GUIDELINES FOR FINANCIAL PLANNING OF WATER UTILITIES

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Prepared for the Office of Health,
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by

Stephen V. Pereira

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WASH FINANCIAL MANAGEMENT SERIES

The Water and Sanitation for Health (WASH) Project has developed a series of publications dealing with financial management and cost recovery issues. Currently there are four reports in this series. Titles of these publications are as follows:

Report 1	Guidelines for Conducting a Financial Management Assessment of Water Authorities (WASH Technical Report No. 53)
Report 2	Guidelines for Cost Management in Water and Sanitation Institutions (WASH Technical Report No. 54)
Report 3	Principles of Tariff Design for Water and Wastewater Services (WASH Field Report No. 348)
Report 4	Guidelines for Financial Planning of Water Utilities (WASH Field Report No. 370)

The four reports provide an integrated package of financial and management assistance and have been prepared for audiences at varying skill levels within the financial discipline, at both the operational and the administrative levels. The approach of the reports is directive. The reports can be used individually or together. Report 1 is an assessment and diagnostic tool and would logically be the first report used to appraise the current financial management situation of a water supply institution. Weaknesses identified in the initial assessment of such areas as cost management, tariff policy, and financial planning can be addressed by using the other WASH reports in the series.

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ABOUT THE AUTHOR

Stephen Pereira is an International Management and Finance Specialist with the Research Triangle Institute (RTI). He specializes in financial analysis of local governments, particularly their capacity to undertake capital investment programs, with special emphasis on cost recovery, revenue generation potential, and debt carrying capacity. He has worked extensively in Indonesia, Nepal, and El Salvador, where he developed financial appraisal methodologies, in addition to cost recovery and betterment levies work for the World Bank in Colombia, Bolivia, and Mexico.

EXECUTIVE SUMMARY

The purpose of this report is to provide a comprehensive overview of a financial planning process that a water utility can use to determine its short- and long-term financing strategies. The goal of sound financial management is to allow a utility to achieve the highest amount of output possible for a given amount of input.

Successful financial planning for a water utility involves anticipating the needs and future demand of the community being served, designing facilities to meet demand, minimizing the costs of operation, constructing and/or purchasing fixed assets for the utility's expansion or rehabilitation, replacing or retiring assets in a timely way, and developing and implementing financing mechanisms to fund these activities. Designing a financial plan requires identifying and evaluating the factors that affect the type and size of the utility's facilities, the financing mechanisms available, and the potential cost recovery from prospective beneficiaries of the service.

This paper provides a series of six steps to assist the user in developing a comprehensive financial plan.

The first step in establishing a workable financial plan is to determine consumer demand. Projection of growth in consumer demand is essential to devising the capital investment plan, which is the next stage in the financial planning process. Designing the capital investment plan is one of the most important components in the successful planning of a water utility, and is essential for securing appropriate financing. The plan establishes priorities for individual projects and schedules them for funding over a five- or six-year period.

After developing the capital investment plan, in step three, plan managers must compare revenue sources with revenue requirements for the five- or six-year planning horizon. Clearly, revenue requirements must match revenue sources to maximize smooth operations and minimize changes in charges to customers. In order to fully identify all costs of the utility, step four addresses the estimation of the utility's existing and proposed operation and maintenance costs. At this stage management will need to identify increased operating costs associated with new facilities as well as proposed operating costs of existing facilities.

Step five in developing a sound financial plan concerns planning cash flow and net working capital. A water utility's cash flow varies yearly, quarterly, and even weekly depending on its operational policies and the changing economic and business environment. Therefore, constant review and updating of working capital are necessary. The final step, step six, is planning for current, accrued, and long-term liabilities. Liabilities represent a water utility's various debt obligations, including payments to suppliers, notes on short-term borrowing, and long-term debt.

A number of sample spreadsheets and flow charts are provided in the report to facilitate the financial planning exercise. Their use requires some ability in financial analysis and exposure to utility management on the reader's part. The report concludes with an appendix that

includes a fully costed example of how a water utility might go about planning what level of leveraging is best to target, given a known set of income sources. Two sets of data are presented. In the first case a utility may choose to finance activities using its own resources, rather than incur any debt. The second case depicts a utility that chooses to finance its activities by borrowing as much as lenders will allow while investing only a small amount of its own funds.

Chapter 1

INSTRUCTIONS

Water utilities generally bear two different types of expenses. The first type, called *recurrent costs* or *operating costs*, includes such items as the cost of electricity, salaries, and chemicals. The second type, *capital costs*, includes building and equipment purchases, debt service, reserve fund contributions, and the costs of supply, treatment, transmission, and distribution of potable water to customers.

Recurrent costs are usually less expensive, on an item-by-item basis, than capital costs, and they must be paid anew each year. Capital costs, on the other hand, are usually expensive per item, and occur irregularly as the utility acquires assets. Because capital assets (e.g., buildings and equipment) last a long time, decisions about capital expenditures also have long-term consequences. A mistake in a major capital outlay decision usually is irreversible for the entire useful life of the asset.

The long-range consequences of capital cost decisions mean that special financial and capital planning are very important for water utilities, hence the reason for this paper. Water utility facilities constructed without the benefit of comprehensive planning lead to inefficient expenditures and inefficient services to the community. As a result, unplanned water systems pose a burden to all prospective beneficiaries—citizens, government, and commercial, residential, and industrial clients.

Financial planning means anticipating the needs and future demand of the community being served, designing facilities to meet demand, minimizing costs, constructing and/or purchasing fixed assets for expansion or rehabilitation, replacing or retiring assets in a timely way, and developing and implementing the financing mechanisms to fund all of these activities. Proper planning allows a utility to achieve the highest amount of output possible for a given amount of input.

These guidelines provide a comprehensive overview of a financial planning process that a water utility management team can use to determine short-term and long-term financing strategies.

1.1 How to Use These Guidelines

- Section 1.2 gives an overview of the planning process and discusses its major components. Included are the six steps involved in developing a financial plan. The organization of this report is based on these steps, as follows:
- Chapter 2 examines forecasting consumer demand for water and services.

- Chapter 3 describes how to develop a capital investment plan, including the different capital projects and outlays that form the basis of capital investments.
- Chapter 4 reviews how to evaluate revenue requirements and revenue sources.
- Chapter 5 covers estimating existing and proposed operation and maintenance costs.
- Chapter 6 describes planning as it relates to current (liquid) and restricted assets.
- Chapter 7 examines liabilities planning.
- Additionally Appendix A provides a technical overview of financial and operational leverage. Its use, as well as that of various tables and formulas in the report, requires some ability in financial analysis and exposure to utility management on the reader's part.

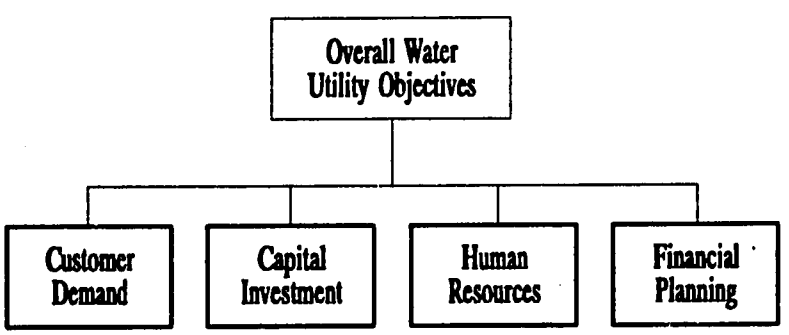
1.2 Overview of the Financial Forecasting and Planning Process

1.2.1 Determining Objectives

Financial planning is only one of a water utility's overall objectives, as shown in Figure 1. The other three components of the overall objectives are customer demand, capital investment, and human resources. Only if the planning objectives of each component are achieved will the overall planning objectives be met.

Figure 1

SYSTEM OF WATER UTILITY OBJECTIVES



- *Customer demand.* Probably the single most important factor that influences financial planning is capital expansion due to growth in demand. Customer demand planning includes forecasts for each segment of usage per customer category (residential, commercial, industrial, etc.) and the geographical distribution of these customers. A long-term forecast of water service customers allows water utility managers to anticipate

requirements for plant facilities and select and design facilities to meet those requirements. It also helps managers to time capital expenditures to ensure adequate plant capacity to meet demand, and develop and implement long-term plans to finance such activities.

- *Capital investment.* Planning the capital expenditures of a utility is one of its most important management considerations. This type of planning comprises anticipating the needs of customers for water service, selecting and designing the proper plant facilities to meet these needs, purchasing or constructing required additions to the plant on time, replacing and retiring plant assets, and securing funds for plant investment.

- *Human resources.* Human resource planning and development can be done once customer demand and capital investment plans are determined. While not the focus of the present study, personnel inventory, salary curve, and other factors critical to this area warrant consideration.

- *Financial planning.* Specific financial planning objectives—such as those in Figure 2—along with the other three component's objectives, feed into the overall financial planning process.

Figure 2

SAMPLE FINANCIAL OBJECTIVES BY FINANCE AREA

Financial Area	*Objective*
Returns	Cover costs and contribute to capital replacement and expansion.
Borrowing Policy	Maintain a balance between borrowing and current receipts to finance new capital needs. Borrow for capital needs up to a limit specified by sound financial management practices.
Credit and Collection	Maximize billing and collection efficiency and minimize losses.
Depreciation Policy	Account for physical depreciation and replacement costs.
Liquidity	Maintain an acceptable level of working capital.

1.2.2 Developing a Plan

Developing a water utility financial plan requires identifying and evaluating those factors that affect the type and size of facilities, the financing mechanisms available, and the potential cost recovery from prospective beneficiaries of the service. Typically the time period for an accurate financial plan should extend no more than five or six years.

- *Step 1: Determining consumer demand.* As mentioned in Section 1.2.1, one of the most important factors affecting financial planning is growth in consumer demand. Historical data, such as per capita consumption, should be examined to ensure that underlying conditions have not changed. The impact of changing economic and social conditions on the number of customers within a particular category, the quantity of water sold within each block, and other factors affecting customer demand must be evaluated. Projections of historical trends must be adjusted to account for changing conditions in the service area. Specifically, the number of customers serviced should be adjusted for changes in demographic profile, the number of building permits issued, the number of houses built, and so on.

Customer demand forecasts are used to determine the capital investment plan, the next stage in the financial planning process.

- *Step 2: Developing the capital investment plan.* The capital investment plan establishes priorities for individual projects and schedules them for funding and implementation. The five- or six-year forecast period encompassed in the capital investment program ensures that capital requirements are ahead of actual needs. The capital investment plan is essential for securing appropriate financing.

Capital expenditures will consist of payments for existing debt service, reserves, and routine capital projects financed from annual income. Additionally, depreciation based on utility plant investment, and estimated service lives, should be accounted for.

- *Step 3: Evaluating revenue requirements and revenue sources.* After the capital investment plan is developed, the next step is to compare all utility revenue sources with revenue that will be required during the five-year planning period. This comparison is done to minimize the effect of securing income on utility finances and charges to customers. Projections of revenues for periods longer than five years are highly speculative. Successful financial planning requires that the capital investment plan have a demonstrated effect on revenue and revenue requirements for the planning period.

During this step, the utility will need to identify and assess (a) new revenue requirements, including the associated costs of each financing alternative; (b) existing financing requirements; and (c) operation and maintenance costs of existing and proposed expansion activities.

Based on billing records, customer accounts are developed by customer class for the five-year planning period. Large users are listed separately to minimize their impact on the average use per customer. Customer account projections are based on multiyear trends rather than on the most recent year of historical information, the recent number of building permits used, or a

design engineer's estimate of use. Large deviations from historical trends (such as those resulting from the expansion of services) need to be taken into account.

Projections of water-sales revenues should be based on the projections of the number of customers and water sales developed concurrently for the financial plan. The number of customers served, the amount of water used per block, and the existing schedule of water charges by customer class projected for each year of the planning period should provide realistic projections of water sales.

Recurring nonoperational revenues should also be evaluated for the planning period. A realistic level of income based on past historical trends should be estimated for these revenues.

■ *Step 4: Estimating existing and proposed operation and maintenance costs*. This step addresses the operation and maintenance (O&M) costs associated with existing and proposed water utility operations. Some of the O&M costs that can be identified in water utilities are source of supply, pumping, water treatment, transmission and distribution, administrative costs, and general costs.

A review of past records should indicate long-term trends and a basis for projecting costs. At the same time, management should determine whether the historical series will exist into the future. Regardless of how costs are projected, allowances should be made for the long-term effects of inflation.

The utility will also need to identify increased operating costs associated with new facilities as well as the proposed operating costs of existing facilities.

■ *Step 5: Planning liquid and restricted assets*. This step concerns planning cash flow and the net working capital of a water utility. It is important to maintain adequate receipts and records of cash disbursements, to determine possible future deficiencies and short-term financing needs, and to plan for extra liquidity that could originate from monthly transactions. For instance, excess cash held in checking accounts is a noneaming asset and could be put to more profitable use (such as paying interest debt).

Cash flow varies weekly, quarterly, and yearly depending on management's operational policies and changing conditions in the economic and business environment. Given these changes, review and constant updates are essential if estimates are to be useful for financial planning.

Cash receipts and disbursements are estimated based on historical performance and tendencies. They must be adjusted for differences on a cash or accrual basis. This adjustment will depend on daily operations, cash disbursements for capital investment projects (depending on whether they are paid from special funds), cash inflows and outflows from customer deposits, receivables, and materials and supplies.

■ *Step 6: Planning liabilities*. Current and accrued liabilities are those that finance the assets and operations of a water utility. The planning of these elements begins with the formulation

of the operating budget based on historical levels, costs of materials and supplies, and the capital budget.

Long-term liabilities are long-term debt used to finance the capital investment plan. This debt does not exclude buildup of equity, as financial planning requires various sources of financing, with equity as one alternative. Other sources include short-term debt, retained earning (where available), financing through bonds, and so on.

Chapter 2

FORECASTING CONSUMER DEMAND

Forecasting the demand for water is a key ingredient of the financial planning process. A long-range forecast of the demand for water is necessary to ensure that the determined capacity is adequate but not substantially more than that required to meet peak and future demand. A long-term forecast of a community's annual requirements for water service will enable the water utility to plan for plant facilities, to select and design facilities to meet demand, and to undertake capital investments over time through long-range financing. If forecasting is to be an effective financial planning tool, it must project the level of demand for the next five years. However, an extended period of time, usually 20 to 30 years, is the preferred planning horizon of a master plan for consumer demand.

Changes in economic and social conditions in a water utility's service area can alter the number of customers in a given tariff block, the quantity of water sold within each block, the number of metered connections, or the number or size of meters. Therefore, as part of the forecasting process, historical data—such as per capita consumption records—must be examined to ensure that underlying conditions in the external environment have not changed. Specifically, the estimated number of customers based on projection of historical trends should account for changes in population, which may affect the number of building permits issued, or the number of new houses built, for example. Likewise, historically based projections of the quantity of water sold should be adjusted for estimated effects of changes in pricing policies, as well as other general and local socioeconomic conditions.

Chapter 3

DEVELOPING A CAPITAL INVESTMENT PLAN

3.1 Overview

Capital investment plans are needed because capital investments or outlays are expensive, do not occur annually, and have long-lasting consequences.

The overall capital investment plan is supported by individual budgets for new and replacement projects. Each project budget includes a description of the project, a project number, an explanation of the project's purpose and need, an implementation schedule, engineering cost estimates, estimated incremental operations and maintenance costs, and an internal rate of return on the project (where applicable).

Consistent with the long-term forecast of consumer demand for water, the capital investment plan should reflect short-, medium-, and long-term needs, although the cost estimates for short-term components will be more precise than those for long-term improvements and expansions.

A capital investment plan divided into five-year increments over a given planning horizon facilitates the use of other financial management tools, such as capital budgeting.

3.2 Costs to Be Included in the Capital Investment Plan

Capital investment projects can be classified into two categories: major and blanket projects. *Major projects* are those that cost a considerable sum relative to ongoing operations. Examples are projects related to source of supply, pumping, water treatment, transmission and distribution facilities, and equipment. *Blanket projects* include proposed additions to and retirement of customer services, meters, and hydrants. Both types should be included in the investment plan.

In some cases, planners may have difficulty determining whether to add certain capital investments or expenditures to the capital investment plan. Such investments may be repair and rehabilitation projects, or replacements as opposed to new capital assets and equipment purchases.

3.2.1 Repair and Rehabilitation

Water utilities often repair, rehabilitate, or renew existing facilities. It is common, for example, to rebuild existing pumps to extend their useful service life for several years. Generally, if a project adds value to a facility, it is by definition a capital item. However, because it may not be practical to determine for each project whether value has been added to the plant, a monetary cutoff value is often used. Projects costing more than the cutoff amount are

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considered to add value and so are included in the capital investment plan. The cutoff amount varies depending on the size and budget of the water utility.

A similar criterion is often used with equipment purchases. If a purchased unit (for example, replacement pumps for a water treatment plant) can be absorbed into the operating budget, it need not be placed in the capital plan. (This criterion varies by country and by size of water utility.) Also, if the equipment purchase occurs on a recurring basis, even though the purchase price may be above the cutoff point, those expenses can be excluded from the capital investment program. The operating budget is oriented to handle such costs that occur annually. Thus, if the cost of a specific piece of equipment is relatively high and the item is not purchased or replaced each year, it should be included in the capital investment program.

3.2.2 Replacement versus New Capital Assets

Planners sometimes distinguish between capital outlays used to replace existing capital facilities and equipment, and outlays that are used to acquire new facilities and equipment. New outlays occur when a new service is started or an existing one is expanded.

Because replacements demand important cost decisions, they are deemed to be as important to the investment plan as additions. For this reason, if they are costly and do not occur annually, replacements should be included along with new purchases in the capital investment plan. For example, if a new treatment plant is added to an existing one, it is considered a new facility, not a replacement.

Figure 3 presents a sample summary of a five-year capital investment plan.

Figure 3

SAMPLE 5-YEAR CAPITAL INVESTMENT PLAN SUMMARY
FY __ to FY __

Proj. No.	Project Description	Estimated Expenditures or Retirements	Expenditures or Retirements as of End FY__	Expenditures or Retirements Required to Complete	Budgeted Expenditures or Retirements FY 1	FY 2	FY 3	FY 4	FY 5
	Source of Supply Plant								
307	Purchase of Reservoir	_____	_____	_____	___	___	___	___	___
	Land Expenditures	_____	_____	_____	___	___	___	___	___
308	Roadway Extension on Reservoir	_____	_____	_____	___	___	___	___	___
309	Replacement of Bridges and Culverts	_____	_____	_____	___	___	___	___	___
310	Construction of Wells	_____	_____	_____	___	___	___	___	___
to 313	Total Expenditures—Supply Plant Sources	_____	_____	_____	___	___	___	___	___
	Total Retirements—Supply Plant Sources	_____	_____	_____	___	___	___	___	___
	Pumping Plant								
314	New Pumping Station	_____	_____	_____	___	___	___	___	___
315	Pumping Station:								
	Expenditures	_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___	___	___
	Total Expenditures— Pumping Plant	_____	_____	_____	___	___	___	___	___
	Total Retirements— Pumping Plant	_____	_____	_____	___	___	___	___	___
316	Water Treatment Plant	_____	_____	_____	___	___	___	___	___
to 321	Total Retirements—Water Treatment Plant	_____	_____	_____	___	___	___	___	___

Figure 3 continued

Proj. No.	Project Description	Estimated Expenditures or Retirements	Expenditures or Retirements as of End FY__	Expenditures or Retirements Required to Complete	Budgeted Expenditures or Retirements FY 1	FY 2	FY 3	FY 4	FY 5
	Transmission and Distribution Plant								
322	New Distribution Tank	_____	_____	_____	___	___	___	___	___
323	Landscaping around Standpipes—	_____	_____	_____	___	___	___	___	___
	Expenditures								
324	Extension and Replacement of Mains								
to								___	
	Expenditures								
355		_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___		___
356	Services								
	Expenditures	_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___	___	___
357	Meters								
	Expenditures	_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___	___	___
358	Meter Installations								
	Expenditures	_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___	___	___
359	Hydrants								
	Expenditures	_____	_____	_____	___	___	___	___	___
	Retirements	_____	_____	_____	___	___	___	___	___
	Total Expenditures—	_____	_____	_____	___	___	___	___	___
	Transmission and Distribution Plant								

Figure 3 continued

Proj. No.	Project Description	Estimated Expenditures or Retirements	Expenditures or Retirements as of End FY__	Expenditures or Retirements Required to Complete	Budgeted Expenditures or Retirements				
					FY 1	FY 2	FY 3	FY 4	FY 5
	Total Retirements—	_____	_____	_____	___	___	___	___	___
	Transmission and Distribution Plant								
	Total Expenditures—Water Utility Plant	-----	-----	-----	--	--	--	--	--
	Total Retirements—Water Utility Plant	-----	-----	-----	--	--	--	--	--

Chapter 4

EVALUATING REVENUE REQUIREMENTS AND REVENUE SOURCES

4.1 Overview

Sound planning is a prerequisite to obtaining an adequate level of revenue. Total operating revenues must be sufficient both to enable the water utility to provide adequate service and to ensure the maintenance, development, and sustainment of the system.

The first step in evaluating revenue requirements is to estimate the revenue component of the budget. Operating revenues are a function of the demand for water service. This demand in turn is a function of factors such as the area's population, industrial concentration, weather conditions, and the customs of the people using the water, whether for sanitary or other purposes.

Operating revenue forecasts can be prepared in two steps:

1. Estimate the quantity of water required by each class of customer, or estimate some other quantity used to calculate demand.
2. Apply the rate schedule to the estimated quantity components.

Sales revenues should be forecast separately for residential, commercial, industrial, and public authority consumers if the accuracy of the forecast can be improved by doing so. The extent to which the revenue forecast is made by customer class will depend on the extent of price differences among the customer classes, differing consumption levels, and the degree of accuracy desired in the revenue forecast.

4.2 Forecasting Water Sales to Metered Customers

Historical water consumption information accumulated from individual customer records may be used as a basis for estimating the amount of water to be sold to each class of metered customer during the budget period. A trend line can then be fitted to the historical data. Within each class of customer or block rate schedule, the trend line can be extrapolated to estimate the amount of water to be provided to the class of customer or the class component for the fiscal year in question.

If a service charge or minimum charge is to be levied on customers, then an estimate of the revenue to be obtained from service charges or minimum charges also must be made. The estimate involves forecasting the number of customers subject to the charges based on the historical series, in much the same manner the forecast of water consumption is performed. If the service or minimum charge is based on meter size or some other measure, the historical data must be assembled on that basis.

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4.3 Forecasting Unmetered Sales

Unmetered sales charges to a given class of customer are based on quantity components or measures other than the amount of water consumed. Budgeted revenue for an unmetered class depends on (1) the estimated number of customers in the class, and (2) the estimated number of units on which water charges are based (for example, faucets, frontal footage, etc.). Customer records provide the historical data that serve as a basis for extrapolating the charges, as previously described.

4.4 Applying the Rate Schedules

To determine the revenue obtainable, the estimated quantity components must be related to the rate schedule. For metered sales, the appropriate meter-rate schedule is applied to the water volume to be sold to obtain a revenue estimate for that class or class component.

In the case of unmetered sales, the appropriate flat-rate schedules are applied to the total estimated number of units used by each customer class to derive the budgeted amounts of revenue.

Figure 4 shows how various inputs are used to estimate revenues.

Figure 4

BASIC INPUTS TO ESTIMATE REVENUES

INPUT DATA VARIABLES	UNITS	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
		<ACTUAL			<PROJECTED								>
Inflation Rate in %, Local	Constant	1.24	1.28	1.26	1.26	1.24	1.23	1.22	1.20	1.20	1.20	1.20	1.20
Annual Average Inflation in %, Local	Constant	1.23	1.26	1.27	1.26	1.25	1.24	1.23	1.21	1.20	1.20	1.20	1.20
Price Deflator in % (Base Year)	Constant	-	-	1.00	0.79	0.63	0.51	0.42	0.34	0.29	0.24	0.20	0.17
Exchange Rate, Year End	LC/US$	263.70	335.95	433.92	564.10	722.04	909.77	1,128.12	1,376.31	1,651.57	1,981.88	2,378.26	2,853.91
Exchange Rate, Average	LC/US$	242.60	299.17	384.94	499.01	643.07	815.91	1,018.95	1,252.22	1,513.94	1,816.73	2,180.07	2,616.09
Average People/Water Connection	Persons/W.Conn.	7.30	6.90	6.60	6.30	6.10	5.90	5.80	5.60	5.60	5.60	5.60	5.60
Average People/Sewerage Connection	Persons/S.Conn	7.80	7.37	6.97	6.66	6.44	6.19	5.80	5.82	5.81	5.80	5.80	5.78
Total Population	Persons/1000s	4,963.00	5,088.20	5,213.10	5,368.20	5,503.60	5,639.00	5,774.20	5,909.60	6,215.00	6,480.60	6,746.20	7,011.90
Water Connections, New	W.Conn'/1000s	31.21	49.26	47.65	60.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Water Connections, Year End	W.Conn'/1000s	659.17	708.43	756.08	816.08	866.08	916.08	966.08	1,016.08	1,066.08	1,116.08	1,166.08	1,216.08
Average Water Connections	W.Conn'/1000s	643.56	683.80	732.25	786.08	841.08	891.08	941.08	991.08	1,041.08	1,091.08	1,141.08	1,191.08
Sewerage Connections, New	S.Conn'/1000s	25.45	52.90	45.33	57.08	56.70	48.00	48.00	48.50	48.50	48.50	48.50	48.50
Sewerage Connections, Year End	S.Conn'/1000s	621.99	674.89	720.22	777.30	834.00	882.00	930.00	978.50	1,027.00	1,075.50	1,124.00	1,172.50
Average Sewerage Connections	S.Conn'/1000s	600.30	648.44	697.56	748.76	805.65	858.00	906.00	954.25	1,002.75	1,051.25	1,099.75	1,148.25
Volume Consumed/Connection/Month	Cu.M/Conn/Mth	34.38	32.12	32.49	34.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Volume of Water Billed, Bulk	Cu.M.in Mill	6.13	6.50	6.77	7.55	9.57	16.66	17.48	18.30	24.23	25.21	26.18	27.17
Volume of Water Billed, Retail	Cu.M.in Mill	291.30	290.00	297.30	320.72	353.25	374.25	395.25	416.25	437.25	458.25	479.25	500.25
Volume of Water Billed, Total	Cu.M.in Mill	297.43	296.50	304.07	328.27	362.82	390.91	412.73	434.55	461.48	483.46	505.43	527.42
Volume of Sewerage Billed	Cu.M.in Mill	262.50	260.50	268.50	305.49	338.37	360.36	380.52	400.79	421.16	441.53	461.90	482.27
Unaccounted-for-Water Ratio	in %	42	44	40	39	37	36	35	33	32	30	29	28
Volume Produced	Cu.M.in Mill	512.81	529.46	506.78	538.15	575.91	610.80	634.97	648.59	678.65	690.66	711.88	732.53
Average Retail Tariff, % Annual Increase	Constant	-	-	-	-	1.25	1.24	1.23	1.21	1.20	1.20	1.20	1.20
Average Bulk Tariff, % Annual Increase	Constant	-	-	-	-	1.25	1.24	1.23	1.21	1.20	1.20	1.20	1.20
Sewerage Tariff, % of Retail Tariff	Constant	-	-	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Combined Tariff Increase, Real in %	Constant	-	-	-	-	0.00	(0.00)	0.00	0.00	(0.00)	0.00	(0.00)	(0.00)
Average Retail Water Tariff	LC/Cu.M.	39.77	54.73	74.19	101.05	126.31	156.63	192.65	233.11	279.73	335.68	402.81	483.37
Average Bulk Water Tariff	LC/Cu.M.	20.13	25.98	34.34	46.77	58.46	72.49	89.17	107.89	129.47	155.36	186.44	223.73
Average Sewerage Tariff	LC/Cu.M.	19.89	27.37	35.96	50.53	63.16	78.31	96.33	116.55	139.87	167.84	201.41	241.69

LC: local currency
Cu.M.: cubic meters

Chapter 5

ESTIMATING EXISTING AND PROPOSED OPERATION AND MAINTENANCE COSTS

5.1 Overview

As part of preparing financial plans and determining objectives and policies for a water utility, it is essential to plan and control the utility's operation and maintenance (O&M) costs. As noted in Chapter 2, the forecast of demand for water services is a starting point for the entire financial planning process. Demand for water, in terms of both number of customers and volume of water produced, is an important variable in determining the level of O&M needed.

Within each cost center, both variable and fixed costs can be identified, although some costs vary more than others. For example, the amount of chemicals used in a water treatment plant will vary with the volume of water sold. Personnel and certain materials and supply costs are considered to be fixed; that is, they do not tend to vary with the volume of water sold. Changes in fixed costs are gradual and tend to be increases caused by inflation. Other costs—such as meter reading, meter installation, and so on—may vary with the number of customers served, and are typically considered to be variable customer costs.

Major expenses incurred in operating and maintaining water utility operations include labor, and materials and supplies.

The first steps in the financial planning of O&M activities are to determine (1) whether relationships that existed in the past will continue to exist in the future, and (2) whether a particular activity or procedure should be performed at all. These decisions involve a trade-off between the estimated cost of performance and the estimated value of expected benefits.

5.2 The Use of Historical Data

Historical data serve as a useful guide for estimating manpower and material requirements for activities that have been performed in the past. For example, in cases where it is possible to establish a physical standard of performance (such as number of labor hours required to accomplish a given task), past performance is a useful measure for setting the standard. The standard can then be used to estimate labor or material requirements for the level of O&M expected to be attained during a given fiscal period.

In addition to physical components, historical data are useful for developing price components, such as labor wage rates and unit costs for materials and supplies. The price components are then applied to the manpower and material requirements to obtain a budgeted O&M expense account. For minor items such as telephone bills, physical and price components do not require separate estimates.

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5.3 Planning Source of Supply, Pumping, Water Treatment, Transmission, and Distribution Expenses

5.3.1 Labor

O&M labor cost is a product of manpower requirements and wage and salary level. The number of employees required to operate and maintain facilities such as the source of supply, pumping stations, treatment plants, transmission and distribution facilities, and so on, depends on the physical condition, the design and size of the facilities, and the utility's replacement policy. Historical data concerning operating manpower requirements, adjusted for contemplated changes in the different facilities, serve as a basis for forecasting manpower requirements for the operation of these facilities.

The number of employees required to maintain a facility depends on the utility maintenance policy. A proper maintenance policy minimizes the total cost of maintaining a facility plus the cost of not maintaining one. Nonmaintenance costs are those that the utility incurs for interruption of service. Planners also should consider manpower requirements for emergency as well as routine maintenance. Based on past experience, utility managers may budget, at overtime rates, the probable number of labor hours expected to result from emergency repair work on transmission and distribution facilities.

Manpower required for maintaining meters depends on the number of customers serviced and the corresponding number of meters installed, removed, relocated, turned on, and shut off. Historical data on manpower needed for handling customer meters—adjusted for anticipated changes in the number to be installed, removed, turned on, or shut off—serve as a basis for forecasting manpower requirements.

Existing wage and salary schedules, modified by expected changes in schedules and number of employees at each level in the schedule, are used to translate manpower requirements into monetary amounts.

5.3.2 Materials and Supplies

The usage of materials and supplies for O&M depends on the physical condition, design, and size of the facility, and the scheduled or planned workload. Again using historical data as a guide, one can estimate future costs of materials and supplies by determining the workload, estimating usage of materials and supplies, and then multiplying by the respective unit prices.

5.3.3 Fuel and Power

A water utility may purchase fuel to produce its own power to operate pumps, it may purchase fuel or power for use directly in operating pumps, or it may employ a combination of the two methods. The amount of fuel or power consumed in either depends largely upon the amount of water produced for customers.

The amount of fuel and power required to pump one million liters of water can serve as a basis for forecasting fuel and power requirements. Future fuel and power usage is determined by multiplying the historical usage per million liters by the estimated pumpage (in terms of millions of liters for the current fiscal year). The estimated usage must then be multiplied by the estimated price to arrive at the projected figures for this variable cost.

5.3.4 Chemicals

The amount of chemicals used depends to a large extent on the volume of water to be treated, as well as on the quality of raw water received from the source of supply.

The amount of chemicals used in the past, per cubic liter of water produced, can serve as a guide for determining chemical usage in the future. Adjustments must be made for anticipated changes in the level of chemical usage due to changes in water quality. For each type of chemical, total usage is calculated by multiplying the estimated usage per million liters of water by the estimated volume of water to be treated. Total chemical usage multiplied by the unit cost will give budgeted expenses.

5.4 Planning Customer Accounts and Service Expenses

Customer accounts activity includes opening and closing accounts, reading meters, billing and collecting, maintaining records, and handling requests and complaints. Costs related to billing and customer recordkeeping will vary depending on whether a manual system, an automated system, or a combination of the two is used.

Financial management practices such as extending the billing period or billing larger customers (commercial and industrial) more frequently than residential customers, need to be considered and evaluated to minimize customer accounts expenses. If meters are read every two months, estimated bills may be issued in alternate months to reduce losses from uncollectible accounts, from late correction of underregistered meters, and so on.

For activities such as meter reading, the method used to record water usage and the location of meters will affect equipment and manpower requirements.

5.4.1 Labor, Materials, and Supplies

Procedures similar to those used in the previous section can be used to estimate overall expenses for each category.

5.4.2 Customer Billings for Work Performed

Amounts billed to customers for service connections and meters should be estimated based on past trends and changes resulting from expansion of services. Any billings that exceed costs incurred can be consolidated as miscellaneous service revenues.

5.4.3 Uncollectible Utility Revenues

Bad debts as a percentage of accounts receivable or of operating revenues are used to determine uncollectible revenues for the period. It is also useful to compare the percentage of bad debts with the stated credit and collection policies of the water utility.

5.5 Planning Administrative and General Expenses

General and administrative expenses make up a relatively large percentage of O&M costs. These expenses occur routinely and include salaries, bonuses, office supplies, insurance, pension plans, and benefit programs, as well as labor and materials expenses. Projected costs for most of these can be based on past experience. Manpower requirements for performing general and administrative functions are relatively fixed over long periods of time and thus also can be based on past experience.

5.5.1 Employee Pensions

Employee pension expenses can be estimated by referring to the terms of the pension contract. Or, if accruals are made to reserve funds, the amount of reserve accrual is based on the number of water utility employees and their corresponding salaries and wages.

Generally, retirement systems of water utilities fall into one of three main categories: (1) a water utility's own plan covering its employees, (2) subscription to a national plan, or (3) subscription to a plan for all municipal employees.

5.5.2 Transportation

Transportation expenses are associated with transmission and distribution, meter reading, bill collecting, and supervisory functions.

5.5.3 Wages and Salaries

Wages and salaries may be budgeted in a manner similar to other categories previously described.

5.5.4 Operating and Maintaining Equipment

Expenses incurred in operating and maintaining equipment may be estimated using historical data on individual pieces of equipment.

5.5.5 Materials and Supplies

The costs of operating central stores and buying materials and supplies depend on the requirements of the organization. These projected costs also can be based on historical data using current operating levels. Unit standard costs can be used to distribute these expenses among O&M activities and specific construction projects. These unit costs require periodical updating.

Figure 5 illustrates a sample annual operating budget structure for a water utility; Figure 6 shows components of O&M expenses.

Figure 5

ILLUSTRATION OF AN ANNUAL OPERATING BUDGET STRUCTURE OF A WATER UTILITY

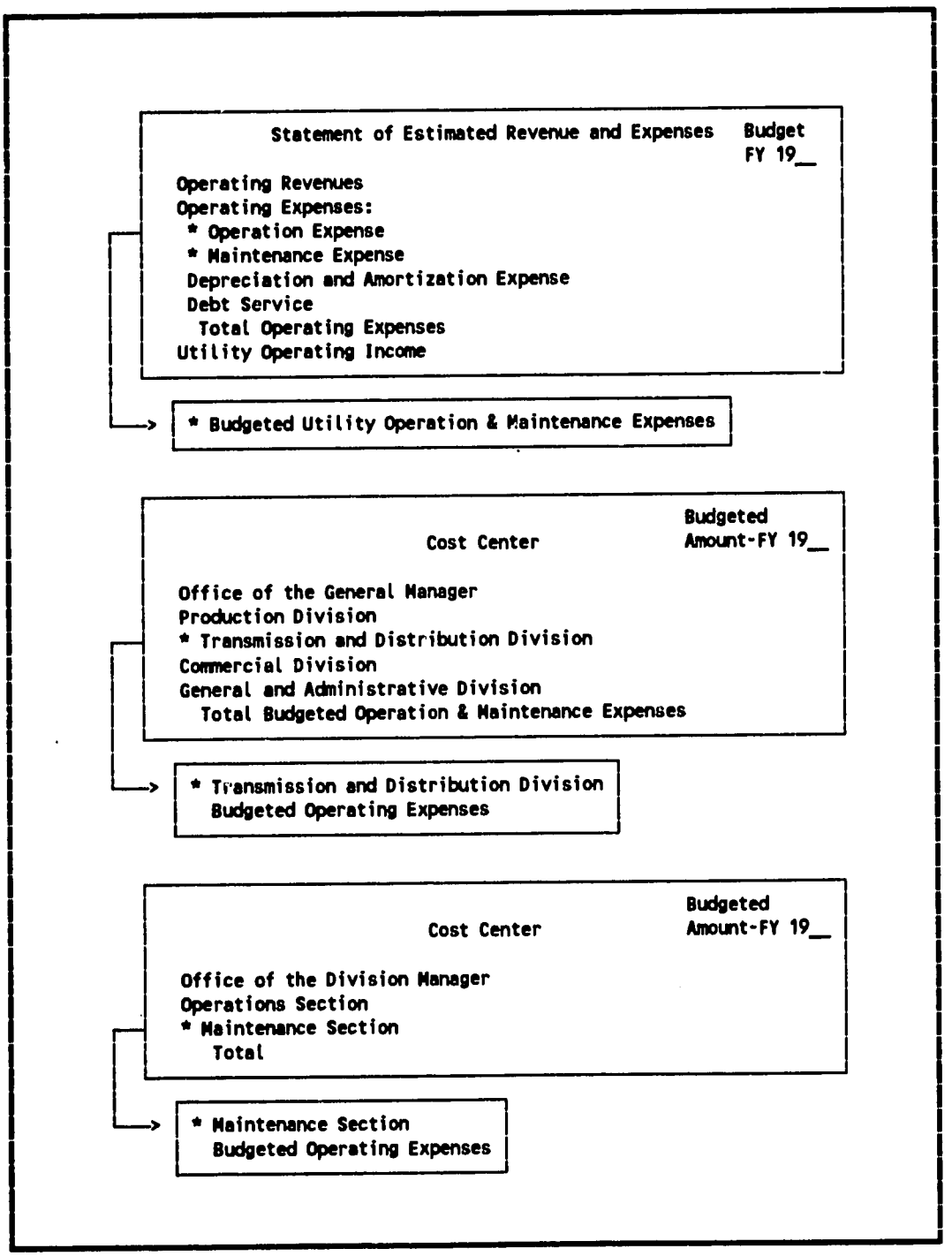

Figure 5 (continued)

Statement of Estimated Revenue and Expense

Cost Center	Budgeted Amount-FY 19__
Maintenance Supervision	
Maintenance of Mains and Storage Facilities	
Maintenance of Customer Services	
* Maintenance of Meters	
Total	

→ * Meter Maintenance Shop

Budgeted Operating Expenses	Budgeted Amount-FY 19__
Salaries and Wages:	
Foreman	
Meter Repairmen	
Laborers	
Total Salaries and Wages	
Materials and Supplies:	
Small Tools	
Maintenance Materials and Supplies	
Other	
Total Materials and Supplies	
Other Expenses:	
Maintenance of Meter Testing Equipment	
Utility Services	
Incidental Expenses	
Total Other Expenses	
Total Budgeted Operating Expenses	

Figure 6

ILLUSTRATION OF SOME COMPONENTS OF OPERATION & MAINTENANCE EXPENSES

			<---ACTUAL---					<---PROJECTED--->					
INPUT DATA VARIABLES	UNITS	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Wage Real Growth Rate	In %	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Wage Growth Rate	In %	1.00	—.—	—.—	1.30	1.29	1.28	1.27	1.25	1.24	1.24	1.24	1.24
Employees/1000 w. Connections	Emp/1000 w. Conn.	4.13	3.86	3.94	3.84	3.74	3.64	3.59	3.54	3.49	3.44	3.39	3.34
Personnel Costs	LC (millions)	8,571.70	12,669.00	17,396.57	23,661.89	31,809.00	41,982.58	55,536.15	72,090.29	92,575.49	118,583.21	151,546.41	193,258.65
Cost of Chemicals, M3 Produced	LC/Cu.M.	0.64	0.80	1.02	1.29	1.61	2.00	2.46	2.98	3.57	4.29	5.14	6.17
Cost of Chemicals	LC (millions)	328.20	425.27	518.97	694.37	928.87	1,221.58	1,562.01	1,930.55	2,424.04	2,960.33	3,661.52	4,521.31
Cost of Electricity, M3 Produced	LC/Cu.M.	2.08	2.32	4.20	5.67	6.94	8.48	10.29	12.66	15.47	18.96	22.88	27.58
Cost of Electricity	LC (millions)	1,065.47	1,228.58	2,130.20	3,053.98	3,994.19	5,178.02	6,536.60	8,214.20	10,496.74	3,093.74	16,284.65	20,201.28

LC: local currency
Cu.M.: cubic meters

Chapter 6

PLANNING CURRENT AND RESTRICTED ASSETS

6.1 Overview

The National Council on Government Accounting uses these definitions for current and accrued assets:

> Current and accrued assets are cash; those assets which are readily convertible to cash or are held for current use in operation or construction; current claims against others, payment of which is reasonably assured; and amounts accruing to the utility which are subject to current settlement.

Current and accrued assets may be broadly grouped into four categories: (1) cash and temporary cash investments, (2) notes and accounts receivable, (3) prepaid expenses and other receivables, and (4) materials and supplies.

The chief assets of a water utility are its current assets (including special funds, commonly known as restricted or accrued assets), and its fixed assets, such as plants.

6.2 Liquid Assets

Current assets that are cash or near cash are called "liquid assets." Assets in this category are cash, temporary cash investments, and accounts receivable. Inventories of materials and supplies are not generally considered liquid assets.

Sound financial planning requires that a utility maintain an adequate cash position and forecast cash receipts and disbursements. Cash flow forecasts anticipate possible future deficiencies, and allow planning of debt servicing and the investment of excessive cash balances.

A perfect balance between cash realized from operations and cash disbursed to discharge obligations is impossible. Either more cash may be generated than is required to discharge operations, resulting in excess cash; or cash realized may be inadequate, thereby requiring the utility to borrow or to use short-term supplier credit to meet short-term obligations.

Financial planning of cash reserves is necessary because cash held in checking accounts and cash on hand are nonearning assets. Excess cash balances withhold resources from possible profitable use or from repaying borrowed money that the water authority no longer needs.

The size of bank account reserves depends on the balances required to compensate banks for their services, on lines of credit, and on other credit agreements. In addition, sufficient outlays are required to cover normal operating expenses—both current and capital. These outlays include seasonal cash fluctuations and contingencies.

Cash flow may be projected for the near term (e.g., weekly) or for a longer term (e.g., yearly), depending on management policy and the prevailing economic situation. For example, in some developing country utilities, weekly planning is a must because of high inflationary pressures. On the other hand, the longer the period covered by the cash flow forecast and the more distant the ending time, the less precise the figures. Constant review and updating are necessary for the estimates to serve as useful financial planning guides.

Cash receipts and disbursements are forecast based partly on experience and partly on anticipated changes in operations. Cash receipts are based on the revenue budget, adjusted for revenue differences as determined on an accrual and cash basis. This adjustment may be made based on past experience of the ratio of cash receipts to revenues. Other sources of cash—such as interest on accounts, customers' deposits, advances, and contributions for construction—can be based on historical levels, with adjustments for contemplated changes. Cash receipts from the sale of assets and property are based as closely as possible on management plans and prospective market prices for such property.

Forecasts of cash disbursements for operations are based on the operating budget, adjusted for differences in expenses as determined on an accrual and cash basis. For example, monthly materials and supplies expenses included in the operating budget ordinarily differ from the cash outlays for operating materials and supplies. Materials and supplies inventories included in the budget are usually based on the average unit cost of the inventory on hand during the fiscal period. Therefore, the availability of materials and supplies at the beginning of the budget period will affect the estimates included in the operating budget. However, cash disbursements during the fiscal year will depend on actual outlays regardless of whether these supplies are used during the period.

Monthly or quarterly cash outlays for capital investment projects are an important cash disbursement line item. The capital expenditures budget, the construction work schedule, and the schedule for purchasing assets during the fiscal period are used to determine cash disbursements. These disbursements should be adjusted to a cash basis to the extent that they reflect accrued costs. Similarly, progress payment dates, supplier credit agreements, and contractual final payment dates determine cash outlay. To the extent that capital investment projects are paid out of assets (special funds) restricted to use for replacement or construction, disbursements from general cash for investment are reduced. Assets that are restricted to rehabilitation or construction of the utility plant, and that are to be spent during the fiscal year, may be considered a separate source of cash rather than being subtracted from cash disbursements for capital investments. Likewise, scheduled inflows to the restricted asset accounts during the budget year need to be accounted for in cash disbursements.

Estimates for repayment of customer deposits and advances for construction can be determined using past experience and adjustments for anticipated changes during the current year. In the same way, cash outflows from repayment of customer deposits and advances for construction can be balanced against inflows. The resulting net cash inflow (or outflow) will then be included as a source or application of cash.

After cash sources and uses (including interest and repayment of principal on outstanding debt) are estimated, the net cash balance will indicate the need for, and the timing of, additional financing. The cash forecast includes anticipated borrowing during the fiscal period.

Other liquid assets that require planning are receivables. Those that are required or expected to be paid within the current fiscal year are customarily classified as current assets. Included in this account are receivables from associated companies, customer accounts, officers and employees, and so on. This account, together with temporary investments, represents purchasing power in suspension. The utility is interested in the market or cash value of these receivables. Credit and collection policies, the economic condition of the locality served by the water authority, and the length of the meter reading and billing period determine the cash inflow and the provision for bad debt and uncollectible accounts. The total investment in customer accounts will depend on the length of the meter reading and billing period as well as collection efficiency; the longer the billing period, the greater the investment in accounts receivable.

Figure 7 shows a sample one-year forecast of cash receipts and payments by quarter, with the earliest quarter forecast by month. The forecast anticipates the need for short- and long-term borrowing in order to maintain an adequate cash balance and reduce cash shortfalls.

6.3 Materials and Supplies

For a water utility, investment in materials and supplies represents a significant portion of operating costs, and therefore requires careful planning. Materials and supplies planning requires a budget and a purchasing plan, and is based on the operational activity defined in the operating and capitalized annual budget.

The operation and maintenance budget and the capital budget are the cornerstones for preparing the materials and supplies budget. The operational and capital requirements of materials are adjusted for existing inventory on hand and for planned increases or reductions in inventory for the budget year. In determining the amount of purchases during the budget period, utility managers should take into account the benefits of quantity discounts, the costs of transportation, and the possibility of changes in market prices.

The materials and supplies plan also helps to program cash disbursements and provides information for formulating the water utility's cash budget. The material and supplies budget should present requirements in monetary amounts as well as list quantities of items required to be stocked. Scheduling purchases will permit management to choose an optimal inventory level, one that will minimize inventory costs while ensuring adequate supplies to meet operational and construction requirements.

6.4 Restricted Assets

Restricted assets are money and other investments that are to be used only for debt service, replacement or construction of plant assets, and employee pensions. Investments in these accounts commonly are held as interest-bearing securities. At present, few water utilities in developing countries plan for restricted assets. The development of secondary capital markets and the introduction of bond financing should facilitate this type of planning. In the case of international financing, however, conditions are often built into the financing of capital projects so that cash proceeds are spent on authorized capital expenditures. Cash is disbursed from restricted special accounts to pay authorized project expenses. Eventually, the restricted account is depleted to zero as all authorized expenditures are completed.

Figure 8 displays a sample worksheet for forecasting changes in restricted assets for a fiscal year.

Figure 7

CASH FLOW FORECAST FOR THE YEAR FY___

	1st Quarter - FY___			2nd Quarter FY___	3rd Quarter FY___	4th Quarter FY___
	January	February	March			
Estimated Cash Balance, Beginning of Period	_____	_____	_____	_____	_____	_____
Estimated Cash Provided by						
Sale of Water Service						
Rent of Property						
Interest on Investments						
Sale of Plant Assets and Other Property						
Advances and Contributions in Aid of Construction (Net of Repayment of Customer Advances)						
Customer Meter Deposits (Net of Repayments)						
Use of Restricted Assets - Revenue Loan Proceeds						
Short-Term Borrowings						
Long-Term Borrowings						
Other						
Estimated Total Cash Provided During Period	_____	_____	_____	_____	_____	_____
Estimated Total Cash Available During Period	_____	_____	_____	_____	_____	_____
Estimated Cash Disbursements	_____	_____	_____	_____	_____	_____
Salaries and Wages						
Materials and Supplies						
Payments to Outside Contractors for Construction						
Purchase of Plant Assets and Other Property						
Interest (Payments from Other than Restricted Assets)						
Repayment of Short-Term Borrowing						
Transfers to Restricted Assets - Customer Meter Deposits						
Transfers to Restricted Assets - Proceeds from Long-Term Borrowing						
Other						
Estimated Total Cash Disbursements During Period	_____	_____	_____	_____	_____	_____
Estimated Cash Balance, End of Period	====	====	====	====	====	====

Figure 8

WORKSHEET FOR STATEMENT OF CHANGES IN ASSETS RESTRICTED FOR LONG-TERM DEBT SERVICE
(for year ending December ____)

	Cash in Banks	Assets Restricted for Debt Service	Assets Restricted for Reserve Use	Assets Restricted for Contin-gencies	Total Restricted Assets
Total Balance, Cash and Investments, Beginning FY___	_____	_____	_____	_____	_____
Cash Balance, Beginning FY___	_____	_____	_____	_____	_____
Cash Receipts					
Transfers from General Cash					
Income from Restricted Investments					
Intergroup Transfer of Cash Restricted for Debt Service					
Total Cash Available	====	====	====	====	====
Cash Disbursements					
Principal Payments					
Interest Payments					
Commitment Fees					
Purchase of Investments					
Intergroup Transfer of Cash Restricted for Debt Service					
Total Disbursements	_____	_____	_____	_____	_____
Cash Balance, End FY___	_____	_____	_____	_____	_____
Investment Balance, End FY___	_____	_____	_____	_____	_____
Additions					
Deductions					
Investment Balance, End FY___					
Total Balance, Cash and Investments, End FY___	====	====	====	====	====

Chapter 7

PLANNING LIABILITIES

7.1 Overview

Water utilities use liabilities to finance the purchase or construction of fixed assets and to fund operations as needed. Financing mechanisms may be external or internal. There are two major categories of liabilities: current and accrued.

Current liabilities are the portions of medium- or long-term debt that come due, or mature, in a given fiscal year. *Accrued liabilities* are those that will mature a year or more hence and that are being provided for by accumulating funds until the maturity date.

Some principal current and accrued liabilities include accounts payable to companies that provide materials and supplies; notes payable on short-term borrowing and accrued interest; customer deposits; construction contracts payable; and long-term debt due within the current fiscal year. These obligations are usually discharged by cash payments or by payments from restricted assets (special funds).

The difference between current assets and current liabilities is often used to indicate financial position. This difference is commonly known as "working capital" or "net working capital." However, the working capital requirements of a water utility generally are lower than those of a manufacturing firm. This fact is reflected in the organization of the balance sheets, in which investments and capitalization are usually listed before current assets and liabilities. For a water utility, access to funds for additions or replacements is more important than access to working capital.

7.2 Current and Accrued Liabilities

The planning process for liabilities begins with the formulation of a budget. A review of the past trends of the operating budget, the materials and supplies budget, and the capital budget helps to project the approximate levels of current and accrued liabilities. These levels are fine-tuned based on specific policy changes, such as new operational and financial leverage (see Appendix A), or new programs for replacement and construction.

Residual levels of current and accrued liabilities are projected from the expected amount of operation activity and the payments associated with this level of activity. The payment policies will depend on contractual agreements with creditors or suppliers of goods and services. However, those preparing the financial plans should make an effort to ensure that such payments come due during periods when operations or other sources are expected to be generating revenues—bearing in mind any seasonal variations.

Planning and forecasting current and accrued liabilities is necessary to determine working capital needed during the fiscal year. A certain level of negative working capital may be

considered acceptable, but only if cash will be generated to meet the obligations as they mature. In practice, this will not often be the case, because proposed commitments of liability are established within the various budgets as they are drawn up.

7.3 Long-Term Liabilities and Equity

Long-term liabilities in water utilities in developing countries usually take the form of long-term debt used to finance capital investments and to build up equity. For the utility to be able to deliver adequate services to customers, a large investment in fixed assets is required. As a result, an important part of financial planning is obtaining adequate financing for the initial purchase of a water utility plant, as well as for extensions, improvements, and replacements, and relocation of assets. A utility may also want to contract long-term debt to reorganize or readjust capital structures in connection with consolidating and repaying loans.

Several financing sources are available.[1] The primary sources of capital are long-term debt, short-term debt, retained earnings, and cash flows covered by depreciation. In addition, selling of shares by investor-owned utilities and different forms of leasing are becoming increasingly more important sources of funds. The price paid for the use of these investable funds is the cost of financing. Financial planning requires that financial managers employ the various resources available in ways that minimize the cost to the utility. No single source of funds can always be used without bound; each source has its own constraints. In addition, borrowing at the lowest effective rate might not always be desirable, if doing so requires managers to make significant concessions or restricts their ability to respond to changing capital market conditions.

7.4 The Cost of Financing

Water utilities usually invest large amounts in plant assets and, as a result, require a variety of financing sources. As previously noted, determining sources and obtaining funds to finance the initial construction of a water utility plant—as well as to finance extensions, improvements, and replacements of fixed assets—is an important part of financial planning. The nature of some sources of financing in developing countries, and their costs, are discussed below.

7.4.1 Long-Term Debt

The annual cost of long-term debt is the interest paid on the debt each year. The corresponding debt service includes payment of principal and, in some cases, commitment fees on undisbursed portions of a loan. Similarly, water utilities usually maintain short-term revolving credit lines with banks. These funds are used for relatively small and frequent

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[1] For more information on financing sources, see J.S. McCullough, *Alternatives for Capital Financing of Water Supply and Sanitation*. WASH Technical Report No. 56. Arlington, Va: WASH Project. July 1992.

financial needs. They enable the utility to time its long-term loans to take advantage of favorable interest rates. The cost of short-term credit is analogous to the cost of long-term debt.

7.4.2 Depreciation

Cash flows generated by recognition of noncash expenses, principally depreciation, are an important internal source of financing to water utilities. Depreciation expense is important to financial management because it not only helps determine net income but also is an important factor in the analysis and budgeting of cash flows. Although depreciation charges are not by themselves a source of cash, they are a factor in rate setting and therefore influence cash flows. Recognition of depreciation also influences cash flows indirectly by deterring disbursements to the utility's general fund or—in some countries—to the municipal general fund. Such disbursements otherwise would be made from fictitious earnings resulting from inadequate depreciation charges.

Conventional ways of determining depreciation are based on historical or original costs. However, in countries in which inflation is a serious problem, concern is increasing over the use of such methods. At issue is whether current depreciation practices can ensure that the original capital invested in the utility is maintained. It is becoming increasingly accepted that depreciation charges should reflect the cost of replacing the fixed assets.

The justification for measuring depreciation in terms of replacement costs is the amount of funds needed for replacement, improvement, and expansion in the face of constantly rising prices. Cash retained through depreciation charges should be available for the most advantageous alternate investments possible. The alternatives should be evaluated based on opportunity costs and on project-specific quantitative and qualitative selection criteria.

7.4.3 Capital Recovery Charges

Capital recovery charges, impact fees, and facility expansion charges are also becoming a source of financing capital improvements. These one-time charges are established to recover part or all of the cost of the additional capacity constructed. In one country in Latin America, funding infrastructure costs through betterment levies has become a popular way of adding equity to the financing and pricing system.

7.4.4 Contributions

The significance of contributions and advances varies among utilities and within the same utility at different times. Contributions in the form of grants or discretionary transfers from the central government may be obtained for financing capital expenditures. The availability of this cost-free resource, however, has gradually decreased as central governments' fiscal constraints increase.

Appendix A

FINANCIAL AND OPERATIONAL LEVERAGE

"Leverage" refers to the degree to which a water utility commits itself to various fixed costs. *Financial* leverage measures how much of the firm's cash resources come from borrowing as opposed to its own financing sources. *Operational* leverage includes all commitments to fixed costs other than interest payments, such as purchases or leases of buildings or equipment, or purchases of raw materials.

There are two possible extreme leverage positions, although most leveraged organizations lie somewhere in between. The first is illustrated by a utility that chooses to finance its activities using only its own resources, preferring not to incur any debt or the corresponding interest payments. The second is shown by a utility that chooses to heavily vertically integrate its operations; that is, to finance its activities by borrowing as much as lenders will allow. The latter utility anticipates larger potential profits (as well as risking larger losses) by investing a relatively smaller amount of its own funds. Ideally, the financial managers plan the leverage level and make long-term decisions in the interest of the utility and its owners.

The following is an example of how a utility might go about planning what level of leverage is best, given a known set of income sources. The utility in this example is a publicly owned water utility.

Suppose a water utility service requires the following assets:

	US$
Fixed Assets	$ 6,000
Current Assets	$ 6,000
TOTAL ASSETS	$12,000

We want to determine (1) how much in current liabilities the firm can or should incur, (2) how much in long-term liabilities, and (3) how much of the firm's own-source funds it should invest.

Liability Structure

We assume that we want to reach a situation in which current liabilities are no more than half of current assets, and that total liabilities likewise are no more than half of total assets. Using classical, standard ratios:

Current Liabilities = Current Assets ÷ 2
Total Liabilities = Total Assets ÷ 2

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Two possible financial resource liability structures follow. One alternative uses a fairly low level of current liabilities and one uses the highest level we will allow, depending on the financing criteria management sets.

Alternative 1

Current Liabilities	$1,500
Long-Term Liabilities	$1,500
Own-Source Funds	$3,000
TOTAL LIABILITIES	$6,000

Alternative 2

Current Liabilities	$3,000
Long-Term Liabilities	$2,000
Own-Source Funds	$1,000
TOTAL LIABILITIES	$6,000

Bankers and other creditors are usually wary of companies with a high proportion of current liability and little equity.

Income/Expenditure Statement

Continuing with our water utility model, the income/expenditure statement is as follows:

Income/Expenditure	*Amount*	*Percent of Revenues*
Revenues	$10,000	100%
Variable Costs	- $6,000	60%
Gross Operating Profits	$ 4,000	40%
Fixed Costs	- $1,800	18%
Operating Profits	$ 2,200	22%

The operating profits category above has not yet taken into account interest payments on loans. Therefore, if funds have been borrowed, the utility has to generate enough of a surplus to pay the interest and amortize the principal. (See "Resources to Amortize Liabilities.")

For this model, we assume that our utility has the following expenses related to credit and depreciation.

Additional Assumptions

1.	Treasury Surplus	0
2.	Debt Service (average period 10 years)	10%
3.	Depreciation of Fixed Assets @ 20 years	$150
4.	Equipment Replacement	$100
5.	Net Working Capital Increase	$500
6.	Liabilities without Cost	$500
7.	Interest Rate	15%

In Alternative 1, the total amount borrowed is $3,000; in Alternative 2, $5,000. Interest (15%) is calculated on those amounts less the increase in net working capital ($500).

	Alternative 1	*Alternative 2*
Operating Profits	$ 2,200	$ 2,200
Interest	375	675
Net Profits	$ 1,825	$ 1,525

Apparently, financing by Alternative 1 is more rewarding than by Alternative 2. However, this is not necessarily so, as we see if we analyze the financial performance indicators.

Financial Performance Indicators

Profitability:

a) Return on Assets (percent)

	Alternative 1		*Alternative 2*	
Net Profits + Interest	$ 2,200	18%	$2,200	18%
Total Assets	$12,000		$12,000	

b) Return on Own-Source Funds (percent)

Net Profits	$1,825	61%	$1,525	153%
Own-Source Funds	$3,000		$1,000	

c) Net Return on Assets (percent)

Net Profits	$1,825	15%	$1,525	13%
Total Assets	$12,000		$12,000	

Conclusions

1. Apparently, with Alternative 1, the municipality has a higher net profit and a better net return on assets.
2. However, the return on own-source revenues is 2.5 times higher in Alternative 2 (153%) than in Alternative 1 (61%). This high return is called financial leverage.

To show this effect even more clearly, we can calculate the rate of return using different levels of own-source revenues:

Financing

a) With own-source revenues only:

Net Profits	$1,825	30%
Own-Source Funds	$6,000	

b) With 50% own-source revenues:

Net Profits	$1,825	61%
Own-Source Funds	$3,000	

c) With 15% own-source revenues:

Net Profits	$1,525	153%
Own-Source Funds	$1,000	

NOTE: Although net profits decrease in absolute terms as liabilities increase, returns increase more than proportionally. This is because the average cost of funds (interest rate) is less than the 30% cost of capital (own-source funds). The difference between the return (cost) that has to be generated and the cost of capital is an additional return for the utility.

Hence we have two financial planning considerations:

1. The business focus—i.e., the need to recover costs and generate a net profit.
2. Financial leverage—i.e. (when loans cost less than the potential net return), the ability to increase returns by financing capital investments with more liabilities and less own-source revenues.

Resources to Amortize Liabilities

As we noted earlier, operating profits have to allow enough of a surplus to meet interest payments and pay depreciation expenses. The following calculations determine the amount of surplus that will be needed as resources to amortize liabilities.

	Alternative 1	*Alternative 2*
Net Profit	$1,825	$1,525
Depreciation	150	150
Resources Generated	1,975	1,675
Equipment Replacement	100	100
	1,875	1,575
Working Capital	500	500
Available Resources	1,375	1,075
Debt Service	300	500
Surplus	1,075	575

A debt service formula can be derived from this example to determine whether there will be sufficient resources to cover interest and principal payments on long-term loans. This formula can be expressed as follows:

$$\text{Debt Service} = \frac{\text{PbI} + \text{Depreciation}}{\text{Interest} + \text{Principal}}$$

The maximum level of financial leverage at which the debt service can still be covered is the point at which the available resources equal the amortization of the liabilities.

Hence, if X is the maximum level of financing and interest payments will be 15% of X, then the maximum debt ceiling limit (based on our earlier assumptions) will be:

(PbI − 15%X) + Depreciation − Replacement of Equipment − Increase in Working Capital = 10% × 2,200 − 15%X + 150 − 100 − 500 = 10% × 1,750 = 25%X = 7,000.

Note that this maximum debt ceiling leaves almost no margin of security in the event of a downturn in revenues. In practice, lenders usually impose limits on indebtedness based on their own estimates of the financial risk they feel the borrower can safely assume.

Operational Leverage or Multiplier

Let us look again at the income/expenditure statement for our model water utility. In this case, given a possible increase or decrease in sales of 10%, the operating profits correspondingly increase or decrease by 18%.

	90%	*100%*	*110%*
Revenues	$9,000	$10,000	$11,000
Variable Costs	$5,400	$ 6,000	$ 6,600
Gross Operating Profits	$3,600	$ 4,000	$ 4,400
Fixed Costs	$1,800	$ 1,800	$ 1,800
Operating Profits	$1,800	$ 2,200	$ 2,600
Inc./Dec. in Operating Profits	-18%	100%	18%

Suppose that revenues were either 10 percent less than or 10 percent more than the minimum needed to break even (the equilibrium point). In this case, the surplus would be calculated as follows:

	10% Decrease	*10% Increase*
Operating Profits	$1,800	$2,600
Interest	$ 375	$ 675
Net Profits	$1,425	$1,925
Depreciation	$ 150	$ 150
Resources Generated	$1,575	$2,075
Equipment Replacement	$ 100	$ 100
	$1,475	$1,975
Working Capital	$ 500	$ 500
Available Resources	$ 975	$1,475
Debt Service (Principal)	$ 300	$ 500
Surplus	$ 675	$ 975

Thus, an increase or decrease in overall sales produces an even greater increase or decrease in operating profits. This phenomenon is called operating leverage. The closer the sales are to the equilibrium point, the greater the effect of the multiplier on operating profits.

$$\frac{\text{Gross Profits}}{\text{Gross Profits} - \text{Fixed Costs}} = \frac{\text{Gross Profits}}{\text{Profits Before Interest}}$$

$$= 1.82 \text{ times}$$

This factor is called the multiplier effect of the operating leverage. Hence, as stated earlier, a 10% increase or decrease in sales will cause the operating profits before interest to vary by 18%.

The following exhibit carries out the multiplier effect calculations for sales varying from 60% to 120% of the equilibrium value.

The Effect of Variation in Water Sales on Various Financial Indicators

Variation in Sales	*Operating Revenues*	*Variation in Profits*	*Multiplier*	*Profits*
60%	$6,000	$600	4.00	-72.73%
70%	$7,000	$1,000	2.80	-54.55%
80%	$8,000	$1,400	2.29	-36.36%
90%	$9,000	$1,800	2.00	-18.18%
100%	$10,000	$2,200	1.82	0.00%
110%	$11,000	$2,600	1.69	18.18%
120%	$12,000	$3,000	1.60	36.36%

Conclusion

The effect of the multiplier on operational leverage is expressed by the following formula:

$$\frac{\text{Gross Operating Profits}}{\text{Operating Profits before Interest}}$$

The effect on financial leverage is measured by this formula:

$$\frac{\text{Operating Profits before Interest}}{\text{Net Profits}}$$

Total leverage, therefore, is the product of the multiplier and the financial leverage, which reduces to:

$$\frac{\text{Gross Operating Profits}}{\text{Net Profits}}$$

Using again the figures for revenues 10% greater than and 10% less than the equilibrium point, and subtracting interest, we arrive at the following net profit and percentage increase/decrease:

	90%	*100%*	*110%*
Revenues	$9,000	$10,000	$11,000
Variable Costs	$5,400	$ 6,000	$ 6,600
Gross Operating Profits	$3,600	$ 4,000	$ 4,400
Fixed Costs	$1,800	$ 1,800	$ 1,800
Operating Profits	$1,800	$ 2,200	$ 2,600
Interest	$ 375	$ 375	$ 375
Net Profits	$1,425	$1,825	$2,225
Inc./Dec. Operating Profits	-18%	100%	18%

Thus, for revenues at the equilibrium point of $10,000, operating leverage, financial leverage, and total leverage are calculated as follows:

a) Operating Leverage

$$\frac{\text{Gross Operating Profits}}{\text{Operating Profits before Interest}} \quad \frac{\$4,000}{\$2,200} \qquad 1.82$$

b) Financial Leverage

$$\frac{\text{Operating Profits}}{\text{Net Profits before Interest}} \quad \frac{\$2,200}{\$1,825} \qquad 1.21$$

c) Total leverage

$$\frac{\text{Gross Operating Profits}}{\text{Net Profits}} \quad \frac{\$4,000}{\$1,825} \qquad 2.19$$