations. It is now intended to sewer the old city during reconstruction and rehabilitation of some of the ancient buildings.

c. The system control center was never completed. Only a partially completed concrete frame building exists.

d. The two 450mm outfalls were changed during design to one 800 mm line.

9. Most of the changes made during design and execution are normal to the design of projects. The deletion of the system control center, however, was evidently caused by delay in plan preparation and tendering the contract and eventually by a lack of funds.

10. Dubrovnik is a difficult and expensive location to construct sewerage and water supply facilities. Steep terrain, curved streets, rock excavations and the indented irregular coastline all create challenging engineering and construction problems. Considering this, the project execution, with the exception of the ocean outfall, was very well performed. Inspection of the physical works and the tender documents indicates a well designed system, constructed according to the plans and specifications and operating well. The amount of water produced and wastewater collected closely follows values given in the appraisal report (SAR, Annex 7). The shortfall in sewer connections is partly the result of delays in sewering the old city. The number of water connections was greater than 9500 in 1985 and equal to the values forecast at the time of appraisal.

11. Under difficult construction conditions Vodovod supervised and managed over US$10 million in contracts. The majority of these contracts were constructed at dollar costs close to the original budget and are a tribute to the Vodovod staff and the contractors performing the work.

12. An exception to the above is the construction of the ocean outfall. This project experienced extreme difficulties during construction. The original contractor was terminated, litigation is in progress and the outfall is currently broken 200 meters from shore and not in service. This subject is discussed in detail in the Supplementary Comments (paras. 32-33 and 38-41).

13. The SAR (para. 5.17) proposed how the organization and management of design and construction would be carried out.

> "Vodovod will be responsible for carrying out the project. Because its engineering staff is limited, further progress on the project depends on the engagement of appropriate consultants (SAR, paras. 5.02 and 5.03). Vodovod intends to assign responsibility for final design and procurement of the project, as well as technical advice during its construction, to the Institute of Civil Engineering Faculty or the University of Zagreb, its wastewater consultants (para. 5.03). During negotiations it was agreed that this contract with the consultants will be signed in a form acceptable to the Bank before the loan becomes effective. Construction supervision will be assigned to a separate group of consultants acceptable to the Bank to be engaged by January 1, 1975. During negotiations it was agreed that these arrangements, too, would be a condition of loan effectiveness."

14. There are several references to the contract with the consultants (SAR, para. 5.17) and the project files show several requests that the Bank be supplied with a copy, but it does not appear in the files (file search). There is no reference anywhere in the files to the requirement in SAR, para. 5.17 of a separate group of consultants supervising the construction. The outfall construction was clearly poorly supervised and not by a separate group with defined responsibility. The PCR is silent on this subject. The audit mission's interviews with Vodovod Dubrovnik personnel indicate that document control, daily construction logs signed by the contractor, weekly progress reports, etc., do not exist.

15. Regardless of the foregoing criticism of project management, with the exception of the ocean outfall, the project was well designed and implemented. The borrower places the blame for the outfall construction debacle on the contractor and partly on the Bank who they feel pressured them into selecting the contractor. This might or might not be a factual interpretation of the reasons for the poor construction and outfall failure.

16. The project, when the outfall is effectively repaired or partially replaced, will provide a functioning water and wastewater infrastructure for the long-term development of Dubrovnik. The problems of sewering the old walled city were underestimated during pre-appraisal and appraisal. Separating combined sewers is a difficult project under the best of conditions and is seldom completely accomplished. A casual inspection of the old city indicates roof drains entering combined sewers, multiple discharges directly

to the ocean and harbor and construction interferences by historic buildings. This is now recognized by Vodovod and the Institute for the Protection of Monuments. Many years will be required to construct a separate system in the old town and elimination of sewage discharges to receiving water adjacent to this area is several years away.

17. The difficulty of construction of a submarine pipeline to 100+ meters depth 1.5 km from shore was underestimated by the design engineers. A method of construction restricted to only one material (high density polyethylene pipe) limited prospective bidders. Only two bidders responded. More conservative designs utilizing steel pipe were precluded from the specifications. The stability of the present line is questionable and the cost of repairs could exceed US$ 0.5 million. Exception is taken to PCR, para. 8.01. The outfall had not been completed properly and was not functioning in November 1983 when the PCR was prepared. The outfall was put in service by a second contractor in 1984. Repairs were made in 1985 and a major failure occurred on January 10, 1986. A newspaper report is in Annex 1.

18. The benefits of the project in terms of improved water supply are sustainable for the foreseeable future, with supply sufficient to meet estimated demand to the year 2000. Benefits from the sewerage components of the project were less than expected, because of inability to resewer the old town completely, and also because of repeated failure of the sea outfall. Nevertheless, the bathing beaches are better protected, Gruz Harbour is no longer polluted and street flooding by sewage has been ended. These benefits are also sustainable, but to achieve full project benefits will require further substantial investment which Vodovod may have difficulty in funding.

Sales and Financial Performance

19. Water sales have been more or less close to appraisal forecasts, though tending to stagnate, or even fall off (in 1984). Statistics updated by the audit mission are as follows:

	1981	1982	1983	1984
Water Sales (million m^3):				
Appraisal Estimate	6.8	7.0	--	--
Actual	6.8	7.1	7.2	6.8
Wastewater Surcharge (million m^3):				
Appraisal Estimate	4.1	4.3	--	--
Actual	3.3	3.4	3.5	3.5

20. Vodovod's revenue convenant, after project completion, provides for earning a rate of return of 6% on average net fixed assets in operation. Calculations developed by the audit mission, based on audited accounts for 1983 and 1984, show that the actual rate of return achieved in those years was 7.1% and 5.9% respectively, which is satisfactory in the light of the constant inflation which the tariff must try to cover.

21. The PCR shows calculations of the rate of return achieved in previous years, but the average net fixed assets used for calculation (PCR, Annex 6, p.1 for Water Supply, Annex 6, p.2 for Wastewater, and Annex 6, p.2 for both combined) are mutually inconsistent, and moreover bear no relationship to the net fixed assets shown in the balance sheets (PCR, Annex 7). The inconsistency is not explained.

V. FINDINGS AND LESSONS

22. The project was well designed and constructed except for the ocean outfall. Project estimates made at the time of appraisal were accurate for the water supply portion of the project (PCR, Annex 2). Water supply components exceeded the appraisal estimate by less than 10 percent. Sewers and pumping stations were constructed at less than the estimated appraisal cost, mainly because the sewers in the old city were deleted. The major cost overrun item was the "Treatment Plant and Outfall Sewer". The cost of this item exceeded the appraisal cost estimate of US$1.26 million by 433 percent. There is no question that each ocean outfall is unique and that estimating costs is difficult. But at the time of appraisal data was available on 1960 through 1972 bid prices on at least 40 outfalls in the U.S. Examination of this data would have shown that the underwater portion of the outfall alone could be expected to cost between US$1.2 million and US$5.0 million at 1974 prices.

23. Design of marine structures is very specialized. The Bank should have required Vodovod to retain a firm experienced in marine design and construction or retained at the Bank expense a consultant to review the proposed materials and methods of construction. The difficult construction and design problem of exiting an almost vertical rock face cliff with a submarine pipeline also should have been reviewed by coastal engineers. The tender documents do not give the height of the design wave, sea floor boring logs or other design parameters and physical features generally provided to bidding contractors.

24. The Bank's project files are incomplete. Copies of documents for Tender 1, the Babin Kuk Reservoir and Tender 5, the System Control Center are not in the files. The actual contract with the outfall contractor including the proposed changes in exiting the tunnel, furnishing a deaerator and diffuser design details are not in the files. A set of these documents including more than 30 pages of text and 16 drawings were reviewed in Dubrovnik. An additional set of drawings changing the original contractor's design was apparently provided by the second contractor and are a part of the contract document between Vodovod and the second outfall contractor. These also were seen in Dubrovnik. These drawings do not appear in the Bank files.

25. There was no overall project management controlling the production and scheduling of tender documents and award of contracts. Tender 5, System Control Center documents were not produced until the early part of 1979 more than four years after the loan was signed. Two and one half years elapsed between the receiving of bids in February 1979 to the award of Tender 5 on

December 12, 1981, 19 days before the loan was closed. Many other instances appear in the files showing no strong project management in control. It would have been in the Bank's and Vodovod's best interests for the Bank to require a Bank approved consultant or employee of Vodovod for project management. Communication between the borrower and the Bank was very poor, probably because of a lack of information. The PCR reports events occurring that never happened and the files show repeated requests for information from the Bank to Vodovod that are not answered. The PCR is silent on the major construction difficulties and structural failures. The completion mission was apparently not briefed by Vodovod on this subject.

26. In hindsight, the major oversight of the Bank was the assumption that Vodovod Dubrovnik, without additional technical assistance, could manage a project of this magnitude and put in place a control and reporting system that would maintain schedules and construction quality.

Bank Performance

27. Little evidence is available from the files as to the quality of Bank performance. Vodovod's evaluation of the Bank's contribution, as expressed to the audit mission, was less than enthusiastic; they felt that they could have done as well or better with their own resources and their own technology.

VI. SUPPLEMENTARY COMMENTS

Inspection of the Completed Facilities

28. The audit team inspected the physical facilities constructed on the project on January 16 and 17, 1986. Sources of information other than visual inspection are noted in the text.

Tender 1. Babin Kuk Water Reservoir

29. This reservoir is constructed as two hydraulically separated 1000 cu meter capacity reservoirs. At the time of the inspection both reservoirs were out of service. Previous review of files indicated leakage problems after construction. Inquiries through an interpreter indicated no current problems. Why the reservoirs were not in service could not be determined. Apparently when only one hotel in Babin Kuk is operating the reservoir is not needed. No maintenance work was in progress and the reservoir had the appearance of having been out of service for a long period of time. (Level controls were disconnected, wells and floor of one side were completely dry.) Other than level indication, there is no provision for remote control.

Tender 2. Water Pumping Station, Komolos

30. This facility is well designed, constructed and maintained. All facilities were operating. No portion of the System Control Center (Tender No. 5) is installed at this location. Minor damage to the yard facilities

recently occurred, caused by heavy run-off of rain water from fire denuded adjacent mountains. The major structures were not damaged.

Tender 3. Waste Water Pumping Stations and Sewers

31. Four of the six pumping stations constructed were visited (Ploce, Gliman, Batala, Gruz). Inspections were cursory. The stations are well designed with particular attention given to architectural detail, access and landscaping. Station construction closely follows the tender documents. Control of pumps is by tethered float tip switches, pumps are submersible, and hand cleaned coarse bar screens are provided. There are no provisions for automatic remote control in the electrical panels but auxiliary relays could be added for remote control if required. The present control system would be adequate if a "common alarm" were added to each station and transmitted to a remote supervisory location as an interim measure until a System Control Center is constructed. Plans and specifications in the Tender Documents are well detailed and very complete.

Tender 4. Sewerage Treatment Plant and Outfall

32. The ocean outfall failed for the second or third time on Janaury 10, 1986. This failure and the long history of poor performance by the contractor was reported in detail by Vodovod staff to the audit mission during meetings on January 15-17. A detailed review of the sequence of events of the outfall performance and a review of the Tender Documents, the plans as modified by the original contractor and further modified by a Yugoslav contractor hired to finish the contract, took place on January 17, 1986. The contract documents and plans were in Serbo-Croatian. The translator was not technically trained and determining the exact sequences of events was difficult. Plan changes during construction were apparently approved or worked out in conjunction with a Yugoslav consulting firm and are countersigned. In February 1986, a detailed review of the project files was made by the OED audit team in Washington. This review included the tender documents, copies of actual bids, analysis of bids by boards of experts convened by Vodovod Dubronvik and by consultants and the Faculty of Civil Engineering, University of Zagreb. All correspondence in the files related to the non-financial aspects of the project was reassembled in chronological order and researched.

33. The following should be noted about Tender 4:

a. The construction has failed structurally (see attached newspaper articles, Annex 1).

b. The cost has exceeded the original estimate in US dollars by 433 percent. The original cost estimate was 1.26 million dollars, the final cost was 5.46 million dollars.

c. The client, Vodovod Dubrovnik, reports they were "pressured" into selecting the contractor by Bank personnel, although there is no evidence to support this claim.

d. A review of the project files shows extensive correspondence on the subject. Two reports of panels convened to review the bids and determine the lowest responsible bidder are in the file. One representing the workers council of Vodovod Dubrovnik (Doc. 155.830c) and one composed of the consultant and engineering professors from the University of Zagreb (Doc. 155.830 E1). Both of these panels recommended award to a contractor other than the one who eventually got the contract, but according to Bank staff the recommendations for award were inconsistent with the Bank's procurement guidelines.

e. The award was made at a price lower than the bids received. The award was apparently based on an alternative bid not considered responsive by the reviewing panels (Doc. 155.830[H]).

f. The outfall as constructed is different from the tender documents in significant details.

Tender 5. System Control Center

34. The system control center does not exist, though a reinforced concrete building was started. The building is probably less than 15 percent complete. Interviews with Vodovod personnel indicated the work was stopped due to lack of funds. When questioned on the US$2.70 million reported spent (PCR, Annex 2) no explanation was offered. Vodovod personnel also stated no automatic control equipment was on hand.

35. Project files available on the system control center have been reviewed on February 10-11, 1986. The following has been extracted:

a. The SAR, October 9, 1974 does not mention a system control center in the Project Description (Annex 3). In the Annex 4 cost estimate two items are listed: (i) "Expansion of Vodovod Headquarters" US$131,000 and (ii) "Operation and Maintenance Equipment" US$78,000. These same items appear under project cost, page 11 and are mentioned in SAR, para. 5.05. There is no reference to tender documents for this work in the files.

b. The PCR (para. 3.03) states, urin appraisal, an element of the project was included to cover improvements for the Vodovod operations building and to supply equipment. Vodovod Dubrovnik later expanded this element to provide the required control equipment which was needed to maintain overall monitoring and surveillance of both water supply and sewerage system operations". Funds may have been spent on the operations building, but there are no tender documents for this work. The monitoring and surveillance equipment is not in place and not on hand at Vodovod Dubrovnik. (Reported by Vodovod staff on January 16, 1986).

c. The PCR (para. 3.09 ii[c]) states actual cost of civil works and equipment of the system control center was (1) 70.6 million dinars

"due to delay in procurement and to the fact that the equipment required for the system was more sophisticated than originally envisaged".

d. The PCR (paras. 5.04 and 5.05) again refers to the (non-existent) central control system including plans to hire five additional engineers to staff the facility.

e. March 19, 1979. A cable from Vodovod Dubrovnik (I. Imaovil) to the Bank recommends award of control equipment to a supplier from Zagreb and a separate contract for civil works.

f. April 5, 1979. No objections to award Tender 5 in cable to Vodovod.

g. September 21, 1979. Cable stating no objection to award equipment contract for Tender 5 for 209,039.33 Dinar.

h. April 15, 1981. Letter to Bank from Vodovod Dubrovnik re Tender 5 stating the contractor went bankrupt during negotiation stage. Requests authority to award to second bidder at five percent additional costs plus escalation.

i. Supervision Summary dated April 24, 1981 states no objection to award of equipment for Tender 5 (7.01). Annex 1-a states "Central Signalling and Control System" will not be completed in 1981 and reports loan will be closed December 31, 1981.

j. May 6, 1981. Letter from Bank to Vodovod stating information in item i. above.

k. December 22, 1981. Cable to Vodovod states willingness of Bank to participate in Tender 5 equipment contract but calls attention to December 31, 1981 loan closing.

l. February 26, 1982. Supervisory Report, Annex 3, p. 2 "Civil works funded by Vodovod and contract for equipment supply signed on December 12, 1981, completion date December 1982."

m. March 3, 1983. Cable from Dubrovnika Bank to World Bank heading "Paid from IBRD Loan", shows Tender 5:

1978 G	134,395,00 Dinars
1979 G	1,153,072,00 Dinars
1980 G	784,269,00 Dinars
1981 G	530,233,00 Dinars
1982 G	2,948,263,00 Dinars
1983-1	920,942,00 Dinars
TOTAL	6,845,714,00 Dinars

36. The system control center reported in the PCR, Annex 1 and Annex 2 as costing US$2.7 million does not exist. No record can be found in the files of the Bank's disbursing money for the project, other than the telex referred to in item m above. Tender 5 documents are not available from the files, but are referred to in correspondence. The civil works were stopped by Vodovod due to lack of funds. The equipment contract was apparently cancelled sometime in 1982. How much was spent on this contract is unknown.

37. The audit has concluded that the figures in PCR, Annex 1 and Annex 2 were estimates, prepared by Vodovod Dubrovnik in the first quarter of 1982 for their project completion report, of the cost of completing the control center. The Bank was not informed later that construction of the center had been abandoned.

Structural Failure of Outfall

38. The plans and specifications as represented in the original documents are a well thought-out design. The design provides for two 500 mm steel pipes mounted one over the other, encased in concrete, for the length of the tunnel between the treatment plant and the start of the outfall. The remaining space in the tunnel is utilized for access and for storm water. A well planned system for storm water diversion at the cliff face is shown on the drawings.

39. The tunnel terminates at an almost vertical cliff face at about 1.2 meters above high water. A connection to the two 500mm encased steel pipes to an 800mm high density polyethylene pipes and extensive concrete work to protect the pipes from wave forces is detailed in the plan documents. All pipes from the end of the tunnel to a distance 200 meters into the sea are to be encased in massive concrete and secured to the steep cliff face. Two hundred meters from shore the depth is 17.30 meters. The sea floor slopes at approximately 15% to a point approximately 600 meters from shore. The slope from this distance seaward is 3%. The initial vertical cliff plus the steep slope of the sea floor makes construction at this location extremely difficult. The factors of the existing tunnel and sewerage collection system and the distance from recreational beaches no doubt outweighed the difficult construction in outfall site selection.

40. The critical part of the construction is to connect the outfall at the end of concrete encasement 200 meters from the cliff face to the portion that was towed to sea and sunk to an in exact alignment. This connection is particularly difficult with polyethylene pipe, a semi-flexible material, that floats and has a very low modulus of elasticity. This connection has never been satisfactorily made. According to the PCR, the original contractor finished this connection. Upon inspection by a remote controlled submersible camera, it was discovered that the connection had not been made properly, and the seaward section of the outfall was several meters out of alignment and overlapping the concrete encased inshore section. The second contractor (hired to finish the work after the original contractor abandoned the work) attempted to pull the polyethylene pipe into place and effect a connection by a large tremie concrete encasement. This connection is unsuccessful.

41. Sewerage now discharges 200 meters from shore in 17.5 meters water depth. Vodovod Dubrovnik is currently working with consultants from Zagreb and contractors to assess the magnitude of the problem and determine a method of repair.

Cost Estimate

42. The appraisal report is dated October 9, 1974. The cost of the underwater outfall only, not including the treatment plant or pipe lines in the tunnel, was estimated by the audit team from cost data on bids received from 1960 through 1972 for about 40 outfalls constructed in the US. The costs were equated to Engineering News Record Cost Index 2500 for January 1975. This standard method of estimating outfall costs at the report stage gives a high value of US$5.0 million and a low value of about US$1.2 million. It is hard to understand how at the time of appraisal it was believed that US$1.3 million (SAR, para. 5.08) would construct the outfall, tunnel pipes and a treatment plant. The estimates apparently were not checked against available unit price construction cost data. The SAR estimate contains allowances for physical and price contingencies. The estimates taken from the other sources contain allowance for physical contingencies only.

Capacity of the Project

43. The SAR and the PCR tabulate pumping capacity and reservoir size of the Dubrovnik system, but are silent on the population the system will adequately serve and the year this population will occur. The following is a rough estimate of these two values.

44. The population and water demand can be extrapolated from the curves in SAR, Annex 7 (WB 7899). Assuming a 2% annual growth continuing from 1982 the population would be 59,000 in the year 2000. For 60,000 persons the water production required would be 7,650,000 m^3 per year (42,000 m^3 per day). The present system with one of the three major supply pumps out of service would supply about 45,000 m^3 per day. This is 2.14 times the expected average daily flow of 21,000 m^3 per day. This means that if the maximum day requirement does not exceed approximately two times the requirements on an average day the present system could meet the demand of the 60,000 population estimated for the year 2000. Because of the large influx of tourists in the peak summer months, the maximum day demand could be greater than two times the average day, but no data is available in the PCR or SAR on maximum day or peak hour demands.

45. Water storage at 60,000 population would be approximately four hours and will probably be inadequate.

46. Sewage capacity for the outfall is controlled by the pumps at the Lapad pumping station. This capacity with one pump out of service is approximately 56,000 m^3 per day, or 1.2 times the required water supply in the year 2000. This capacity would probably have to be expanded to meet peak hour demands during periods of precipitation.

DUBROVACKI VJESNIK

Article dated January 18, 1986

Main Sewer Outlet at the Foot of the Petka *

Part of Conduit Damage

On hearing the news that the main sewer outlet at the foot of the Petka was again damaged, we contacted the technical director in KRO "VODOVOD" (Sewerage Working Organization of the Water Supply System), Dominik Brigovic, who told us, inter alia, the following: "As soon as we heard that something had happened at the foot of the Petka, we went to inspect the site together with [the representative of] the Port Authority of Dubrovnik and we determined that a section of the conduit of the main sewer outlet had floated to the surface of the sea.

"On January 10, a team of divers discovered that the conduit had begun to separate at the depth of about 30m. The separation occurred at the spot which was repaired last year, the location of the so-called "concrete connecting block". For reasons not yet known, a section of the conduit 1.30 meters long had slipped out of the connecting block causing an 800 mm pipe, from which the weights had slipped off, to float. Without the weights, the conduit became parabolic in shape, and part of it floated to the surface."

"Any idea what might have caused the separation of the conduit?"

"I cannot say anything about it at this time. KRO "VODOVOD" has set up a commission composed of experts from Dubrovnik, Rijeka and Zagreb. The commission will start working on Friday, January 17, on only after we have received its report will we be able to speak more concretely about what had happened."

"What measures are being taken to repair the conduit?"

"KRO "VODOVOD" has already invited bids from a number of working organizations for sinking the pipe. This is essential in order to prevent the pipe from being ripped away in bad weather. That would be the first step. The work on repairs will be completed only after the causes of the separation are established and plans of the work to be done drawn up. The timing will also depend on weather conditions."

This is the story, for the time being, about "the free floating", not "the broken off", section of the conduit, as D. Brigovic pointed out. However, it must also be pointed out that at the foot of the Petka sewage is now freely flowing into the sea creating a sort of "fecal spill". It is difficult to predict for how long sewerage will continue to pollute the sea and the surrounding area. We need to remember, however, that the conduit was laid by the Italian firm Geneco of Milan which went bankrupt before finishing the job but not before collecting full payment for it; that last year

* Petka is a mountain above the port of Gruz.

DUBROVACKI VJESNIK

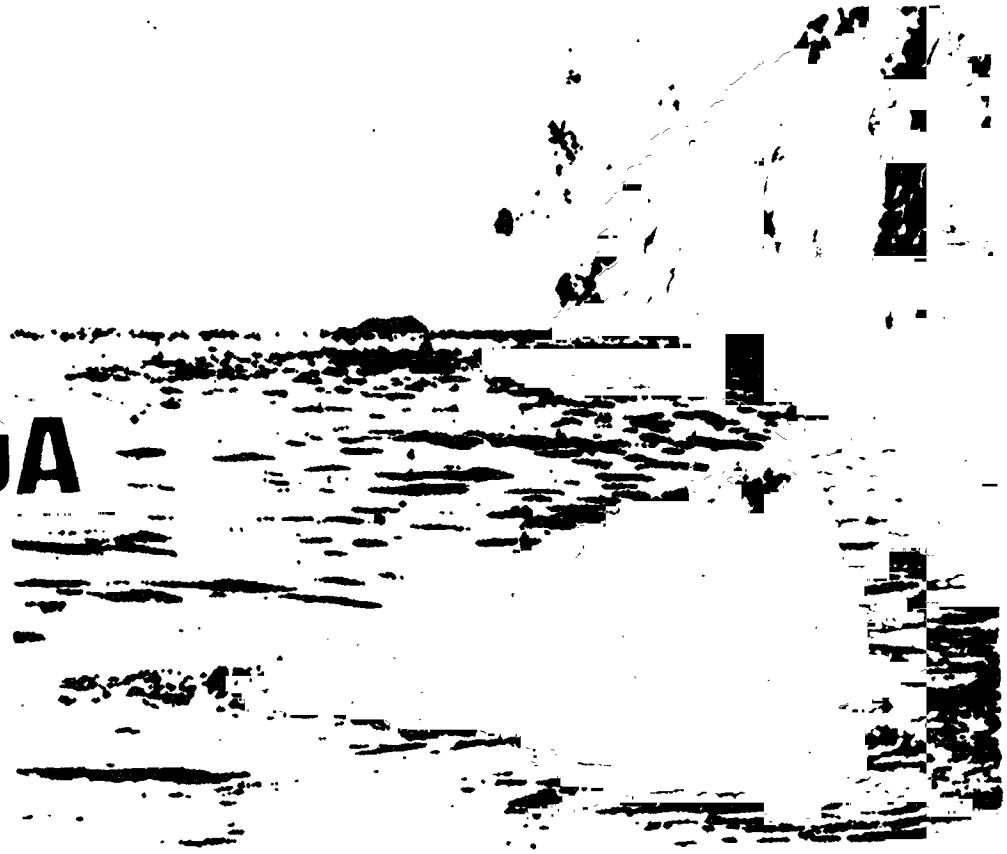
Article dated 1/18/86, continued

billions of dinars were sunk into the repairs of this "completed" job; that "VODOVOD" kept informing us that the entire sewerage system was fully functioning...

As is usually the case with investments for which "VODOVOD" is responsible, there are many more questions than answers. But it is no use crying over spilt milk. In the "time honoured fashion", the Executive Council of the Commune Assembly will also be informed of the accident for which a price will have to be paid. The question is how high a price this time and what will be the share of the "separation" of the conduit in the new rates of KRO "VODOVOD" services. Particularly in view of the fact that this organization is still not credit worthy. --L.B.

Glavni kanalizacijski ispust podno Petke

OŠTEĆEN DIO CJEVOVODA



Iz, za sada, nepoznatih razloga došlo je do odvajanja dijela cjevovoda na glavnom kanalizacijskom ispustu podno Petke — Dio cjevovoda isplutao na površinu, pa kanalizacija nesmetano izlazi u more — Koliko će koštati nova sanacija lani »saniranog« glavnog kanalizacijskog cjevovoda»?

PROJECT COMPLETION REPORT

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT

(LOAN 1066-YU)

I. INTRODUCTION

1.01 The water supply system serving Dubrovnik had continued to use the groundwater sources which had first provided water to public fountains in the town in 1428. The existing distribution system had come into being in the early 1900s, and had been expanded several times in this century. By 1959, the growth of the town and the increase in tourism called for further expansion of the system.

1.02 Dubrovnik's wastewater system dated back to the storm sewers built centuries ago in the old town. Some 30 km of combined wastewater and storm sewers had discharged untreated wastes through 33 outfalls into the harbor of Gruz and the old town (see IBRD Map 10626). During heavy rains, many of the lines lacked sufficient capacity to handle flows and untreated sewage would flood low-lying areas.

1.03 In 1970, Vodovod Dubrovnik, the Dubrovnik Water and Wastewater Enterprise, engaged one group of consultants to prepare a master plan and feasibility study for a regional water supply system and another group for a wastewater system for Dubrovnik.

1.04 In July 1971, the Government of the Socialist Federal Republic of Yugoslavia formally requested a Bank loan to assist in financing the Dubrovnik Water and Wastewater Project. On December 19, 1974, the Bank approved a loan of US$6.0 million to Vodovod Dubrovnik with the guarantee of the Federal Government. The Project was part of Vodovod Dubrovnik's program to improve and expand water supply and distribution facilities in Dubrovnik and the surrounding tourist zones, and to abate sewage pollution of the shores, beaches and harbor by constructing sewerage facilities including those for sewage treatment and disposal.

II. PROJECT PREPARATION AND APPRAISAL

Origin, Preparation and Appraisal

2.01 The first Bank reconnaissance of the Dubrovnik infrastructure took place in October 1970, during Bank appraisal of the Babin Kuk Tourism Project (Loan 782-YU). The Babin Kuk Loan Agreement included the financing of studies for the treatment and disposal of wastewater in the Dubrovnik urban area. Following the Babin Kuk Project appraisal several Bank missions visited Dubrovnik to assist in the preparation of the water and wastewater project. In the spring of 1973, a Bank mission reviewed the feasibility studies and preliminary engineering reports and reached an agreement on the scope and basic design criteria for the Project. A September 1973 mission reviewed the proposed Project's financing. The appraisal was carried out in June 1974. The key issues were: (i) the institutional development and strengthening of

Vodovod Dubrovnik; and (ii) the adoption of appropriate financial policies. Agreements were reached during negotiations on institutional measures and financial policies acceptable to the Bank, the Federal Government and Vodovod Dubrovnik. The Staff Appraisal Report was issued in October 1974.

Negotiations and Approval

2.02 The loan was negotiated in September 1974, and approved and signed in December 1974.

Major Objectives of the Project

2.03 The major objectives of the Project were:

(i) to improve and expand the water supply and distribution facilities of Dubrovnik and the surrounding tourist zones; and

(ii) to abate pollution of the shores, beaches and harbor by constructing sewers and treatment and disposal facilities.

Project Description

2.04 The project consisted in the extension and/or construction of facilities to improve the water supply and wastewater systems of Dubrovnik and vicinities. It included:

(i) Water Supply

(a) extension of the Komolac pumping station and installation of two additional pumps;

(b) construction of a new 1.4 km rising main from the Komolac pumping station to the tunnel through Srdj mountain;

(c) construction of a 2,000 m^3 reservoir at Babin Kuk;

(d) extension and renovation of the water distribution system;

(e) acquisition of land; and

(f) engineering design, supervision and project administration.

(ii) Wastewater

(a) construction of 13.6 km of sewage collectors and 8.2 km of mains;

(b) modifications to existing sewers;

(c) installation of four automatically operated sewage pumping stations;

(d) construction of a primary sewage treatment plant incorporating comminution and removal of grit and floatables;

(e) construction of a 1.3 km outfall sewer including a de-gassifier and terminating in a diffuser at a depth of about 97 m;

(f) provision of equipment for operation and maintenance;

(g) acquisition of land; and

(h) engineering design and supervision and project administration.

(iii) Vodovod Headquarters

- Expansion of the offices and workshops of the Borrower.

2.05 The water supply component of the Project included two new pumps to provide a total capacity of 740 l/s required to meet the projected peak demands though 1995. The water would be conveyed by a 600 mm transmission line. Tourism development would be assisted through construction of the Babin Kuk reservoir. The 2.7 km of water distribution system would improve service along the west side of Gruz harbor and would supply Babin Kuk. An additional 2 km of pipes would be installed to rehabilitate lines which were leaking, corroding or otherwise restricting hydraulic capacity.

2.06 The wastewater components would collect and direct wastewater from existing and proposed branch sewers to the proposed Lapad treatment plant. The areas along Gruz Harbor, the west side of Dubrovnik, and near the old town would no longer discharge wastewater onto the beaches and into the harbor through the numerous existing outfalls. Combined connections (about 1,500) would be modified in order to separate domestic sewage and stormwater. The four pumping stations would have respective capacities of 74, 96, 134 and 328 lps (at Lapad). After primary treatment at the Lapad plant the effluent would flow through a 600 mm pipe in the existing 500 m long tunnel through Petka hill into a 1,300 m outfall comprising two 450 mm diameter pipes. With an initial dilution greater than 1 to 40 and adequate dispersive dilution and bacterial die-off the disposal system would meet the Croatian Republic standards for coastal waters.

Special Conditions

2.07 Special conditions were specified in the Loan Agreement, as follows:

(a) Babin Kuk would provide the Borrower with Dinars 25 million as a contribution toward carrying out the project (Preamble para. G). This contribution has been provided;

(b) the Dubrovnik Commune would prepare regulations governing the use of the wastewater systems in the city of Dubrovnik, satisfactory to the Bank, and would cause such regulations to become effective not later than June 30, 1975 (Preamble para. I). This condition has been met;

(c) Vodovod Dubrovnik would appoint a qualified financial director and would improve its accounting and billing procedures by December 31, 1975 (Section 4.03). This condition has been fulfilled;

(d) Vodovod Dubrovnik would make arrangements to become responsible for emptying septic tanks in Dubrovnik by December 31, 1975 (Section 5.02). This condition has been met;

(e) Vodovod Dubrovnik would levy such tariffs for its water supply and wastewater services as would ensure that:

(i) Revenues from water and wastewater charges would be sufficient together with other revenues from the operation of the water supply service, to cover all operating and administrative expenses, including depreciation, and taxes or payment in lieu of taxes (if any), in respect of the water supply service (Section 5.05 (a) and (b)). This covenant was met;

(ii) During the period of project construction, funds generated from internal sources and available for investment in the water supply and wastewater systems would equal, in 1975 and each year thereafter until and including the year in which the Project came into operation, at least 4 percent of the gross value of its utility plant including work-in progress (Section 5(c)). This covenant was only met for part of the construction period (Annex 8); and

(iii) Commencing in the year following the year in which the Project came into operation, and for each year thereafter, revenues derived from its water supply and wastewater operations would be sufficient to cover all operating and administrative expenses of the Borrower and taxes or payments in lien of taxes (if any) and would produce an annual rate of return on the Borrower's net fixed assets in operation of at least 6 percent (Section 5.05(d)). The Project has only become operational in July 1983, and therefore this covenant will become effective in 1984.

(f) Vodovod Dubrovnik would not incur debt unless its net revenue were not less than 1.5 times maximum future debt service (Section 5.06); Vodovod Dubrovnik had no difficulty meeting this requirement except in the last two years (Annex 8); and

(g) Section 5.04 of the Loan Agreement specified that Vodovod Dubrovnik had to reduce its account receivables to 2.5 months' revenue from water and wastewater charges by December 31, 1978, and thereafter maintain them at or below that level. This condition has been met (para.4.06).

III. PROJECT IMPLEMENTATION AND COST

Effectiveness

3.01 Special conditions of effectiveness included, inter alia:

(a) the employment of engineering consultants acceptable to the Bank to assist the Borrower in the execution of the project;

(b) the issuance of all necessary construction licenses by the governmental authorities; and

(c) the commitment undertaken by the Commune to approve, as required, tariff increases to enable the Borrower to generate the revenues required by the provision set forth in Section 5.05 of the Loan Agreement.

The date of effectiveness was scheduled for May 23, 1975. All above conditions were met with only a slight delay and the Loan was declared effective on June 26, 1975.

Implementation of the Project

3.02 Implementation of the Project components -- paras. 2.04 (a to f) for water and (a to g) for wastewater -- should have been completed by mid-1976 for water and mid-1978 for wastewater components. However, these were substantially completed only in October 1979 and mid-1983 respectively. It took Vodovod Dubrovnik much longer than foreseen at appraisal to put together an effective team of technicians capable to monitor the Project. It appears that the assumption that the bulk of the construction would be completed within 2 1/2 and 3 1/2 years respectively (SAR Annex 5), was overoptimistic in light of Bank experience in Yugoslavia. Implementation slippage was in part due to the fact that evaluation of bids, decision of awards and signing of the contracts generally required much more time than originally anticipated. Implementation slippage was also due to delays in completion of design works for: (i) reservoir and associated water distribution network other than the Babin Kuk reservoir; (ii) sewers in the old town; and (iii) sewage outfall and treatment plant. Actual completion dates were as follows:

(i) Water Supply Components:	As per Appraisal	Actual
(a) Pumping Station Equipment	Mid-1976	Mid - 1977
(b) Pumping Station Civil Works	Mid-1976	Sept. 1979
(c) Rising Main to Tunnel	Mid-1976	End - 1978
(d) Reservoir at Babin Kuk	Mid-1976	End - 1978
(e) Extensions to Distribution System	Mid-1976	Sept. 1977
(ii) Wastewater Components:		
(a) Sewer Construction	Mid-1978	End - 1978
(b) Pumping Stations	Sept.1977	Mid - 1983
(c) Treatment Plant	End-1976	Mid - 1983
(d) Outfall Sewer	End-1976	Jan. 1983

Revisions to the Scope of the Project

3.03 The Project had been appraised on the basis of feasibility studies and without an updated urban development plan. Revisions were made with Bank's concurrence to the Project scope, as follows: (i) the original design of the sewer outfall considered two-450 mm plastic pipes, while the outfall, as finally justified by the Consultant, is a single 800 mm high density polyethylene pipe; (ii) the finalization of design of the new sewerage system in the old city had to be temporarily postponed because the construction of sewers might have caused more environmental and aesthetic damage to the historical part of the town than that due to the small amount of sewage discharged. The replacement of old stone sewers, some of which were considered worthy of preservation, by a new network (serving about 15 percent of the population) would have necessitated directing the force mains around the city outskirts. In early 1983, concurrent with the initiation of renovation of the old town (since the roadway in the Town Hall area was under repair) replacement of a minor portion of the existing collection system had begun (see para. 7.02). However, this remedial work does not represent part of the overall reconstruction of the old town sewerage system, although design of the overall revised old town collection system was also underway. Collectors which encircled the old town, and pumping capacity which anticipated the old town's sewage discharge loading were installed in close proximity of the town, by adding the small Ploce pumping station; (iii) the hydraulics of the sewage collection system were improved and pump sizes reduced through addition of an intermediate pumping station in the system. Through the addition of the Batala station (see Map 10626), it became possible to reduce the size and number of pumps in the Lapad station; (iv) in order to minimize traffic disruption and to economize on road rehabilitation costs, some of the sewer mains were installed simultaneously with the water supply mains, especially in the Gruz harbor area; and (v) during appraisal, an element of the project was included to cover improvements for the Vodovod operations building and to supply equipment. Vodovod Dubrovnik later expanded this element to provide the required control equipment which was needed to maintain overall monitoring and surveillance of both water supply and sewerage system operations.

Performance of Consultants and Contractors

3.04 The consulting firm which assisted Vodovod Dubrovnik in the final designs, procurement and supervision of the Project was generally qualified. Execution delays were incurred and changes were made to the Project scope mainly because, as stated in para. 3.03, at the time of appraisal, only feasibility studies were ready. During the preparation of final engineering designs, some components required more specialized expertise, particularly for the design of the sea outfall, construction of reservoir at Babin Kuk and construction of the sewage treatment plant. As Vodovod Dubrovnik has indicated, in retrospect, it would have been more beneficial to hire other consultants for those specific components. Regarding construction supervision, tighter control over the construction of the reservoir and more decisive handling of the sea outfall would have resulted in significant time and investment savings.

3.05 The civil works elements of the Project are considered to be of acceptable quality.

Procurement

3.06 All goods and services (other than the services of consultants) required for the Project were procured on the basis of international competitive bidding in accordance with the Bank's guidelines for procurement. Vodovod Dubrovnik had no difficulty in complying with these guidelines; and procurement was accomplished in a satisfactory manner.

Disbursements

3.07 Because of the implementation delays noted in para. 3.02, actual disbursements lagged considerably behind the appraisal estimate. At the end of 1978 at which time the loan was to have been fully disbursed, actual disbursements totalled about US$0.99 million or about 16.5 percent of the Loan amount. It took seven and a quarter years to disburse the Loan instead of four years as originally forecast. The total amount disbursed was US$5.87 million, and the undisbursed balance of US$130,000 was cancelled. As of February 1, 1983 an amount of US$ 585,000 had been repaid.

Project Costs

3.08 A comparison of estimated and actual costs is presented in Annex 1, 2 and 3. The Project was executed during a period of much higher inflation than could have been anticipated at appraisal. Actual costs amounted to D 405.8 million (appraisal D 145.9 million). It is estimated that of the total cost overrun of D 259.9 million, about D 108.1 million, i.e., 42 percent, resulted from higher prices and the fact that roughly 54 percent of the investments were made after the 1978 scheduled completion year.

3.09 The remainder of the cost overrun is due to a mix of factors. The major variations occurred in the following components:

(i) Water supply: actual cost of the pumping station and force main amounted to D 46.6 million vs. D 16.6 million at appraisal. Construction cost increases were principally due to problems encountered with extremely difficult groundwater conditions, viz. foundations had to be constructed with caissons in groundwater pools;

(ii) Wastewater:

(a) actual cost of the sewers and pumping stations was D 114.1 million vs. D 87.0 million at appraisal. Excavations encountered rock strata requiring drilling and blasting which had not been foreseen at appraisal;

(b) actual cost of the treatment plant and outfall sewers amounted to D 144.8 million vs. D 18.7 million at appraisal. The cost of the sewage outfall was considerably underestimated at appraisal because there was no precedent on which to base costs in Yugoslavia. Also the final design called for a greater volume of excavation and concrete fill than originally foreseen. Furthermore, delays in construction led the contractor to demand and obtain substantial increases in the value of its contract and notwithstanding to abandon the project. This is under litigation at present. In the meantime, another contractor was selected resulting in further increased costs.

(c) actual cost of civil works and equipment of the system control center was D 70.6 million vs. D 5.1 million at appraisal. Due to delay in procurement and to the fact that the equipment required for the system was more sophisticated than originally envisaged (paras. 3.03 (v).

3.10 The cost overrun was met by the Commune of Dubrovnik through equity contributions.

IV. FINANCIAL PERFORMANCE

4.01 Vodovod Dubrovnik's appraisal and actual income statements, cash flow statements and balance sheets for the period 1973-82 are shown in Annexes 6, 7 and 8.

Operating Results

4.02 The appraisal forecast of the total volume of water sold by Vodovod Dubrovnik for the period 1975-82 was remarkably accurate (see Annex 6). In 1982, total actual revenues were 17 percent higher than forecast for water and 30 percent lower than forecast for wastewater while total actual expenses were 91 percent higher for water and 21 percent lower for wastewater. Personnel

costs for both water and wastewater activities increased rapidly and, for the period 1975-82, accounted for about 43 percent of total expenses as compared to 31 percent forecast at appraisal. The effect of the high rates of inflation that prevailed during the period is readily seen in the following table:

	----- Dinars -----	
	1975	1982
Average Revenues per m^3		
Actual	4.14	12.83
Appraisal	4.65	8.92
Average Expenses per m^3		
Actual	3.37	11.59
Appraisal	2.79	5.88

Financing Plan

4.03 The period 1975-82 was characterized by rapidly increasing operating and investments costs and was particularly difficult for a public corporation like Vodovod Dubrovnik to execute its first Bank project. Nevertheless, albeit with severe delays, with the support of the commune, Vodovod Dubrovnik succeeded in expanding the service.

4.04 Total investments and working capital requirements totalling D 637.7 million (appraisal D 225.4 million) were financed 1.6 percent from internal cash generation (appraisal: 29.0 percent), 24.4 percent from Government contributions (appraisal: 16.6 percent) and 74.0 percent from borrowings (appraisal: 54.4 percent). A comparison of appraisal and actual financing plans is shown in Annex 9.

Consumer Charges

4.05 Vodovod Dubrovnik's tariff structure consists of four rates for water sold to domestic consumers, government and commerce, local and foreign ships, and one rate for consumers connected to the sewerage system. Since 1975, tariffs have been increased every year between 10 and 30 percent. These adjustments were sufficient to meet the financial objectives embodied in the Loan Agreement (para. 2.07(e)).

Financial Position

4.06 Vodovod Dubrovnik's overall financial position has been satisfactory. Its debt to equity ratio increased gradually during the period 1975-82 and stood at an acceptable level of 60:40 at the end of 1982. Its current ratio was somewhat low towards the end of the period under review because of an increase in short-term credits, while its receivables reached less than one month of sales at the end of 1982 (Annex 7).

V. INSTITUTIONAL PERFORMANCE

Organization and Management

5.01 The organization structure of Vodovod Dubrovnik appears in Annexes 10 and 11. As is customary in Yugoslavia, Vodovod Dubrovnik is controlled by its workers who direct the enterprise through the Worker's Council. However, its autonomy is limited, since the Commune has to approve changes in its organization and tariffs, and provides financing. The Commune also acts as coordinator between various local enterprises.

5.02 Vodovod Dubrovnik is responsible for water supply facilities throughout the Commune. The only wastewater system for which the enterprise is responsible is in the City of Dubrovnik. Vodovod Dubrovnik is headed by a Managing Director who receives policy guidance from the Worker's Council. At its inception, three departments (Finance, Technical and Superintendence) reported to the Director. Currently, there are four departments (Finance, Technical, Administration and Development). The current organization works satisfactorily.

Personnel and Training

5.03 In the period 1974 to 1982, Vodovod Dubrovnik's staff increased from 115 to 168, and at the end of 1982 stood at the equivalent of 20 employees per 1,000 connections.

5.04 The objectives of the project did not include reorganization or restructuring of the entity since the magnitude of the new works did not justify such an approach. However, expansion of Vodovod Dubrovnik's offices and workshop complex, including central system control capability, was made a part of the project in anticipation of the substantial growth in wastewater operations. Generally, the technical aspects of the project were managed acceptably well as a result of Vodovod Dubrovnik's appointment of a qualified technical director in 1972. However, this technical director left in 1982, and Vodovod Dubrovnik is trying to recruit a successor.

5.05 A separate function has not been set up for staff training because the skills required for virtually all positions are readily available in the country. The professionals and technicians needed for the system control center and for the expanded laboratory facilities are presently under recruitment. The engineers for the former are already on board, but a chemical engineer will be assigned at a later date to assist the incumbent laboratory technicians. Five additional engineers will be hired to staff the system control center.

Accounting

5.06 During appraisal, it was noted that financial management, especially planning, had not been strong. The Bank's emphasis on remedial action was followed by an agreement reached during negotiations that Vodovod Dubrovnik would hire a finance director. The engagement of the latter took place in early 1976.

5.07 From 1976 onwards, significant improvements were noted in Vodovod Dubrovnik's accounting function. Its financial records, including accounts and inventory controls, are kept according to the standards laid down by the Social Accounting Service. The present staff is adequate. Records are kept manually in a reasonably efficient fashion.

5.08 During the project implementation period, Vodovod Dubrovnik's fixed assets in operation were revalued every year, although, as often happens in Yugoslavia, the amount of depreciation charged to income has been less than the full amount which would result from revaluation. This, however, did not materially affect the net cash flow available for operations.

Audits

5.09 Since 1975, Vodovod Dubrovnik's accounts have been audited by the Special Audit Group of the Social Accounting Service (SAS). The quality and depth of the audits have improved considerably since the creation of this Group. However, the audit reports were submitted to the Bank with substantial delays, i.e., up to 18 months instead of the covenanted 6 months. While there is considerable room for improvement, the time specified in the Loan Agreement for submission of these reports was perhaps too optimistic. At any rate, audit reports have been comprehensive and valuable to Vodovod Dubrovnik and the Bank.

VI. BANK PERFORMANCE

6.01 The project was supervised at an average of about six-month intervals. The Supervision Reports generally highlighted issues in project execution and were followed by letters to the Borrower urging corrective actions where required. However, the Bank did not have much success in getting quarterly reports from Vodovod Dubrovnik nor in convincing it to take measures to reduce unaccounted-for water.

6.02 The Bank was flexible in agreeing to modifications in the project scope (para. 3.03).

VII. PROJECT JUSTIFICATION

Institutional Aspects

7.01 One of the major contributions of the Project has been the institutional development and strengthening of the Borrower particularly in the area of project execution and administration and in the adoption of institutional measures and financial policies. At first, Vodovod Dubrovnik had difficulties in recruiting qualified personnel, but this was eventually overcome (para. 5.04). It took about two years for its technical department to become fully operative.

Improvement to Dubrovnik Water Supply and Wastewater Systems

7.02 The Borrower was able, albeit with considerable delays, to expand Dubrovnik's water supply system and to improve its wastewater system in order to meet the needs of the Dubrovnik urban population and more specifically, to provide dependable service and reduce coastal pollution which is vital to its growing tourist industry. Water production and distribution facilities were constructed as planned, but some elements of the sewerage system had not been completed by June 30, 1983 (para. 3.02). Although improved sewer service and the resultant abatement of beach pollution in the Babin Kuk area have been realized, the old town sewers have not yet been rehabilitated. It has recently been agreed, however, between the Institute for the Preservation of Monuments, the Executive Council, the Mayor's Office and Vodovod Dubrovnik that the wastewater system in the old part of Dubrovnik will be renovated in conjunction with an ongoing restoration of the old town.

7.03 Improvement in the environment of Dubrovnik, particularly in coastal areas, was achieved as noted earlier in Babin Kuk and also in the new harbor area and in Sumartin Bay, all of which are highly sensitive tourist areas. The new systems fulfill the requirement of Yugoslavia's water quality standards. Further improvement has resulted from the separation of stormwater drains from sanitary sewers. Flooding of low-lying areas from sewer surcharge has ceased along with the attendant pollution problems.

Economic Analysis

7.04 The appraisal had concluded that wastewater benefits could not be meaningfully quantified and had focussed its attention on water supply. It had shown that, since the tariffs to be in force by project completion would approximate the long-run incremental cost (LRIC) of water at a 10 percent discount rate, water pricing was reasonable. Using the same methodology, the LRIC has been recalculated at D 15.91 per m^3. As of the last tariff adjustment (Annex 12), the domestic tariff which in 1982 covered about 39 percent of the total volume of water consumed was about 63 percent of the LRIC. The commercial tariff which covered about 59 percent of the water consumed was about 105 percent of the LRIC. All other tariff categories were above.

VIII. CONCLUSIONS AND LESSONS LEARNED

Conclusions

8.01 Apart from execution delays, the project was successful in all major aspects, namely:

(a) the infrastructure provided performs as expected; and the effects on the service area are impressive (paras. 7.02 and 7.03).

(b) Vodovod Dubrovnik has developed into a satisfactorily well-run organization (para. 7.01).

Lessons Learned

8.02 This project confirms the importance of adequate project preparation. The project was appraised on the basis of feasibility studies and without an updated urban development plan for the town of Dubrovnik (paras. 3.03 and 3.04). This resulted in revisions to the project scope during implementation (para. 3.03).

8.03 It took longer than assumed at appraisal for the Vodovod Dubrovnik's technical department to become fully operative (para. 3.02). The Borrower's ability to hire qualified personnel in its early stage of operation was overestimated (para. 7.01).

ANNEX 1

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER SUPPLY AND WASTEWATER SUPPLY

PROJECT COMPLETION REPORT

Estimated and Actual Costs
(Dinars Million)

Project Elements	Appraisal Estimate 1/			Actual Costs			Increase/Decrease		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
A. Water Supply Component									
Pumping Station and Force Main	12.04	4.54	16.58	36.81	9.79	46.60	24.77	5.25	30.02
Reservoir and Distribution System	11.44	2.65	14.09	9.83	2.77	12.60	(1.61)	0.12	(1.49)
Land	0.29	—	.29	— 2/	—	—	(0.29)	—	(0.29)
Engineering	0.74	0.04	0.78	1.44	0.12	1.56	0.70	0.08	0.78
Sub-Total	24.51	7.23	31.74	48.08	12.68	60.76	23.57	5.45	29.02
B. Wastewater Component									
Sewers & Pumping Stations	71.73	15.31	87.04	87.86	26.25	114.11	16.13	10.94	27.07
Treatment Plant & Outfall Sewer	10.55	8.17	18.72	92.62	52.19	144.81	82.07	44.02	126.09
Land	0.85	—	0.85	— 2/	—	—	(0.85)	—	(0.85)
Enigneering	2.34	0.12	2.46	12.83	1.27	14.10	10.49	1.15	11.64
Sub-Total	85.47	23.60	109.07	193.31	79.71	273.02	107.84	56.11	163.95
C. System Control Center									
Headquarters Expansion and Equipment	3.90	1.23	5.13	52.24	18.35	70.59	48.34	17.12	65.46
Engineering	—	—	—	1.29	0.12	1.41	1.29	0.12	1.41
Sub-Total	3.90	1.23	5.13	53.53	18.47	72.00	49.63	17.24	66.87
Total	113.88	32.06	145.94	294.92	110.86	405.78	181.04	78.80	259.84

1/ To allow for direct comparison between the estimated and actual costs of project elements, the physical and price contingencies forecast at appraisal were redistributed among the items to show their costs in current prices.

2/ Land was Government-owned, transferred to Vodovod.

ANNEX 2

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER SUPPLY AND WASTEWATER SUPPLY

PROJECT COMPLETION REPORT

Estimated and Actual Costs
(US$ Million)

Project Elements	Appraisal Estimate 1/			Actual Costs			Increase/Decrease		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Tota
A. Water Supply Component									
Pumping Station and Force Main	0.79	0.29	1.08	0.90	0.40	1.30	0.11	0.11	0.2
Reservoir and Distribution System	0.75	0.17	0.92	0.69	0.21	0.90	(0.06)	0.04	(0.0
Land	0.02	—	0.02	— 2/	—	—	(0.02)	—	(0.0
Engineering	0.05	0.01	0.06	0.06	0.01	0.07	0.01	—	0.0
Sub-Total	1.61	0.47	2.08	1.65	0.62	2.27	0.04	0.15	0.1
B. Wastewater Component									
Sewers & Pumping Stations	4.70	0.98	5.68	3.61	0.70	4.31	(1.09)	(0.28)	(1.3
Treatment Plant & Outfall Sewer	0.70	0.56	1.26	3.49	1.97	5.46	2.79	1.41	4.2
Land	0.06	—	0.06	— 2/	—	—	(0.06)	—	(0.0
Enigneering	0.16	0.01	0.17	0.36	0.07	0.43	0.20	0.06	0.2
Sub-Total	5.62	1.55	7.17	7.46	2.74	10.20	1.84	1.19	3.0
C. System Control Center									
Headquarters Expansion and Equipment	0.24	0.08	0.32	1.97	0.73	2.70	1.73	0.65	2.3
Total	7.47	2.10	9.57	11.08	4.09	15.17	3.61	1.99	5.6

1/ To allow for direct comparison between the estimated and actual costs of project elements, the physical and price contingencies forecast at appraisal were redistributed among the items to show their costs in current prices.

2/ Land was Government-owned transferred to Vodovod.

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT

PROJECT COMPLETION REPORT

Estimated and Actual Annual Expenditures
(Dinars Million)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
APPRAISAL											
Water Supply Component	0.05	15.37	15.61	0.71	—	—	—	—	—	—	31.74
Wastewater Component	0.10	13.59	58.42	37.42	4.67	—	—	—	—	—	114.20
Total Project Cost	0.15	28.96	74.03	38.13	4.67	—	—	—	—	—	145.94
ACTUAL											
Water Supply Component	—	1.49	11.09	24.81	11.57	11.30	0.50	—	—	—	60.76
Wastewater Component	—	1.00	1.09	1.71	41.51	37.84	100.46	58.72	52.92	49.77	345.02
Total Project Cost	—	2.49	12.18	26.52	53.08	49.14	100.96	58.72	52.92	49.77	405.78

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT (LOAN 1066-YU)

PROJECT COMPLETION REPORT

Estimated and Actual Operational Data

	1974	1975	1976	1977	1978	1979	1980	1981	1982 1/
Water Produced, Mm^3									
Appraisal	-	-	-	-	-	-	-	-	-
Actual	7.23	7.63	8.02	8.85	8.93	9.10	9.54	9.95	10.41
Water Sold, Mm^3									
Appraisal	4.88	5.14	5.46	5.98	6.17	6.30	6.57	6.78	6.97
Actual	4.62	5.04	5.45	5.93	5.81	6.10	6.49	6.77	7.08
Number of Connections									
Appraisal	6,700	7,040	7,380	7,710	8,030	8,350	8,670	8,990	9,300
Actual	5,650	7,011	7,302	7,560	7,781	7,680	7,800	7,980	8,379
Unaccounted-for Water									
Appraisal	-	-	-	-	-	-	-	-	-
Actual	36	34	32	33	35	33	32	32	32
Wastewater Mm^3									
Appraisal	2.43	2.65	2.92	3.37	3.58	3.79	3.96	4.14	4.32
Actual	2.14	2.31	2.75	3.11	3.17	3.16	3.21	3.26	3.39
Sewer Service Connections									
Appraisal	2,470	2,570	2,870	3,170	3,470	3,670	3,870	4,070	4,270
Actual	2,420	2,471	2,510	2,689	2,800	2,897	2,998	3,052	3,100

1/ Projected.

YUGOSLAVIA

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT (LOAN 1066-YU)

PROJECT COMPLETION REPORT

Appraisal and Actual Technical Specifications

Item		Appraisal	Actual
A. WATER SUPPLY COMPONENT			
Babin-Kuk Reservoir			
- Capacity of Reservoir	m^3	2,000	2,000
Ombla Pumping Station			
- Number of Pumps		3	3
- Capacity per Unit	Average l/sec.	260	260
- Design Pumping Head	m	99.7	99.7
- Pump Motor Size	kw	285	285
- Number of Pipes		1	1
- Length of Pipeline	m	1,400	1,415
- Pipe Diameter	mm	600 I.D.	609.6 O.D.
B. WASTEWATER COMPONENT			
Sewage Pumping Stations			
- Number of Stations		4	6
Pumping Station "Pile"			
- Number of Pumps		3	2
- Capacity per Unit	Average l/sec	134	128
- Design Pumping Head	m	42	60
- Pump Motor Size	kw	--	132
Pumping Station "Ploce"			
- Number of Pumps		--	2
- Capacity per Unit	Average l/sec	--	30
- Design Pumping Head	m	--	25
- Pump Motor Size	kw	--	18
Pumping Station "Cruz"			
- Number of Pumps		2	2
- Capacity per Unit	Average l/sec	74	95
- Design Pumping Head	m	7	7
- Pump Motor Size	kw	15	15

Item		Appraisal	Actual
Pumping Station "Batlava"			
- Number of Pumps		--	3
- Capacity per Unit	Average l/sec	--	126
- Design Pumping Head	m	--	48.7
- Pump Motor Size	kw	--	110
Pumping Station "Gliman"			
- Number of Pumps		3	2
- Capacity per Unit	Average l/sec	96	35
- Design Pumping Head	m	18	23
- Pump Motor Size	kw	--	18.5
Pumping Station "Lapad"			
- Number of Pumps		3	2
- Capacity per Unit	Average l/sec	328	145
- Design Pumping Head	m	24	34.8
- Pump Motor Size	kw	--	110
Wastewater Treatment Plant			
- Capacity	Average l/sec	900	900
Outfall Sewer			
- Number of Pipelines		2	1
- Length of Pipelines	m	1,300	1,500
- Pipe Diameter	mm	450	800
- Material		Plastic	High Density Polyethylene
- Depth of Outfall	m	95	102

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER AND WASTEWATER ENTERPRISE (VODOVOD)

Income Statements for the Years 1973-1982

Water

(Din thousands)

Year Ending Dec. 31	1973 /1		1974 /1		1975		1976		1977		1978		1979		1980		1981		1982 /2	
	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual
Consumption (thousand m3)																				
Domestic	1,955	2,062	2,090	2,030	2,190	2,060	2,280	2,039	2,360	2,228	2,430	2,283	2,510	2,486	2,580	2,581	2,655	2,745	2,740	2,783
Commercial	2,560	2,716	2,720	2,534	2,880	2,932	3,100	3,359	3,530	3,652	3,650	3,477	3,760	3,547	3,890	3,850	4,015	3,953	4,120	4,185
Shipping	60	64	65	63	75	76	80	52	85	50	90	47	95	61	100	57	105	69	110	113
Total Consumption (thousand m3)	4,575	4,842	4,875	4,627	5,145	5,038	5,460	5,450	5,975	5,930	6,170	5,807	6,365	6,094	6,570	6,488	6,775	6,767	6,970	7,081
Connections																				
New Connections During Year	498	432	350	366	340	361	340	291	330	258	320	141	320	110	320	120	320	180	310	399
Total Connections at Year End	6,350	6,284	6,700	6,650	7,040	7,011	7,380	7,302	7,710	7,560	8,030	7,701	8,350	7,680	8,670	7,800	8,990	7,980	9,300	8,379
Charges (Average) Dinars per m3																				
Domestic	1.23	1.23	1.46	1.25	1.84	1.84	2.12	2.06	2.44	2.27	2.81	3.00	2.81	4.14	2.81	5.36	2.81	6.87	2.81	7.45
Commercial	2.37	2.36	2.88	2.78	3.68	3.44	4.23	4.74	4.86	4.74	5.59	4.88	5.59	5.86	5.59	7.02	5.59	10.14	5.59	10.27
Ships	11.00	12.50	11.50	13.10	13.92	13.20	16.01	13.20	18.41	16.42	21.17	16.60	21.17	19.23	21.17	29.28	21.17	28.13	21.17	28.63
Revenues																				
Charges - Domestic	2,405	2,536	3,050	2,538	4,030	3,784	4,835	4,200	5,760	5,047	6,830	6,849	7,055	10,292	7,250	13,840	7,460	18,853	7,700	20,738
Commercial	6,065	6,409	7,052	7,052	10,600	9,984	13,115	15,921	17,155	17,325	20,405	16,971	21,020	20,790	21,745	27,042	22,445	40,084	23,030	42,992
Shipping	660	800	745	825	1,045	1,003	1,280	686	1,565	821	1,905	780	2,010	1,173	2,115	1,669	2,220	1,941	2,330	3,235
Water Rents	375	253	515	289	635	398	760	358	870	428	1,016	408	1,150	509	1,300	496	1,500	786	1,700	1,000
Connection Fees	3,575	3,530	2,695	2,760	3,085	2,641	3,480	2,428	3,715	2,064	3,960	1,410	4,360	1,370	4,790	2,400	5,270	2,760	5,620	8,335
Other Revenues	900	1,150	1,050	27	1,300	204	1,500	- 9	1,750	32	2,000	- 37	2,250	- 41	2,600	2,699	2,800	1,734	3,000	3,340
Total Revenues	13,980	16,678	15,890	13,491	20,695	18,016	24,970	23,584	30,815	25,717	36,110	26,381	37,845	34,093	39,800	48,148	41,695	67,158	43,380	79,700
Operating Expenses																				
Salaries & Wages	2,730	3,029	3,335	3,216	3,690	3,766	4,155	6,099	4,615	6,931	4,975	8,668	5,580	13,758	6,255	19,096	7,136	27,[illegible]	8,215	32,461
Power	1,560	1,653	2,400	1,016	2,650	1,179	3,070	2,388	3,550	2,421	4,[illegible]00	2,716	4,750	2,839	5,470	4,074	6,325	5,940	7,300	10,842
Materials & Maintenance	1,435	570	1,915	657	2,100	890	2,300	3,124	2,500	2,085	2,900	1,672	3,200	2,131	3,400	3,114	3,900	1,831	4,400	3,114
Insurance	245	253	250	229	260	250	275	364	280	578	300	816	310	632	320	745	330	1,180	340	1,298
Other Operating Expenses	260	3,205	300	683	325	1,881	370	1,557	390	1,689	440	2,747	500	3,278	530	4,312	600	6,968	680	7,665
Provision for Bad Debts	430	143	30	129	40	505	30	—	35	—	35	—	40	—	40	—	50	—	50	—
Taxes & Contributions	380	1,568	540	1,387	585	2,426	640	1,828	680	1,645	750	1,299	820	2,582	840	4,407	930	5,971	1,020	6,568
Extra-ordinary Losses	85	310	85	229	90	582	100	7.9	105	321	115	274	125	97	130	533	140	1,1[illegible]	155	1,152
Depreciation	2,046	1,825	1,970	2,020	2,115	2,084	2,265	3,049	2,465	3,945	3,145	3,008	3,805	5,690	4,045	7,270	4,335	8,971	4,605	8,195
Total Operating Expenses	9,131	12,562	10,825	9,757	11,865	13,567	13,320	19,428	14,620	19,615	16,760	23,202	19,130	33,007	21,030	43,551	23,715	59,355	26,765	71,295
Net Income Before Interest	4,849	4,116	5,065	3,734	8,830	4,447	11,650	4,156	16,195	6,102	19,350	3,179	18,715	1,086	18,770	4,597	17,980	7,803	16,615	8,405
Rate of Return																				
Average Net Fixed Assets in Operation (millions)	58.9	58.9	63.2	60.8	67.1	58.4	70.9	61.0	76.6	68.8	100.9	72.5	123.9	72.5	129.5	73.4	136.0	76.5	145.2	80.2
Rate of Return (1)	8.2	7.0	8.0	6.1	13.2	7.6	16.4	6.8	21.1	8.9	19.2	4.4	15.1	4.3	14.5	6.2	13.2	10.2	11.6	10.5

/1 Unaudited results.

/2 Estimated results.

LOAN 1066-Y

DUBROVNIK WATER AND WASTEWATER ENTERPRISE (VODOVOD)

Income Statements for the Years 1973-1982

WASTEWATER

(Din thousands)

Year Ending December 31	1973 /1		1974 /1		1975		1976		1977		1978		1979		1980		1981		1982	
	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual
Consumption of Water at Premises																				
Connected to Wastewater																				
System (thousand m³)	2,200	2,207	2,430	2,139	2,650	2,307	2,920	2,749	3,370	3,106	3,580	3,173	3,790	3,157	3,966	3,210	4,160	3,299	4,320	3,385
Connections																				
New Connections During Year	50	40	100	60	100	51	300	39	300	179	300	111	200	97	200	101	200	34	[illegible]	48
Total Connections at Year End	2,370	2,360	2,470	2,420	2,570	2,471	2,870	2,510	3,170	2,989	3,470	2,800	3,670	2,897	3,870	2,994	4,070	3,052	4,270	3,100
Charges (Average) (dinars per m 3)	0.45	0.45	0.73	0.80	1.20	1.40	1.44	1.18	1.73	1.81	[illegible]	2.00	2.50	2.14	3.00	2.20	3.50	2.52	4.32	3.25
Revenues																				
Charges	990	988	1,775	1,703	3,180	2,770	4,205	3,239	5,830	5,618	7,445	6,346	9,475	6,748	11,880	7,062	14,905	8,552	18,600	11,001
Other Revenues	20	20	30	30	40	75	50	99	60	100	70	141	80	48	90	608	100	543	110	150
Total Revenues	1,010	1,008	1,805	1,733	3,220	2,845	4,255	3,338	5,890	5,718	7,515	6,487	9,555	6,796	11,970	7,670	15,005	9,095	18,770	11,151
Operating Expenses																				
Salaries & Wages	675	758	835	810	925	1,103	1,470	1,370	1,535	1,898	2,130	3,216	2,625	3,320	3,220	3,295	3,840	4,175	4,425	4,810
Power	--	--	--	--	--	--	--	--	200	--	500	--	710	--	820	--	950	--	1,100	--
Materials for Maintenance	305	63	480	150	525	141	640	375	850	260	950	459	1,100	403	1,500	377	1,700	503	1,900	740
Insurance	45	67	73	73	90	160	150	177	230	183	300	265	380	217	400	240	420	310	440	370
Other Operating Expenses	65	801	75	331	80	441	90	248	130	586	150	443	165	249	230	676	260	1,011	290	1,240
Provision for Bad Debts	30	9	10	8	15	47	20	--	20	--	25	--	25	--	20	--	30	--	40	--
Taxes & Contributions	145	581	150	509	160	759	190	376	225	532	250	328	275	690	360	495	400	940	450	1,170
Extraordinary Losses	30	111	30	97	30	153	30	102	35	79	40	69	45	27	55	77	60	209	65	370
Depreciation	729	609	690	638	630	657	690	1,021	690	1,113	2,325	1,187	4,515	1,799	4,845	1,849	5,185	1,890	5,530	2,030
Total Operating Expenses	2,024	2,999	2,345	2,616	2,515	3,431	2,915	3,669	3,915	4,653	6,870	5,967	9,840	6,705	11,450	7,009	12,845	9,048	14,240	10,750
Net Income Before Interest	(1,014)	(1,991)	(540)	(883)	705	(586)	1,340	(331)	1,975	1,065	645	520	(285)	91	520	661	2,160	47	4,530	401
Rate of Return																				
Average Net Fixed Assets in Operation (millions)	24.9	22.8	24.5	20.8	23.8	20.5	23.1	21.0	22.5	22.5	94.1	23.4	170.2	24.4	178.4	25.2	187.5	25.3	195.8	26.3
Rate of Return (%)	0	0	6	0	3.0	[illegible]	5.8	0	8.8	4.7	[illegible]	2.2	--	6.4	0.3	2.6	1.2	0.2	2.3	1.5

SUMMARY - WATER AND WASTEWATER OPERATIONS

Net Income Before Interest																				
Water	4,849	4,116	5,063	3,734	8,850	4,447	11,640	4,154	16,195	6,102	19,350	3,179	18,715	3,086	18,770	4,597	17,960	7,605	16,615	8,405
Wastewater	(1,014)	(1,991)	(540)	(883)	705	(586)	1,340	(331)	1,975	1,065	645	520	(285)	91	510	661	2,160	47	4,530	401
Total Net Income Before Interest	3,835	2,125	4,523	2,851	9,555	3,861	12,99[illegible]	3,823	18,170	7,167	19,995	3,699	18,430	3,177	19,280	5,258	20,140	7,652	21,145	8,806
Interest																				
Gross Interest	376	418	403	452	1,924	481	[illegible],280	427	5,687	375	7,822	344	8,196	847	8,009	2,137	7,407	3,416	7,577	4,310
Less Charged Construction	--	--	--	--	(1,464)	--	(2,886)	--	(4,341)	--	(7,507)	--	--	--	--	--	--	--	--	--
Net Interest Charged Operations	376	418	403	452	460	481	394	427	346	375	[illegible]	344	1,196	847	1,409	2,137	7,407	3,416	7,577	4,310
Net Income	3,459	2,707	4,122	2,399	9,095	3,380	12,596	3,398	17,824	6,792	19,695	3,355	10,232	2,330	21,271	3,121	12,734	3,936	13,568	4,496
Distribution of Net Income																				
Collective Consumption Fund	745	794	900	700	900	1,024	1,900	850	1,150	2,384	1,300	2,031	1,450	1,271	1,600	1,695	1,7[illegible]	1,626	1,900	1,857
Reserve Fund	160	168	240	192	270	267	330	310	400	465	460	472	540	594	700	880	930	1,953	1,000	2,231
Business Fund	2,554	745	3,082	1,507	7,925	2,[illegible]	11,266	2,238	16,274	657	17,900	472	8,202	[illegible]	8,971	545	9,7[illegible]	[illegible]	10,664	408
Rate of Return																				
Average Net Fixed Assets in Operation (millions)	83.8	81.7	87.7	81.6	90.9	76.9	[illegible]	82.[illegible]	99.1	91.1	195.6	[illegible]	244.1	[illegible]	338.4	99.[illegible]	[illegible]	[illegible]	339.0	190.5
Rate of Return (%)	4.6	2.6	5.2	3.5	10.5	4.9	13.6	4.7	18.3	7.6	10.3	[illegible]	[illegible]	[illegible]	6.3	[illegible]	[illegible]	[illegible]	6.2	4.5

/1 Unaudited results.
/2 Estimated results.

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER AND WASTEWATER ENTERPRISE (VODOVOD)

Balance Sheets as at December 31, 1973 - 1982

(Din thousands)

Year Ending December 31	1973 /3		1974 /3		1975		1976		1977		1978		1979		1980		1981		1982 /4	
	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual
Assets																				
Fixed Assets - Water Supply																				
Fixed Assets in Operations	75,756	72,130	81,656	75,065	87,656	141,834	93,656	168,653	103,756	218,836	147,772	275,663	156,772	308,124	166,872	378,029	178,172	529,357	190,172	535,245
Less Accumulated Depreciation	14,504	13,812	16,476	15,832	18,591	30,585	20,856	36,017	23,321	50,202	26,466	67,171	30,271	80,264	34,316	100,187	38,631	148,841	43,236	155,223
Net Fixed Assets in Operation	61,252	58,318	65,180	59,233	69,065	111,249	72,800	132,636	80,435	168,634	121,306	208,492	126,501	227,860	132,556	277,842	139,541	380,516	146,936	380,022
Fixed Assets - Wastewater System																				
Fixed Assets in Operation	27,616	26,294	27,616	25,226	27,616	43,801	27,616	56,722	27,616	61,833	174,145	66,937	186,845	99,944	200,945	109,454	213,945	123,976	228,345	133,922
Less Accumulated Depreciation	2,744	2,613	3,434	3,251	4,124	9,461	4,814	12,082	5,504	14,160	8,029	16,288	12,544	25,985	17,389	29,070	22,576	34,860	28,104	38,722
Net Fixed Assets in Operation	24,872	23,681	24,182	21,975	23,492	34,340	22,802	44,640	22,112	47,673	166,116	50,649	174,301	73,959	183,556	80,384	191,371	89,116	200,241	95,200
Fixed Assets Under Construction	1,607	1,530	1,757	1,597	32,183	6,290	111,497	19,640	160,371	46,739	—	119,888	—	193,486	12,000	297,135	27,000	362,642	45,100	363,288
Total Net Fixed Assets	87,729	83,529	91,119	82,805	124,740	151,879	207,099	196,916	262,918	263,046	287,422	379,029	300,802	495,305	328,112	655,361	357,912	832,274	392,277	838,510
Investments & Advances	1,242	1,922	2,232	1,721	3,302	3,515	4,482	16,598	5,782	25,267	7,212	25,516	8,792	30,219	10,342	45,908	12,392	94,441	16,392	110,000
Current Assets																				
Inventories	1,700	1,603	1,900	2,832	2,300	3,993	3,300	4,082	4,000	2,151	4,800	3,413	5,400	5,304	5,800	5,148	5,900	6,734	6,100	6,788
Receivables	3,488	2,428	4,320	2,984	5,452	2,612	6,084	1,836	6,992	2,326	7,707	2,225	8,316	2,578	9,030	4,878	9,649	4,971	10,836	5,000
Construction Advances	100	—	110	725	130	967	150	1,137	160	2,896	180	613	200	716	220	2,046	240	1,647	260	1,650
Short Term Investments	220	334	240	583	280	144	320	507	350	334	390	564	420	832	470	448	510	997	570	998
Cash	3,632	2,957	4,104	2,473	4,788	4,671	5,296	4,069	7,086	13,191	8,910	7,435	10,670	12,202	12,506	13,548	14,221	17,694	14,719	18,070
Total Current Assets	9,140	7,322	10,674	9,597	12,950	12,387	15,150	11,631	18,588	21,294	21,987	14,250	25,006	21,832	28,026	26,068	30,720	32,043	32,485	34,506
Other Assets	—	—	—	3,024	—	4,227	—	4,761	—	7,434	—	19,034	—	20,021	—	45,763	—	98,147	—	107,962
Total Assets	98,111	92,773	104,025	97,147	140,992	172,008	226,731	229,906	287,288	317,145	316,621	437,829	334,600	567,377	366,680	773,100	401,024	1,056,905	439,154	1088,978
Liabilities & Equity																				
Equity																				
Business Fund 1/	68,960	74,976	72,042	78,133	79,967	149,194	91,233	172,523	107,507	207,884	125,467	256,419	133,609	306,994	142,580	370,349	152,313	488,271	162,981	491,841
Contributions & Grants																				
Enterprises & Consumers	12,467	—	12,467	—	12,467	—	13,867	13,184	16,367	19,678	17,267	21,357	28,767	31,465	53,667	44,383	80,367	61,699	109,967	64,869
Babin Kuk Enterprise & Commune	697	—	697	—	4,807	—	21,077	10,607	31,917	19,835	33,297	27,926	33,297	30,849	33,297	35,387	33,297	53,201	33,297	58,521
Reserve Fund	540	593	780	785	1,050	1,052	1,280	1,039	1,780	1,366	2,247	2,955	2,840	2,714	3,540	2,965	4,390	4,591	5,390	5,050
Total Equity	82,664	75,569	85,986	78,918	98,291	150,246	127,557	197,353	157,571	248,763	178,231	308,157	198,513	374,022	233,084	453,084	270,367	607,762	311,635	620,281
Long Term Liabilities																				
Existing Loans	12,712	13,631	14,359	13,535	13,093	6,072	11,677	4,882	11,059	6,510	10,303	23,433	9,651	32,839	8,980	36,421	8,290	44,264	7,606	46,477
Proposed IBRD Loan	—	—	—	—	21,310	—	62,985	—	82,989	17,387	91,500	25,512	89,536	52,063	87,412	48,757	85,115	167,737	82,630	174,124
Proposed Republic Water Fund Loan	—	—	—	—	1,273		6,338	9,000	9,818	9,200	10,444	9,207	10,658	8,853	10,871	8,853	10,691	8,875	10,507	9,319
Proposed Bank of Dubrovnik Loan	—	—	—	—	2,515	8,371	12,544	9,806	19,441	20,369	26,608	43,169	20,042	71,162	19,383	142,631	18,711	186,332	18,026	192,649
Total Long Term Debt	12,712	13,631	14,359	13,535	38,181	14,443	93,744	23,688	123,307	53,466	132,940	101,321	129,887	165,857	126,646	286,862	122,807	407,208	118,769	422,569
Less Current Maturities	1,256	1,148	1,276	1,240	1,206	1,060	818	892	756	1,056	3,262	3,500	3,454	4,175	3,839	8,854	4,038	42,054	4,267	44,157
Net Long Term Liabilities	11,456	12,483	13,083	12,295	36,975	13,383	92,926	22,796	122,551	52,410	129,678	97,821	126,433	161,682	122,807	278,008	118,769	365,154	114,302	378,412
Current Liabilities																				
Customers' Deposits	600	473	650	516	770	467	880	740	960	1,527	1,050	433	1,150	1,359	1,250	1,580	1,400	764	1,550	862
Short-Term Bank Loans	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Payables - General	890	747	1,230	972	1,350	809	1,150	571	1,800	552	2,100	6,549	2,400	5,219	2,700	17,455	3,100	12,502	3,500	24,752
Liabilities to Contractors	500	814	1,000	967	1,500	2,868	2,000	3,832	2,500	6,976	1,000	4,199	1,200	3,613	1,400	5,621	1,600	6,133	1,800	8,946
Proposed Distribution 2/	745	1,539	800	2,239	900	3,175	1,000	3,722	1,150	8,068	1,300	16,979	1,450	17,307	1,600	6,495	1,750	10,516	1,900	11,566
Current Maturities of Long-Term Debt	1,256	1,148	1,276	1,240	1,206	1,060	818	892	756	1,056	3,262	3,500	3,454	4,175	3,839	8,854	4,038	42,054	4,267	44,157
Total Current Liabilities	3,791	4,721	4,956	5,934	5,726	8,379	6,248	9,757	7,166	15,972	8,712	31,851	9,654	31,673	10,789	42,008	11,888	63,969	13,017	90,283
Total Liabilities & Equity	98,111	92,773	104,025	97,147	140,992	172,008	226,731	229,906	287,288	317,145	316,621	437,829	334,600	567,377	366,680	773,100	401,024	1,056,905	439,154	1088,978
Ratios																				
Debt/Equity Ratio	12:88	14:86	13:87	13:87	27:73	14:86	42:58	18:82	44:56	29:71	42:58	40:60	39:61	49:51	35:65	59:41	31:69	60:40	27:73	60:40
Current Ratio	2.3	1.6	2.2	1.6	2.3	1.5	1.4	1.2	2.6	1.3	2.7	0.4	2.6	0.7	2.6	0.6	2.6	0.4	2.5	0.4

1/ Contributions & Grants before Dec. 31, 1969 are included in the Business Fund.
2/ Distribution to Collective Consumption Fund.
3/ Unaudited results.
4/ Estimated results.

ANNEX 7

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER AND WASTEWATER ENTERPRISE (VODOVOD)

Statements of Sources and Applications of Funds 1973-1982

(Din thousands)

Year Ending December 31	1973 Appraisal	1973 Actual	1974 Appraisal	1974 Actual	1975 Appraisal	1975 Actual	1976 Appraisal	1976 Actual	1977 Appraisal	1977 Actual	1978 Appraisal	1978 Actual	1979 Appraisal	1979 Actual	1980 Appraisal	1980 Actual	1981 Appraisal	1981 Actual	1982 Appraisal	1982 Actual
SOURCES OF FUNDS																				
Internal Cash Generation																				
Net Income Before Depreciation and Interest																				
Water	6,855	5,941	7,033	5,754	10,965	6,535	13,915	7,205	18,640	10,047	22,495	8,187	22,52[illegible]	8,776	22,815	11,867	22,295	15,875	21,220	16,000
Wastewater	(285)	(1,382)	150	(245)	1,395	71	2,630	690	2,665	2,178	3,170	1,707	4,230	1,890	5,355	2,510	7,345	1,937	10,060	2,451
Net Internal Cash Generation	6,570	4,559	7,183	5,509	12,360	6,606	15,945	7,895	21,325	12,225	25,665	9,894	26,75[illegible]	10,666	28,170	14,377	29,640	17,812	31,280	19,051
Loans Raised																				
Disbursements	-	771	2,903	1,032	35,098	2,148	54,769	10,305	30,381	30,670	10,389	48,911	219	98,036	213	125,180	-	129,206	-	57,415
Equity Contributions & Grants																				
Contributions & Grants	3,760	-	-	-	4,110	-	17,670	23,634	13,340	15,718	4,280	16,858	11,5[illegible]	22,485	24,900	24,448	26,700	45,917	29,600	6,718
Total Sources of Funds	10,330	5,330	10,088	6,561	41,568	8,754	90,384	41,834	65,046	58,613	38,334	75,663	38,439	101,187	53,283	164,005	56,340	172,929	60,880	83,184
APPLICATIONS OF FUNDS																				
Fixed Asset Construction																				
Project Expenditures	-	-	150	-	28,962	2,436	74,024	12,194	38,133	26,535	4,647	53,146	-	27,930	-	89,027	-	32,305	-	6,500
Other Expenditures	5,400	2,453	5,900	284	6,000	411	7,400	15,988	14,500	13,364	18,000	27,710	21,700	53,456	36,200	26,960	39,300	48,117	44,500	6,819
Total Fixed Asset Construction	5,400	2,453	6,050	284	34,962	2,847	81,424	28,182	52,633	39,899	22,647	80,946	21,700	81,486	36,200	115,987	39,300	80,422	44,500	13,319
Debt Service																				
Amortization	1,185	1,060	1,256	1,148	1,276	1,240	1,206	1,090	818	892	7[illegible]6	1,030	3,262	3,300	3,434	4,175	3,893	8,854	4,038	42,036
Interest	376	416	403	432	1,924	481	4,280	427	6,687	375	7,824	444	8,198	847	8,049	2,137	7,807	3,916	7,577	6,310
Total Debt Service	1,561	1,476	1,659	1,600	3,200	1,721	5,486	1,487	7,505	1,267	8,578	1,460	11,460	4,347	11,483	6,312	11,666	12,770	11,615	48,364
Investments & Advances	2[illegible]0	910	990	2,823	1,070	2,997	1,180	13,617	1,390	11,462	1,430	11,769	1,580	5,690	1,750	41,431	1,850	100,917	2,060	25,174
Contributions to Collective Cons.Fund	745	794	840	709	900	1,024	1,000	850	1,150	2,369	1,300	2,031	1,450	1,231	1,660	1,695	1,750	1,626	1,900	1,857
Increase in Net Working Capital																				
Increase in Net Working Capital (Excluding Cash)	(83)	(2,087)	117	1,638	757	(2,035)	782	(1,709)	606	(5,506)	2,535	(14,727)	509	3,668	[illegible]	(2,766)	79	(6,952)	367	(4,106)
Increase in Cash	2,457	1,782	472	484	684	2,198	508	(1,607)	1,790	9,122	1,824	(5,756)	1,760	4,767	1,835	1,346	1,715	4,146	498	479
Total Increase in Working Capital	2,374	(305)	589	1,154	1,436	165	1,290	(2,302)	2,458	3,616	4,359	(20,483)	2,269	8,435	2,210	(1,420)	1,794	(2,806)	865	(3,780)
Total Applications of Funds	10,316	5,330	10,088	4,561	41,568	8,754	90,384	41,834	65,046	56,613	38,334	75,663	36,459	101,167	53,283	164,005	56,340	192,929	60,880	83,184
Year End Cash Balance	3,632	2,757	4,104	2,573	4,788	4,671	5,246	4,069	7,086	13,191	6,910	7,435	10,67[illegible]	12,202	12,366	13,548	14,271	17,094	14,719	18,070
Ratio of Internal Cash Generation to Annual Debt Service	4.2	3.1	4.3	3.4	3.9	3.8	2.9	5.3	2.8	9.[illegible]	[illegible]	7.1	[illegible]	[illegible]	[illegible]	2.1	2.5	[illegible]	2.7	3.4

ANNEX 8

ANNEX 9

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER AND WASTEWATER ENTERPRISE (VODOVOD)

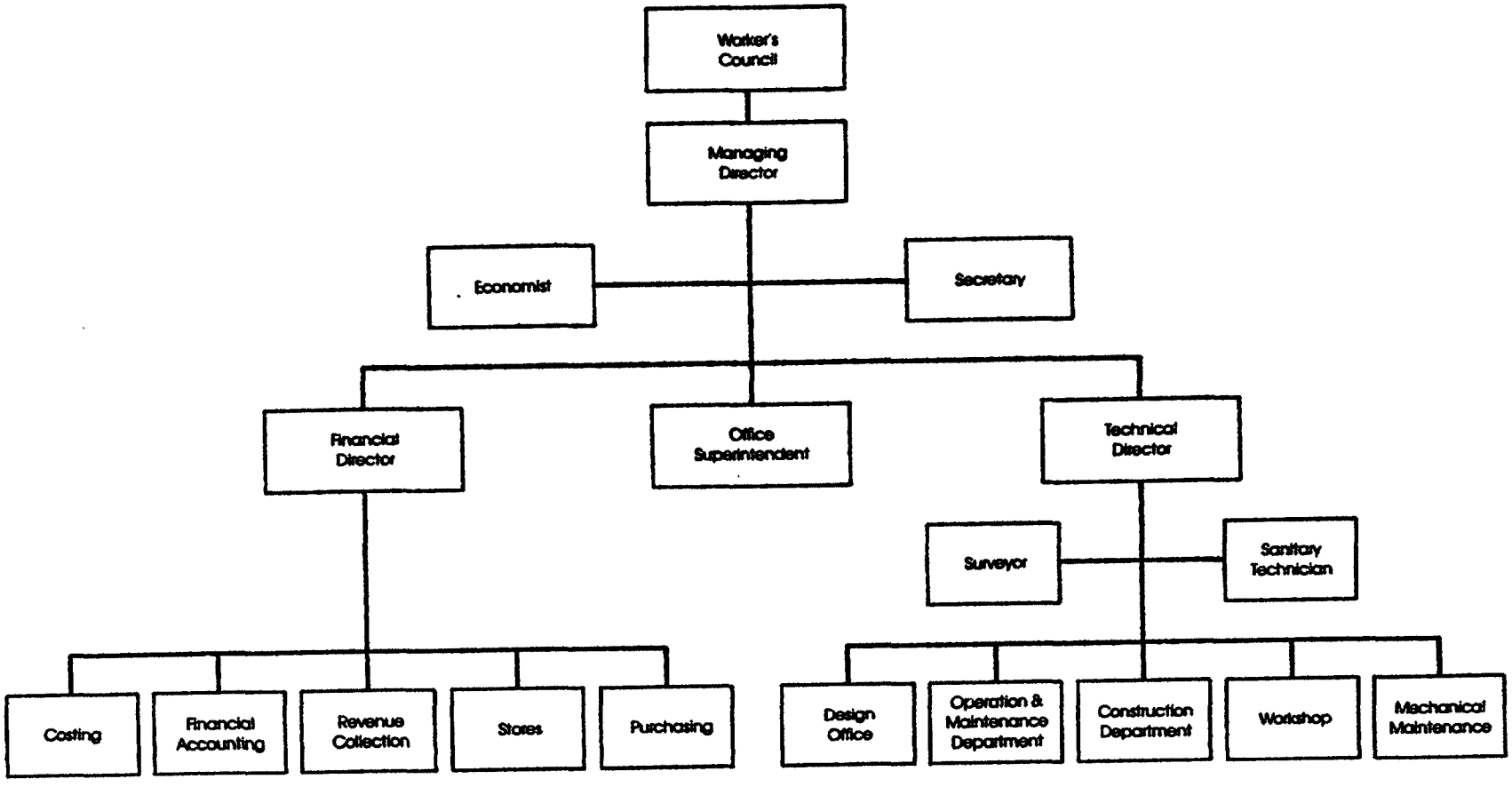
PROJECT COMPLETION REPORT

Comparison of Appraisal (1975-1978) and Actual (1975-1982) Financing Plan

Funds Requirements and Sources

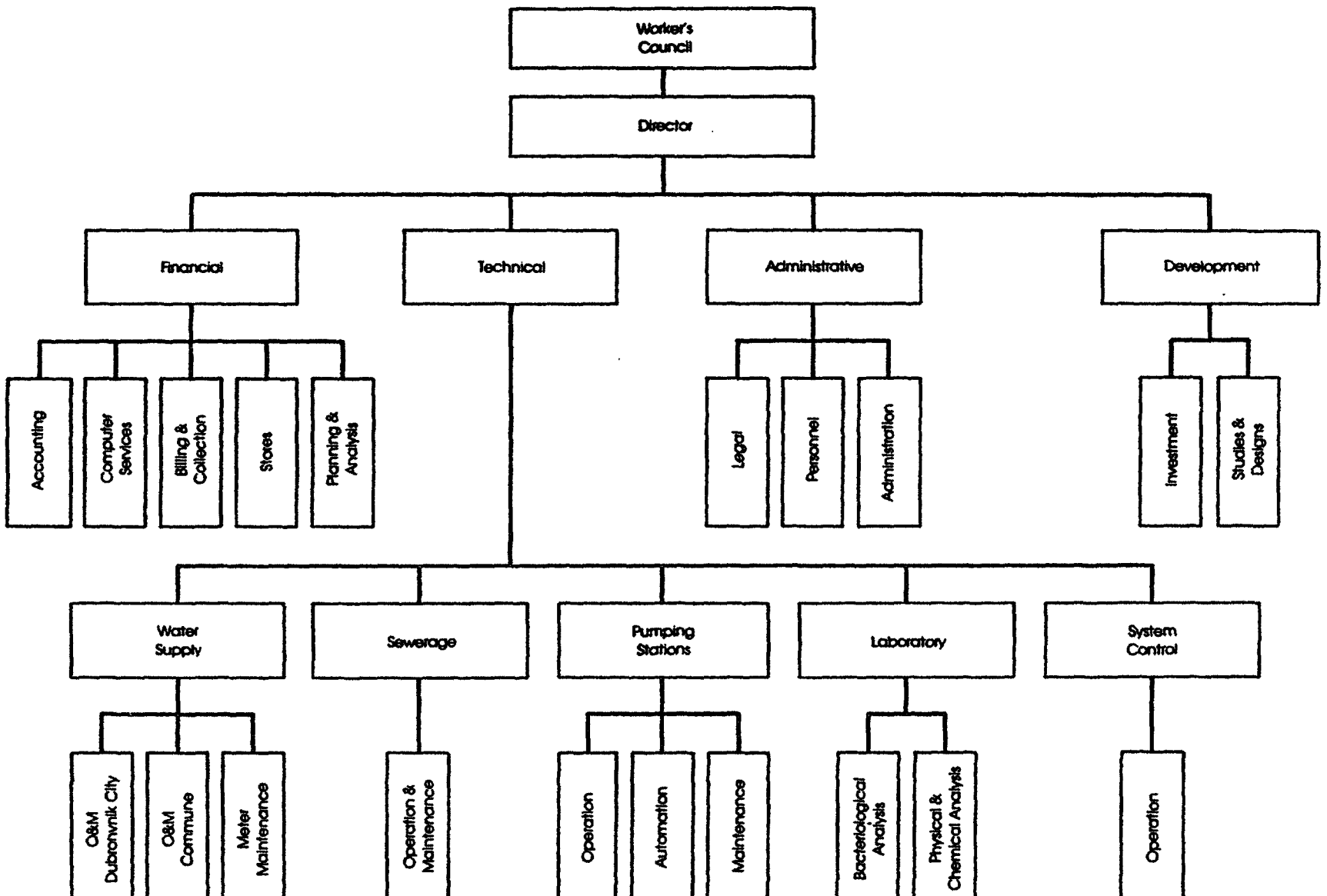
	Appraisal	%	Actual	%
	Dinar Million			
Capital Sources				
Bank Loan	91.5		191.7	
Republic Water Fund	10.5		10.2	
Other Loans	20.7		269.9	
	122.7	54.4	471.8	74.0
Capital Contributions and Grants	37.4	16.6	155.8	24.4
Internal Cash Generation	75.3		98.5	
Less: Debt Service	(5.6)		(75.7)	
Contribution to Collective Consumption Fund	(4.4)		(12.7)	
	65.3	29.0	10.1	1.6
	225.4	100.0	637.7	100.0
Capital Requirements				
Capital Investments	210.9	93.6	443.1	69.5
Increase/Decrease in Working Capital	9.5	4.2	(18.5)	(2.9)
Other Investments and Advances	5.0	2.2	213.1	33.4
	225.4	100.0	637.7	100.0

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT
Organization Chart for Dubrovnik Vodovod
(1974)



World Bank—24852

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT
Organization Chart for Dubrovnik Vodovod
(1983)



ANNEX 12

YUGOSLAVIA

LOAN 1066-YU

DUBROVNIK WATER SUPPLY AND WASTEWATER PROJECT

PROJECT COMPLETION REPORT

Tariff Schedule of Vodovod Dubrovnik
(Effective June 1, 1982)

Category	Water	Sewerage
	(Din./m^3)	
Domestic and Schools	10.000	7.15
Commercial	16.75	7.15
Cable Car	19.10	7.15
Domestic Ships	26.75	--
Foreign Ships	75.90	--