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FINAL

IMPROVING COST RECOVERY FOR WATER PROVISION

VOLUME II
LVIV VODOKANAL:
IMPROVING COST RECOVERY

Prepared for

Government of Ukraine

and

Vodokanal, City of Lviv, Ukraine

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EXECUTIVE SUMMARY

Planning and Development Collaborative International (PADCO, Inc.) prepared this document for the United States Agency for International Development (USAID) and the Government of Ukraine. The present study, *Lviv Vodokanal: Improving Cost Recovery*, is the second report in a planned four-volume series on "Improving Cost Recovery for Water Provision." The report seeks to help Lviv Vodokanal (waste and wastewater authority) and the City of Lviv make the provision of water service in Lviv more financially sustainable, with a focus on helping the Vodokanal (VKL) recover more costs from monthly user charges.

Financing the Provision of Water in Lviv

(see Chapter 1)

Responsibilities for providing water service are currently divided in Lviv. The VKL is charged with operations and maintenance (O&M) and system renewal and replacement, while the City is responsible for system expansion and extension. This divided responsibility complicates service provision — particularly capital investment programming, which involves both system renewal and replacement, as well as expansion and extension.

Both the VKL and the City collect different types of charges that are based in some way on water use. The VKL levies a monthly volume charge and a lump-sum connection charge. These charges pay for services provided. The City funds what water system improvements may occur, in part out of general revenues and in part from an off-budget account established for different types of infrastructure. For 1995-96, the City plans to collect five types of charge that bear some relation to water use. This proliferation of charges does not, however, add up to a coherent financial base for sustainable water service provision. Among other irregularities, we note here that revenues generated from the use-based charges are not necessarily tied to water system improvement.

Revenue Requirements for Lviv Vodokanal

(see Chapter 2)

One goal of effective tariff-setting is the recovery of revenues from consumers based on the costs of providing service to those customers. For tariff-setting purposes, the VKL divides customers into four major categories: general population, budget organizations, communal services, and enterprise/industry. We conclude that these categories are not based on water demand characteristics, but on other criteria, resulting in inefficient and inequitable pricing.

We project future revenue requirements for Lviv Vodokanal under five different scenarios. *Scenario A*, the baseline, follows current practices for estimating costs. The average price per cubic meter of water — the monthly volume charge — would rise very modestly over time under that baseline case. *Scenario B* also follows current costing practices, but restores operations and maintenance line items to the highest levels recorded over the last four years. This change would result in very modest raises in price levels over baseline conditions — increases equal to about a penny (US$0.01) per cubic meter. *Scenario C* continues to follow current costing practices. However, it includes substantial new funding for system renewal and replacement. This scenario, which represents an initial approximation to full-cost pricing

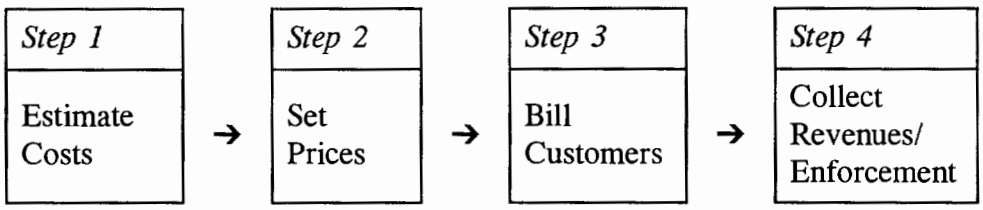
(assuming high collection levels), would result in average prices that stand about 10 cents (US$0.10) above baseline levels.

Scenarios D and *E* both break from current cost-setting practices and embrace a model cash-needs technique. That technique follows, in part, average incremental cost (AIC) principles for setting prices to reflect the costs of future capital improvements in an efficient manner. (Because of the lack of a capital investment program, we were not able to fully explore the AIC approach.) These scenarios also assume that the monthly volume charge would include a debt service component. We assumed a loan of US$20 million for Scenario D and US$75 million for Scenario E. Scenario D would result in average price levels similar to those of Scenario C, i.e., about 10 cents over the baseline case. Price levels about 14 cents (US$0.14) higher than the baseline case would obtain under Scenario E. All five scenarios, however, assumed fully effective billing and collection systems, an assumption that is examined below.

The study team also attempted to allocate revenue requirements to customer classes. We were unable to allocate costs to customer classes because data on customer demand characteristics were either unavailable or else severely skewed by the restricted three-hour service blocks now in place. We were, however, able to go so far as to allocate costs by functional area: supply and pumping, treatment, system maintenance, and administration.

Cost Recovery (see Chapter 3)

Recovering costs from customers involves four steps:



We described the procedures for estimating costs (Step 1) and setting prices (Step 2) in the Volume I report. The text of the present report describes the processes of billing customers (Step 3) and collection/enforcement (Step 4). Billing is the responsibility of the VKL's Water Sales Department, while collection is administered through the banking system. Zheks play a role in both processes. Billing and collection procedures vary by customer class and other factors.

For any given month, we can calculate revenue levels that correspond to the different steps of the user charge cost recovery system presented above. If the system is completely successful in recovery costs:

"actual" costs = estimated costs = amount billed = amount collected

(An independent consultant can calculate "actual" costs, for comparison with costs estimated by a given water authority.) Calculating and comparing these four revenue amounts helps us diagnose where the cost recovery system is working and where it is not.

We assess the performance of the VKL's cost recovery system for April 1995. One of the largest differences found between revenue amounts was between "amount billed" and "amount collected." Total collected represented only about 65 percent of total billed. This collection-to-billing ratio dropped to 41 percent when we excluded in-kind (bartered) payments. We attribute these low rates in part to the lack of effective enforcement policies and procedures. We also found a large difference between "actual costs" and "estimated costs." As presented earlier, this is due to inadequate funding of maintenance and repair and in particular of system renewal and replacement.

Recommended Strategy for Improving Cost Recovery in Lviv (see Chapter 4)

The goal of the proposed strategy is to make water service provision in Lviv more financially sustainable. Both the VKL and the City need to play parts. We ranked recommendations by urgency and grouped them into three phases. The strategy is summarized in Table ES-1 and below (see Chapter 4 for details).

Vodokanal. The top priority for the VKL should be to improve collections **(Phase 1)**. As part of this effort, the VKL should put in place and then implement enforcement procedures. As collections improve, for equity reasons, the VKL should bring the tariffs charged to different customer classes to a common level by gradually increasing prices for communal service providers and the general population. (This is the general direction prompted by recent Cabinet of Ministers' decrees, e.g., No. 733.)

Phase 2 should begin only after the VKL has strengthened its collection and enforcement system and after tariffs are generally equalized. The VKL should then begin, as permitted, to increase its estimate of total costs until its prices reflect full costs. These cost increases should occur only after the collection/enforcement system is strengthened to avoid the substantial increases in defaults on payments that could result.

After Phases 1 and 2 have improve cost recovery to allow for sustainable service provision, the VKL should begin as permitted to change the way it sets prices so as to develop more equitable and efficient rate structures **(Phase 3)**.

City. The City of Lviv should modify and rationalize its system of user charges so as to provide for effective system expansion and extension. This involves dedicating revenues from certain user charges exclusively to improving the water system, budgeting capital investments, and otherwise rationalizing its financial system. At the same time, capital investments should be coordinated with the Vodokanal.

Table ES-1
Strategy for Making Water Service Provision More Financially Sustainable

Phase	Lviv Vodokanal	City of Lviv
1	• Improve collection/enforcement • Increase tariffs charged to the general population and communal service providers • Improve data collection and analysis to prepare for later phases, etc.	• Modify system of user charges and dedicate revenues to provide for sustainable service provision • Rationalize use of dedicated revenues by coordinating capital investment programming between City and Vodokanal
2	• Increase calculation of total cost used as basis for setting monthly user charges	
3	• Make pricing process more efficient and equitable	

National-Level Recommendations (see Chapter 4)

We confined national-level recommendations to the area of our investigation — increasing cost recovery and improving the pricing process. Our recommendations assume, however, that, as has been suggested elsewhere, the State will at some point invest the institution of the vodokanal with all responsibilities for direct water service provision and otherwise strengthen that entity.

The State should first enable the VKLs to adopt a more commercial approach to water provision. The State should enable VKLs to: improve collections and enforcement; establish automatic collection mechanisms for communal service providers; account for full costs in monthly volume charges; and improve service connection procedures. As a longer-term priority, the State should allow the VKLs' price-setting processes to become more efficient and equitable.

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CHAPTER 1
INTRODUCTION AND FINANCING WATER SERVICE

1.1 INTRODUCTION

Planning and Development Collaborative International (PADCO, Inc.) Prepared this document for the United States Agency for International Development (USAID) and the Government of Ukraine (GOU) under the Shelter Sector Reform Program for the Newly Independent States.[1]

The present study, *Lviv Vodokanal: Improving Cost Recovery*, is the second report in a four-volume series on "Improving Cost Recovery for Water Provision."[2] The four volumes are:

Volume I: Lviv Vodokanal: Pricing Process
Volume II: Lviv Vodokanal: Improving Cost Recovery
Volume III: Manual for Improving Cost Recovery
Volume IV: Final Report

As shown, the first two volumes focus on water service in Lviv, with a focus on Lviv Vodokanal (waste/wastewater authority). The final two volumes largely address the replication of the Lviv experience in other vodokanals in Ukraine.

Current levels of water service are inadequate in Lviv. Most residents only experience running water for six hours a day. Lviv officials frequently cite a lack of financial resources as a major obstacle to improving service provision. In this context, a "lack of financial resources" can best be expressed by saying that the costs of providing the service are not fully recovered.

The present report seeks to help Lviv Vodokanal and the City of Lviv make the provision of water service in Lviv more financially sustainable,[3] with an emphasis on recovering more costs from monthly user charges. We explain this focus below.

1.2 FINANCING THE PROVISION OF WATER SERVICE IN LVIV

1.2.1 Areas of Responsibility

Two institutions, related but with separate legal identities — Lviv Vodokanal and the City of Lviv — play direct roles in providing water service in Lviv. Lviv Vodokanal is generally

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[1] USAID/PADCO Contract No. CCS-0008-C-00-2057-00, Task Order 57.

[2] See Volume I: *Pricing Process*, for Terms of Reference (Appendix A), Context and Need for Technical Assistance (Section 1.1) and Scope of Assignment (Section 1.2).

[3] Increasing funds available by decreasing costs of service, an engineering and administrative challenge, is outside the scope of the present assignment, which focuses on financial issues.

responsible for operations and maintenance, as well as renewal and replacement[4] of the existing water system. The Vodokanal is charged with connecting new customers. The City of Lviv is responsible for expansion and extension of the system, and retains ownership of most water system assets. Major areas of responsibility are summarized as follows.

Table 1.1

Area of Responsibility	Lviv Vodokanal	City of Lviv
Operations and maintenance	◆	
System renewal and replacement	◆	
System expansion and extension		◆

This division of responsibility between two service providers makes the provision of water services more difficult. Capital investment programming in particular, divided between the City (expansion and extension) and the Vodokanal (renewal and replacement), becomes problematic. International economists have argued that Ukrainian vodokanals should be reconstituted as autonomous, self-financing, commercially oriented manager/operators of water and wastewater systems.[5] Achieving this goal would presumably involve making the vodokanals responsible for all aspects of water provision listed above. In the meantime, coordinated Vodokanal/City capital investment programming appears essential for effective service provision.

1.2.2 Sources of Revenue

Achieving **full cost recovery** means that service providers have enough resources to pay for all operating and maintenance expenses, to renew and replace existing capital equipment, and to expand and extend the water supply system as necessary. Efficient pricing implies recovering most or all of those costs through **user charges**, i.e., charges related to use of the service. Service providers may also, however, receive some revenues from sources not related to service use, such as municipal tax revenues.

Economists generally recognize four different types of water use charge. Of those four types, two are periodic (monthly) user charges, while the others are one-time (lump-sum) charges, as follows:

- *Monthly volume charge.* This charge is based on the amount of water consumed. The rate is set per cubic meter, and usually involves metering water use.
- *Monthly service charge.* This charge pays for costs associated with billing, customer service, administration, etc. These charges are fixed and do not vary depending on the

[4] The legal framework implies that renewal and replacement of capital goods is a Vodokanal responsibility because the Vodokanal is allowed to treat depreciation of capital goods as a cost item to cover in its user charges. This institutional responsibility, however, has not been clearly defined.

[5] See Stottmann, Walter, *Ukraine Water and Wastewater Sector Study*, World Bank, 1995.

volume of water consumed. Where this charge is levied, it is typically included along with the volume charge in one monthly bill.

- *Lump-sum connection ("hook-up") charge.* This charge generally reflects costs associated with connecting a specific customer to the water system.
- *Lump-sum development charge.* This charge is typically determined by the capital cost of infrastructure that will service an area. These costs are typically shared among properties in that area.

For a given charge to be properly considered a water use charge, the monies generated from that revenue source should be applied to the costs of providing water service. Other types of charge related to water use are less generally recognized and accepted.

The financial model for providing water service in Lviv now rests partly, but not exclusively, on revenues generated from different types of user charges. Sources of revenue are as follows.

Lviv Vodokanal

The Vodokanal levies a *monthly volume charge*. While no monthly *service* charge is applied, the Vodokanal includes the costs normally associated with such a charge into the monthly volume charge. To calculate the charge, the volume of water used is estimated using State norms or, in some cases, is based on actual flows using meter readings. The price per cubic meter is set to reflect costs associated with operations, maintenance, renewal and replacement, as well as taxes.[6] Revenues from this charge could total around $6,000,000 in 1995.[7] The Vodokanal also collects a *lump-sum connection charge* when physical hook-up occurs. Regarding secondary funding: the Vodokanal has taken out at least one short-term loan to pay for electro-energy use.

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[6] Expressed more precisely, prices are based on a calculation of average costs (i.e., "total" costs divided by total water produced). "Total" costs in turn equal:

TC = TPC + P + VAT + OP

where:

TC	=	total costs
TPC	=	total production costs permitted under Decree No. 759
P	=	allowable "profit" (0.25 x TPC)
VAT	=	value-added tax (0.20 x (TPC + P))
OP	=	other obligatory payments (taxes and fees, etc.)

See Cabinet of Ministers Decree No. 759, *Main Statements on Production Costs Estimatations for Enterprises and Organizations*, 10 November 1994. As of August 1995, TPC can also include land tax payments by the Vodokanal. For further description of current price-setting processes, see USAID/PADCO, *Lviv Water Service: Pricing Process* (Volume 1), Appendix B.

[7] For convenience, due to inflation, amounts are expressed in U.S. dollars (US$) unless otherwise noted.

City of Lviv

The City of Lviv funds water system extension and expansion in part out of general revenues and in part from an off-budget account established for different types of physical and social infrastructure. As described below, for 1995-96, the City plans to collect five types of charge that bear some relation to water use. Revenues generated by those charges are not, however, necessarily tied to water system development, and so are not, properly speaking, user charges. Amounts of revenues generated by those sources vary considerably, with only one or two capable of financing capital improvements.

Revenues generated by two of those five charges are paid into the general City account. First, the "geologic exploration and development tax" is based on the *volume* of water sold. It is levied against the Vodokanal at one-thousandth the rate of the Vodokanal's average monthly charge to customers. This charge may generate about $45,300 for 1995. Second, the City collects a "utilization of natural resources" charge. Beginning in 1996, the City reportedly plans to levy this charge against the Vodokanal as a user of water, a "natural resource." The name of the charge suggests it also should be levied against *volume* of water use. The charge will reportedly, however, be levied as a percentage of the Vodokanal's total costs, leaving its precise nature unclear.

Revenues collected from a third and fourth charge are administered by the Water Inspectorate of Lviv City Executive Committee.[8] The Inspectorate collects a *lump-sum connection charge* when it issues a certificate of water use. The Inspectorate also charges for yearly inspections of most customer classes — communal services, enterprise/industry, and budget organizations. Such a charge is not commonly used in other countries, although it may be applied under special circumstances (e.g., in situations where risk of contamination is high). Total revenues raised from these two sources for 1995 are expected to reach about $22,000.

Revenues generated by a fifth charge are reportedly reserved to develop infrastructure related to heat, electricity, roads and "social" uses, as well as water and wastewater services. This charge is the off-budget "expenses for infrastructure development" charge levied by the City's Investment Department on new building construction. It is intended as a type of *lump-sum development charge*. Officials describe this charge as "share-holder participation" in infrastructure development. The fee is based on the cost of construction as determined by the Architecture and Land Development, and is levied at a rate that varies with the purpose of construction. The rate is 100 percent on construction related to enterprise/industry, 83 percent for residential construction, and 50 percent for off-budget communal service providers. These revenues are administered in a separate off-budget account and use by the Department for Capital Construction. These funds reportedly totaled about $776,400 in 1994. Officials note that the legal foundation of this charge is unclear.

Other and secondary funding sources are in short supply. Subsidies from the Central Government ceased several years ago. Lviv City officials have entered into discussions with World Bank representatives regarding a project and loan to finance water sector investments. One

[8] See "Regulations of Water Inspectorate of Lviv City Executive Committee.

emphasizes that such a debt would have to be repaid largely or exclusively from revenue generated by user charges. Underscoring this linkage, an Aide Memoire between the World Bank and the City of Lviv states, "The size of the project and the Bank loan will ... depend foremost on the ability of Lviv Vodokanal to generate resources from water ... tariffs."[9]

1.3 CONCLUSIONS

Potential use-related revenue sources are summarized in Table 1.2. We observe that this collection of charges offers many of the ingredients for a sustainable system of finance for water service. Most of the generally recognized types of user charge are present. However, we must note the following.

The City's charges are not, properly speaking, user charges. While these charges are levied against water use, none is used exclusively to fund physical improvements to the water system. City financing of water improvements, therefore, rests largely with general City revenues. Year-to-year financing of capital improvements is generally less stable from general revenues than from dedicated or restricted funding. Thus, the current system complicates the task of multi-year capital investment programming.

While the "expenses for infrastructure development" charge could potentially fund some investment in the water system, the legal foundation of this charge is in question. At the same time, these revenues are reportedly divided among a variety of types of physical/social infrastructure projects. Little, if any, remains for improvements to the water system.

No monthly service charge currently exists. Instead, fixed service costs are billed through the monthly volume charge. The Vodokanal could take up this refinement in tariff-setting, which would price water more efficiently.

Some City charges duplicate Vodokanal charges or are minor "nuisance" charges. Both the Vodokanal and the City levy a type of connection charge; this duplication appears unnecessary. The need for annual customer inspections remains unclear. In any case, both hookups and inspections appear more aligned with Vodokanal responsibilities than with those of the City. The "Geologic exploration and development" tax does not generate sufficient revenues for identifying new water sources. These minor, duplicate, and misnamed charges cloud the picture of water finance in Lviv.

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[9] World Bank and City of Lviv, *Ukraine Proposed Water and Wastewater Project: Aide Memoire*, 30 May-1 June 1995 Mission, p. 2.

Table 1.2

Actual or Potential Sources of Revenue	Lviv Vodokanal	City of Lviv	Comments Regarding City Sources of Revenues
Use-Related Charges			
Monthly volume charge	○	❑	Geologic Exploration and Development Tax
Monthly service charge			
Lump-sum connection charge	○	❑	Water Inspectorate Certificate
Lump-sum development charge		❑	Expenses for Infra-structure Development
Other charges		❑	Water Inspectorate yearly inspection
		❑	Use of Natural Resources
Other			
General revenues		◆	

Notes:

○ = Revenue source dedicated exclusively to water and wastewater system

❑ = Revenue source based on use of water/wastewater service, but not dedicated exclusively to improvement of water/wastewater system

◆ = General revenues that are used in part for water/wastewater system

The above discussion *(Chapter 1)* places in context and shows the importance of the Vodokanal's monthly user charges for financing water service in Lviv. Those charges are the focus of the rest of the report. The study proceeds as follows.

- *Chapter 2* examines the revenue requirements of the Vodokanal under different future scenarios, translates those revenue needs into an average price per cubic meter, and discusses other aspects of water pricing.
- *Chapter 3* investigates the performance of the Vodokanal's user charge cost recovery system.
- *Chapter 4* proposes (based on input from City and Vodokanal officials) a strategy and action plan for improving cost recovery and otherwise making the provision of water services more financially sustainable in Lviv.

CHAPTER 2
ANALYSIS OF REVENUE REQUIREMENTS

2.1 SYSTEM AND CUSTOMER CHARACTERISTICS

This Chapter examines future revenue requirements of the Vodokanal and issues related to price setting. After describing system and customer characteristics (Section 2.1) and components and trends in current revenue needs (Section 2.2), projections of future revenue requirements are developed using two models and varying assumptions regarding expenditures and capital investment (Sections 2.3 and 2.4). Finally, we investigate the feasibility of allocating service costs to customer categories (Section 2.5), and provide suggestions for preparing for future tariff analyses (Section 2.6).

2.1.1 System Description

Lviv provides water service to a population of approximately 830,000 and associated enterprises and industry. Water supply is drawn entirely from groundwater sources located 20 to 105 km from the City. In 1994, there were 16 developed wellfields, which delivered 415,000 cubic meters of water each day. Water is pumped to the City via transmission lines varying from 225 to 1,200 mm in diameter, and treated with chlorine prior to distribution. Within the City, the distribution system is divided into seven pressure zones. Total system length is estimated at 1,700 km. Using water production and estimated water usage information for 1994, unaccounted for water is estimated at approximately 21 percent. This figure should not be viewed as entirely accurate since end use generally is unmetered.

Water service is made available to all customers during two three-hour blocks each day when system pressures are increased. However, system supply and leakage make it necessary to reduce pressure during the balance of the day. At these times, limited service may continue to be available to some customers depending on physical location within the distribution system. However, customers on upper floors of apartment buildings, or in areas of higher elevation generally do not receive service outside of the two three-hour blocks. To overcome these restrictions, most customers fill containers (e.g., bathtubs, sinks, and buckets) with water for use during other parts of the day. Water not used is often drained away prior to the next three-hour service block. In addition, some industries, enterprises, hospital, and residential customers have constructed individual cisterns and storage facilities. These also are filled during the general service time blocks and used to provide pressurized water service through the individual customer's plumping system during the balance of the day. There reportedly are other instances where industries and enterprises have developed private wells independent of the Vodokanal water supply system.

2.1.2 Customer Profile

One goal of effective tariff-setting is recovery of revenues from customers based on the costs that the water provider incurs in providing water service to those customers. Typically, customers with similar water use and demand characteristics are grouped into classes or categories. A tariff is then developed for that category that reflects those specific use and demand characteristics. Characteristics might include hourly, daily, and average demand, location

within the water system, or use of facilities constructed to serve a specific customer or group of customers. For the Lviv Vodokanal, users fall into one of the following four customer categories.

- **General Population.** General population is further divided into two sub-categories:
  - **Residential.** General population primarily in multi-family apartment buildings; zheks act as intermediaries in billing and collections
  - **Private Sector.** General population not relying zheks; primarily includes privately owned single-family units
- **Budget Organizations.** Organizations with budgets set by the City and Lviv Oblast; includes schools, medical institutions, civic establishments, etc.
- **Communal Services.** Enterprises providing services to the general population; includes laundries, cleaners, and food establishments not selling alcohol
- **Enterprise/Industry.** Commercial, retail and industrial enterprises, food establishments selling alcohol

Table 2.1
Customer Distribution by Category

Customer Category	Number of End-Users	Percent of Total
Residential (general population)[a]	10,338	33
Private Sector (general population)[a]	(est) 15,000	47
Budget Organizations	1,333	4
Communal Services	1,982	6
Enterprise/Industry	3,300	10
Total	**(est) 31,953**	**100**

Source: Lviv Vodokanal Water Sales Department

[a] NOTE: One "customer" may represent more than one household (e.g., multi-flat building).

Review of these categories and the types of establishments placed within them suggests that the categories are not based on water demand characteristics. For example, there probably are not significant differences in water use and demand characteristics between those food establishments selling alcohol and those that do not. Discussions with Vodokanal staff indicate that this latter distinction is made solely on the perceived ability of food establishments that sell alcohol to pay for water service.

The Vodokanal currently (September 1995) provides services to 31,953 customers with the residential and private sector groups accounting for nearly 80 percent of all end-users. With the City of Lviv supporting more than 830,000 inhabitants, each end-user in the residential and private sector categories represents, on average, about 30 persons. End-users in these

categories range in composition from one household living in a single-family detached unit to residents of apartment buildings often with 200 or more units.

Of the estimated 31,953 end-users, only about 1,955 (about 6 percent) are metered. The other 94 percent are not. Further, metering is concentrated more in the enterprise/industry and communal services categories, and lower for the remaining customer categories, as follows.

Table 2.2
Metered Users by Category

Customer Category	Number of Metered End-Users	Percent of Category Metered
Residential (general population)	312	3
Private Sector (general population)	0	0
Budget Organizations	146	11
Communal Services	444	22
Enterprise/Industry	1,053	32
Total	**1,955**	**6**

Source: Lviv Vodokanal Water Sales Department

Usage data for metered accounts is limited and, as can be seen from the data for 1995 presented in Table 2.3, the number of meters read is inconsistent and varies from month to month. Meter reading may range from more than once per month for residential accounts to only once per year for collective farms (enterprise/industry category). Further, it cannot be assumed that metered accounts represent a random sample of their respective categories. For example, within the enterprise/industry category, Vodokanal staff indicate that 100 percent of "large" customers are metered, while "small" customers in that category generally are not. However, the latter subcategory (i.e., "small" customers) includes about 10 times as many accounts as the former ("large" customers). Hence, metering is not random.

Table 2.3
Recent Metered Water Usage (cu m) and Meter Reading Frequency
By Category (1995)

Category	Metered accounts	Jan	Apr	May	Jun	Jul	Aug
Residential	312	392,838 (595)	422,262 (360)	449,312 (359)	493,784 (334)	600,031 (545)	720,928 (312)
Budget Organizations	146	139,012 (151)	83,246 (111)	148,364 (125)	766,883 (146)	769,956 (234)	773,767 (146)
Communal Services	444	88,102 (440)	55,217 (326)	61,913 (358)	53,789 (422)	62,455 (445)	56,980 (444)
Enterprise/ Industry	1,053	631,355 (653)	524,843 (706)	477,214 (799)	452,479 (931)	595,463 (1,027)	586,524 (1,053)

(meters read this month)

Source: Lviv Vodokanal Water Sales Department

Lviv estimates of water use are generally based on norms, established by the State Committee of Housing and Communal Services.[10] For the residential category:

Both hot and cold water service	9.1 cu m per month per capita
Cold water service only	5.8 "
Service with no bathtub	3.3 "

Norms for other than the residential category are also established and used in developing estimates of actual water use. Where available, meter use is also considered.

In this manner, estimates of water use by customer category are made. Estimated use by customer category for 1995 is presented in Table 2.4. This estimate is based on reported "actual" use for the first quarter of 1995 and estimates for the balance of the calendar year. As can be seen, water use is not directly proportional to the number of end-users. Budget organizations and communal service providers consume a disproportionately large amount of water — nearly 40 percent of the total usage, but only 10 percent of end-users. Conversely, the private sector category accounts for an estimated 47 percent of total end-users, yet reportedly less than 1 percent of total estimated use.

[10] State Committee of Housing and Communal Services, *Regulation of Water Supply and Wastewater System Usage in Cities and Village of Ukraine*, 1 July 1994.

Table 2.4
Estimated Monthly Water Usage by Category

Customer Category	Estimated monthly use by category (1,000 cu m)	Estimated daily use by category (1,000 cu m)	Percent of total use
Residential (general population)	5,241	172	53
Private Sector (general population)	72	2	< 1
Budget Organizations and Communal Services	5,852	11	39
Enterprise/Industry	768	25	8
Total	**9,933**	**326**	**100**

2.2 Current Trends in Revenue Needs

2.2.1 Trends in Operating Expenses

Currently, the Vodokanal develops an annual budget for its water system operations. The budget presents estimates of expenses for the upcoming year. The summary budget presents anticipated production-related expenditures for the following line items as generally required by Cabinet of Ministers Decree No. 733:

- Salary — Direct personnel costs for staff directly involved in water supply and system activities
- Taxes on Salary/Bonuses — Payments to employee social security, development and pension funds, Chernobyl fund
- Electro-energy — Purchased electricity costs
- Raw Materials
  - Fuel for emergency vehicles — fuel for vehicles used in emergency repair
  - Transportation — shipping equipment , parts, etc.
  - Chemicals — chemicals used in treatment (e.g., chlorine)
  - Gas used at the boiling stations — natural gas used for centralized water heating
- General Expenditures — Administrative salaries, security services, related fuel postage, office equipment, office supplies, etc.
- Repair Fund — Capital costs for current repairs; not related to depreciation
- Pumping to Upper Floors — Payment to zheks for additional pumping to higher floors of apartment buildings
- Maintenance Workshop — Salary for maintenance workers, laboratory, technical supply; transportation and small equipment repair.

These eight expense categories represent the major direct cost components associated with providing water service. Other less important categories are also included in the typical expenditure report presented by the Vodokanal, including:

- Distribution Repair / Flushing Water — Flushing of lines after repairs; cost of associated water usage
- Purchased Water — Water purchased from other entities (e.g., Oblasts)
- Miscellaneous — Miscellaneous expenditures
- Waste Disposal — Wastewater disposal; disposal of waste related to Vodokanal activities
- Outside Laboratory Analysis — Laboratory analysis of water quality (Vodokanal department)
- Interest — Interest on loans and debt
- Fines — Fines for incidental damages related to Vodokanal activities
- Pest Control — Pest control at Vodokanal facilities
- Geological / Water Source Research Tax — Paid the City government for investigations for new water sources
- Tanker Transport — Water deliveries via tanker (as needed)
- Cafeteria — Workers' lunchroom
- Outside Consulting — Outside consulting
- Support Maintenance — Specific maintenance item for refrigerators

For this analysis, summaries of recorded annual expenses for 1992, 1993, and 1994 were obtained. For 1995, actual expenditures for the first three months were combined with projections made by the Vodokanal for a recent rate adjustment request. The results were compared with six-month actual expenses and then extrapolated to the end of 1995. It should be noted that depreciation, a production-related capital cost, is not included in this particular analysis of operating expenditures. The results are presented in Table 2.5. For analytical purposes, expenditure line items also are presented as a percentage of production costs (not including depreciation).

When these items are examined, several thing can be noted. First, and perhaps-most importantly, electro-energy costs have increased from approximately 43 percent of production expense in 1992 to more than 70 percent in 1994. In fact, more than 80 percent of the increase in production cost between 1992 and 1994 can be directly attributed to electro-energy costs. Projections for 1995 indicate that electro-energy will continue to grow, approaching 75 percent of production costs by the end of the year.

Other expenses have been reduced in order to meet increasing electro-energy costs. Repair Fund expenditures have decreased from nearly $440,000 (19 percent of production cost) in 1992 to approximately $300,000 (less than 4 percent) projected for 1995. Combined expenditures for components related to system maintenance and repair have generally declined since 1992. The combined total for the Repair Fund and Maintenance Workshop has eroded from approximately $640,000 (30 percent of production expense) in 1992 to approximately $575,000 projected for 1995. This suggests that regular routing system maintenance is likely being deferred.

TABLE 2.5 Operating Expenditure Trends ($US 1992-1995)

Expenditure Category	Reported Actual Expenditures						Projected Actual (1)	
	1992		1993		1994		1995	
Exchange Rate	224	krb to $US	4,464	krb to $US	32,203	krb to $US	141,300	krb to $US
Salary (direct water production only)	122,232	5.74%	62,977	1.52%	81,117	1.14%	130,520	1.55%
Taxes on salary + bonuses	67,565	3.17%	48,621	1.17%	81,708	1.15%	67,617	0.80%
Development fund	3,749		2,939		4,374		0	
Chernobyl fund	15,350		9,433		17,177		0	
Social security fund	6,468		4,739		7,219		0	
Pension fund	41,997		31,510		52,939		0	
Electroenergy	1,010,107	47.45%	3,202,758	77.28%	5,084,014	71.39%	6,190,924	73.64%
Raw materials	6,208	0.29%	28,980	0.70%	66,479	0.93%	29,618	0.35%
Fuel for Emergency Repairs**	1,001		12,581		16,387		0	
Shipping and Transport Costs**	876		4,952		5,716		0	
Chemicals**	2,153		10,414		11,697		0	
Gas for Central Water Heating	2,178		1,033		32,679		0	
General Expenditures	96,862	4.55%	0	0.00%	453,044	6.36%	257,743	3.07%
Repair Fund**	439,213	20.63%	377,348	9.10%	438,379	6.16%	302,462	3.60%
Pumping to the upper floors**	103,607	4.87%	0	0.00%	236,359	3.32%	613,226	7.29%
Maintenance Workshop	197,568	9.28%	239,919	5.79%	353,483	4.96%	272,332	3.24%
Other								
Distribution Repair / Flushing Water**	0	0.00%	0	0.00%	83,557	1.17%	0	0.00%
Purchased Water**	57,851	2.72%	6,138	0.15%	0	0.00%	318,863	3.79%
Misc.	66	0.00%	0	0.00%	0	0.00%	91,364	1.09%
Waste disposal**	0	0.00%	0	0.00%	489	0.01%	0	0.00%
Outside Laboratory Analysis**	0	0.00%	113	0.00%	27	0.00%	0	0.00%
Interest	24,683	1.16%	0	0.00%	0	0.00%	0	0.00%
Fines	1,939	0.09%	6,560	0.16%	159,720	2.24%	49,065	0.58%
Pest Control**	0	0.00%	0	0.00%	171	0.00%	1,135	0.01%
Geological / Water Source Tax	0	0.00%	46,517	1.12%	0	0.00%	39,776	0.47%
Tanker Transport	1,082	0.05%	124,473	3.00%	77,844	1.09%	34,099	0.41%
Cafeteria	0	0.00%	0	0.00%	4,601	0.06%	7,884	0.09%
Outside Consulting**	0	0.00%	0	0.00%	8	0.00%	0	0.00%
Support Maintenance**	0	0.00%	0	0.00%	45	0.00%	0	0.00%
SUBTOTAL--DIRECT PRODUCTION	2,128,983	100.00%	4,144,403	100.00%	7,121,045	100.00%	8,406,628	100.00%
Depreciation Expense	216,070		335,396		129,587		359,792	
TOTAL PRODUCTION COST (per Decree No. 759)	2,345,053		4,479,799		7,250,632		8,766,420	

(1) 1995 Projected Actual based on 3 months actual and 2 months projected by Vodokanal for recent tariff request; combined and extrapolated to year end.

** Subject to Value Added Tax beginning in 1993.

2.2.2 Capital Needs

As noted in Chapter 1, the Vodokanal is generally responsible for operations and maintenance and renewal and replacement of the existing water system. The City is responsible for expansion and extension of the system. Regardless of this division of capital-related responsibility, both have engaged in development of capital programs for system improvement. These program are summarized in Table 2.6. The City project list is drawn from *Voda 98*[11] and represents the highest priority elements of an aggressive approach to improvements to be accomplished by 1998 at a cost of approximately $75 million. The Vodokanal list is a more modest one ($19 million) intended to stabilize operations and provide some overall improvement in general water service. Generally, both lists of capital projects are derived from previous system master plans and a five-year plan developed by the State for the Vodokanal in 1992. The difference in the current capital project lists prepared by the City and Vodokanal appears to be in the aggressiveness of implementation. But neither agency has identified corresponding sources of funds for executing their respective lists of projects. This is a key element necessary for completion of a true capital investment program.[12]

The Vodokanal does make limited investment in renewal and replacement. Funds derived from system depreciation expense are used for projects with reimbursable cost components borne by agencies outside the Vodokanal (e.g., line replacement involving major street repair by the City road department). Renewal projects within the Vodokanal are expensed under the Maintenance Workshop line item. However, the combined available funds for both depreciation expense and Maintenance Workshop is projected at only $632,000 for 1995. Actual available funds are even less, since the Maintenance Workshop item covers other related expenses as well. This level of investment in system replacement appears inadequate given the system's age and condition. Replacement of 1 percent of the system each year (i.e., a 100-year replacement cycle) would require an annual replacement investment approaching $2 million — for mains alone.[13] When other system components are considered, the total may well exceed $2.5 to $3.0 million annually.

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[11] *Voda 98*, A Draft of the Program. City of Lviv Expert Commission (1995).

[12] These capital programs are provided for information only and are used herein to illustrate possible impact on the projected revenue requirements of the Vodokanal. Investigation and evaluation of capital needs is the subject of additional work being completed by others.

[13] Based on information from Vodokanal staff, an average replacement cost of $100/meter was estimated. This includes:

labor	$10/meter
pipe (250 mm)	$25/meter
road replacement	$75/meter

TABLE 2.6. Recent Capital Improvements Programs

Priority 1 Projects identified in "Voda '98" report.

Project Description (1)	Cost in million $US (1995)					Project total
	1995	1996	1997	1998	4-year total	
Verknyobuzskyy Water Intake--completion	1.63	2.12	2.09	2.33	8.16	8.86
Vynnyky Pump Station--reconstruction	0.70				0.70	0.70
Dovha Pump Station--completion	0.19	0.64	0.54	0.54	1.90	1.90
V. Buzskiy Water Intake--village water supply	0.58	0.58	0.47	0.26	1.88	12.00
???v Water Intake--enlargement	0.01	3.49	3.49	3.49	10.48	16.76
???h Group Water Intake--productivity increase	0.05	0.70	0.99	1.64	3.37	3.57
??? water Intake--Plugiv Village supply	0.01	3.49	3.49	3.49	10.48	31.50
Total--Priority 1	3.168	11.006	11.056	11.735	36.965	75.282

(1) From English translation of "Voda 98. A Draft of the Program. City of L'viv Expert Commission (1995).

Projects from Vodokanal staff

Project Description	Cost in million $US		
	Previous	Recommended	Total
Verkhnybuzhky Water Intake	25.31	9.07	34.38
Pluhiv Water Intake Extension		0.99	0.99
Vynnyky PumpStation--reconstruction		1.37	1.37
Dovha Pump Station--construction		0.89	0.89
Dovha to Hirs'ka smuha Pump Station-main		1.00	1.00
Kurovychi Pump Station--reconstruction		2.55	2.55
Kryvchychi - Zboysk--main		1.07	1.07
Buden Pump Station--reconstruction		1.88	1.88
Total	25.31	18.81	

2.2.3 Other Costs

In addition to direct costs, the Vodokanal also incurs other expenses during the course of operations, some of which can be recovered via the tariff as production cost. Other expenses and costs, however, are paid from revenues retained by the Vodokanal. These are as follows.

Table 2.7
Other Taxes Paid by Vodokanal

Type	Included as Production Cost	Paid from Retained Revenue	Comment
Tax on Profit		x	30% of net profit
Value-Added Tax	x		20% of production cost and profit
Land Tax		x	Paid from gross profit; based on facility location
Transportation Tax		x	Paid from Gross profit; based on number and power of vehicles
Road Tax	x		1.2% of revenue
Innovation Tax	x		1% of revenue
Labor Protection Tax	x		1% of revenue

2.2.4 Overall Expenses

Information contained in Table 2.8, Summary of Expenditure Trends (1992-95), can be used to further analyze the cost components of the Vodokanal. These results for 1995 are presented in Table 2.9. As can be seen, production costs account for nearly two-thirds of revenue needs, while taxes account for about one-fifth. The balance is available for other uses by the Vodokanal, including system renewal and replacement.

TABLE 2.8. Summary of Expenditure Trends ($US 1992-1995)

Expenditure Category	Reported Actual Expenditures						Projected Actual	
	1992		1993		1994		1995	
Exchange Rate	224	krb to $US	4,464	krb to $US	32,203	krb to $US	141,300	krb to $US
rect Production Subtotal (1)	2,128,983	68.38%	4,144,403	69.47%	7,121,045	57.87%	8,406,628	62.35%
preciation Expense	216,070	6.94%	335,396	5.62%	129,587	1.05%	359,792	2.67%
Profit (25 percent)	703,516	22.60%	1,343,940	22.53%	2,175,189	17.68%	2,191,605	16.26%
Value Added Tax (To State)	0	0.00%	0	0.00%	2,639,230	21.45%	2,191,605	16.26%
Labor protection tax	30,486	0.98%	58,237	0.98%	94,258	0.77%	109,580	0.81%
Innovation tax	30,486	0.98%	58,237	0.98%	94,258	0.77%	109,580	0.81%
Retained (70 percent)	21,340		40,766		65,981		76,706	
To State (30 percent)	9,146		17,471		28,277		32,874	
Road Tax	3,963	0.13%	25,501	0.43%	51,209	0.42%	113,362	0.84%
Debt Service								
Cash Financed Capital Improvements								
Revenue Required from User Charges	3,113,504	100.00%	5,965,715	100.00%	12,304,776	100.00%	13,482,153	100.00%
Gross Revenues Retained								
Profit	703,516		1,343,940		2,175,189		2,191,605	
Less								
Transportation tax	n/a		n/a		n/a		5,081	
Land tax	190,665		253,065		46,393		31,479	
Net Profit	512,851		1,090,875		2,128,797		2,155,044	
Profit Tax (30 percent--to State)	153,855		327,262		638,639		646,513	
Net Profit after taxes	358,995		763,612		1,490,158		1,508,531	
Plus								
Innovation Tax (70 percent)	21,340		40,766		65,981		76,706	
Net Revenues Retained (2)	380,335		804,378		1,556,138		1,585,237	
Depreciation Expense	216,070		335,396		129,587		359,792	
Potentially Available for Replacement Investment (2)	596,406		1,139,774		1,685,725		1,945,029	

n/a - data not available.

(1) See Table 2-5 for detail.

(2) Assumes 100 percent collection of revenues available from user charges.

Table 2.9
Vodokanal Cost Components for 1995

Component	1995 Expense (US$)	Percent
Production Cost	$8,766,420	65.0
Taxes	2,770,704	20.6
Retained and Available for Replacement and Renewal	1,945,029	14.4
Total	**$13,482,153**	**100.0**

2.3 DETERMINING REVENUE REQUIREMENTS

To provide adequate water service to its customers, every water utility must receive sufficient total revenue to ensure proper operation and maintenance, development and perpetuation of the system, and maintenance of financial integrity. These requirements frame the revenue needs of any water utility and the costs of service to be derived from its user charges. The consequences of inadequate revenue include, among other thing, deferring system maintenance and postponing capital replacement of obsolete or aging system components. Hence, underpricing often correlates with inadequate provision for system renewal and replacement, maintenance, and other expenditures, as well as political and customer pressure to keep rates low.

The **cash needs approach** is structured to recover specific cash requirements for system operations and capital needs. In fact, the current approach emphasizes the cash needs of vodokanal operation. Recurrent operating costs are determined, including projections for operations and maintenance, inflation, staff and salary adjustments, and costs of materials and supplies. Capital requirements may include debt service (both principal and interest), pay-as-you-go capital, and contributions to reserve funds (e.g., renewal and replacement). Through active planning, future capital needs are projected and, thus, provide the basis for establishing the future cash needs (or revenue requirements) for operations and capital. Both the current method and an alternative approach to developing such revenue requirements are discussed in this section.

2.3.1 Current Method

The current method for developing revenue requirements focuses on the cash needs of vodokanal operation, but in a limited and simplified manner:

Revenue Requirement = O&M+Depreciation+Taxes+[Ratio x (O&M+Depreciation)]

This particular method is termed the **operating ratio** technique and is generally used for small utilities having little or no capital investment.[14] The technique is a means of simplifying

[14] Beecher, J.A., et al., *Cost Allocation and Rate Design for Water Utilities*, National Regulatory Research Institute, Columbus, OH, USA (March 1991).

the regulatory process, and its purpose is only to provide for an adequate margin of revenues over expenses. It is not intended to provide capital for investment in the system. The operating ratio technique does not eliminate the need for regulation, however. An appropriate ratio must be determined and the results monitored to assure adequate operation and maintenance of the system. Further, the method offers no incentive to reduce operating costs and may have the opposite effect of encouraging undue inflation of expense projections during tariff development.

As noted in Volume I of this assignment, the Vodokanal estimates revenue requirements based on the Cabinet of Ministers Decree No. 759.[15] These include the budget line items presented in Table 2.5. Expenditures are projected based on historical trends and anticipated additional costs, e.g., escalating increases in electro-energy costs. Depreciation, indexed to allow for inflation, is calculated according to ministerial procedure using a straight-line methodology based on a service life set by national norm for various asset categories. Under Decree No. 759, the sum of direct operating and maintenance costs plus annual depreciation constitutes "production costs."

Next, additional taxes and margins are added to the sum of production costs. A 25 percent margin, referred to as "profit," is collected along with a value-added tax. The value-added tax was initiated in 1993 at a rate of 28 percent, but has been reduced to 20 percent currently. Finally, road, labor protection, and innovation fund taxes are added to arrive at the final revenue requirement. Revenue requirement calculations for the period 1992 through 1995 are presented in Table 2.8. Transportation and land taxes are paid from "profit." The net "profit" remaining after these payments is then subject to a 30 percent "profit" tax. The remaining balance, including 70 percent of the innovation fund tax also retained by the Vodokanal, is available to the Vodokanal for other purposes, such as system renewal and replacement.

Of course, a balance of retained funds available for such purposes assumes that sufficient revenues have been collected to pay outstanding expenses and taxes. However, as of mid-September 1995, the Vodokanal was in arrears in payment of its expenses. Outstanding bills owed were approximately $1.4 million for electro-energy and $475,000 for materials and services provided by others. Projected to year-end, expenses outstanding may exceed $2.5 million. In addition, the Vodokanal currently receives approximately 25 percent of billed revenues as in-kind payments. This, too, reduces the potential for retained funds for the Vodokanal.

2.3.2 Model Cash Needs Technique

As noted earlier, capital expansion and extension of the water system currently is the responsibility of the City. Indications are that a cash infusion, most likely in the form of a loan, would be necessary to accomplish even a limited capital improvements program. A lender, in all likelihood, will require that debt service for such a loan be recovered through some form

[15] Cabinet of Ministers Decree No. 759, *Main Statements on the Production Costs Estimations for Enterprises and Organizations*, 10 November 1994.

of user charge. However, the current tariff-setting method limits Vodokanal revenue requirements to operations and maintenance costs, depreciation expense, and net "profit," which may be applied only to system renewal and replacement. If the costs of a broader capital improvements program are to be included within a tariff for services, some change in the method for establishing revenue requirements may be necessary. Further, the current operating ratio methodology is of limited usefulness in that its purpose is to provide only an adequate margin of revenues over expenses, not to provide for capital investment. Its application appears inappropriate when large capital needs are required. An alternative cash needs technique was therefore developed for this purpose.

The alternative revenue requirements model substantially (but not completely) follows a cash needs approach to determining revenue requirements for Vodokanal operations and capital improvements. The model does contain features also typically found in pricing based on an AIC approach. It allows for future system expansion and determines replacement costs based on current and future estimates, rather than on historic or original costs.

Water service pricing based on marginal cost concepts is increasingly advocated by development economists as the "best" approximation of the efficient consumption price.[16, 17] This proposed model methodology follows as closely as is currently possible an AIC pricing approach, but does not strictly follow such an approach. The task was complicated by the lack of a single comprehensive capital and financial plan for water service in Lviv as noted above. Such a plan is a necessary prerequisite to fully determining costs based on AIC concepts. In the absence of such a plan, for modeling purposes we adopted a conservative assumption that capital investments would not lead to marginal increases in water available for consumption over the next several years. As a capital program is formulated, however, this model can be refined so that future price projections reflect increases in water production.

As noted previously, revenue requirement components considered under the cash needs approach include recurrent operations and maintenance expense, debt service, capital expenditures not debt financed, and other taxes and payments. Under the proposed model, the operations and maintenance component is determined in a fashion identical to the method currently in use except that depreciation expense is not included. Instead, depreciation expense is replaced by a schedule of capital improvements (or, as an alternative, contributions to a reserve fund) relating to system renewal and replacement. Costs for these renewal and replacement projects are based on current costs rather than on imbedded or original cost. Finally, a cost component based on incremental cost principals is included for water resource development and facilities.

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[16] Bahl, Roy and Linn, Johannes, *Urban Public Finance in Developing Countries*, p. 299 and p. 309.

[17] The reader is referred to Volume I of this assignment for additional commentary.

Table 2.10
Elements of Revenue Requirement Models

Model:	Current Method	Alternate Method
Basis:	"Operating Ratio"	"Cash Needs / AIC"
Component		
O&M expenses	x	x
Taxes and payments	x	x
"Profit"	x	
Depreciation	x	
System Renewal and Replacement		x
Resource development (AIC)		x
Capital Investment		x

2.4 QUANTITATIVE RESULTS

2.4.1 Modeled Changes

The models for estimating revenue requirements were used to assess the impacts of possible operational budgeting and capital financing changes. Five different scenarios were developed: three using the current model (Scenarios A, B, and C), and two applying the alternate approach (Scenarios D and E). Other differences in assumptions are summarized in Table 2.11. The different variables used in the five scenarios are described as follows.

Collection Costs — Adjustment for revenues retained by zheks and banks for processing of payments; estimated at 2.5 percent of collected revenues

Repair — Increase Repair Fund to 1992 level (highest during last four years); estimated at $700,000 when adjusted for inflation

Maintenance — Increase Maintenance Workshop to 1994 level (highest during last four years); estimated $400,000 when adjusted for inflation

System Renewal — Replaces depreciation expense with an annual investment in system renewal and replacement; this could be used to cash finance replacement or as a contribution to a replacement reserve fund to be used in the future; estimated at $2,500,000/year based on 1995 main and equipment replacement cost.

Capital Improvements Loan — Debt service schedules were developed for two sizes of loans — $20,000,000 and $75,000,000. These amounts correspond to the

two capital programs presented by the City and Vodokanal, respectively. Loan repayment is based on 9.0 percent interest, level payments over a 20-year period with interest only during the first five years. Schedules are presented in Appendix A, Tables A-1 and A-2.

Resource Cost Component Based on AIC

A component for resource capital cost was developed using AIC concepts based on the partially completed Verkhnybuzhky Water Intake project — to provide 90,000 cu m per day of supply at a cost of approximately $34.4 million. The resulting AIC capital component is $0.052 per cubic meter. Details are presented in Appendix A, Table A-3.

These items were selected for various reasons. First, there may to be opportunity to capture additional operational costs — collection costs are an example. Second, additional investments in system maintenance and repair are necessary. Third, Vodokanal responsibilities for system renewal and replacement appear to be underfunded. Added investment in system renewal and replacement, coupled with the resource cost component, can provide added funds for that specific purpose. Finally, a loan for capital improvements is being pursued.

Table 2.11
Analyzed Components

Component	Scenario				
	A	B	C	D	E
Collection cost	no	2.5%	2.5%	2.5%	2.5%
Repair Fund	no	$700,000	$700,000	$700,000	$700,000
Maintenance	no	$400,000	$400,000	$400,000	$400,000
System Renewal	no	no	$2,500,000	$2,500,000	$2,500,000
Improvements Loan	no	no	no	$20,000,000	$75,000,000
Resource Cost Component (per cu m)	no	no	$0.032	$0.032	$0.032
Model Applied	Current	Current	Current	Alternate	Alternate

As explained earlier, it appears that the current legal framework will permit additional expenditures to recover collection costs and added investment in system renewal and replacement. Hence, the additional items were analyzed using the current approach. Addition of debt service for a capital improvements loan, however, moves beyond costs allowed under current law. When debt servicing is considered, the alternate model was used for analysis.

Projections through 1998 were developed with an assumed general inflation rate of 10 percent per year, electro-energy cost increases of 10 percent annually, and no projected increase in water usage during the study period. This later assumption is based on review of estimated water sales during the last four years (see Appendix A, Table A-4). Over that period, water sales have decreased each year, probably in response to increasing user charges. Given the likelihood that user charges will continue to increase, there is little reason to believe that water sales will increase appreciably over the short term — even with system improvements.

2.4.2 Results

Both the estimated average unit price and estimated funds available for system renewal and replacement are fundamental to the responsibilities of the Vodokanal — operations and maintenance and system renewal and replacement. For discussion purposes, output for these key items is summarized in Figures 2.1 and 2.2. Complete analytical details for each of the five scenarios are included in Appendix A.

In both figures, it can be seen that results for 1995 remain the same over each scenario examined using the current pricing method (A, B, and C). This is true since any change in operations budgeting or replacement investment is assumed to begin in 1996. Hence, results for 1995 represent the "base case" for comparison. Differences among scenarios result from application of the changes outlined previously. Within any scenario, however, differences occurring after 1996 result from inflation and changes in projected water sales, if any.

Several items can be noted from examination of the figures. First, price increases resulting from additional expenditures (Scenario B) for repair and maintenance, coupled with capture of bill collection costs (from banks and zheks), are modest — averaging only about $0.014 per cubic meter over the study period. The corresponding additional funds potentially available for annual replacement investment increase by only about $165,000. This is a very modest increase in funds available for system renewal and is unlikely to have significant impact on service delivery.

Application of the changes included in Scenario C have a much more dramatic impact. Here, designation of an annual replacement investment ($2.75 million in 1996) and imposition of the resource cost component (approximately $3.78 million in 1996) add signifieantly to the funds potentially available for replacement investment. These amounts, coupled with net "profit" retained under the current pricing method ($2.38 million in 1996) account for the $8.91 million shown in Figure 2.2. But the corresponding increase in user charge, from $0.133 to $0.210 per cubic meter, is also significant.

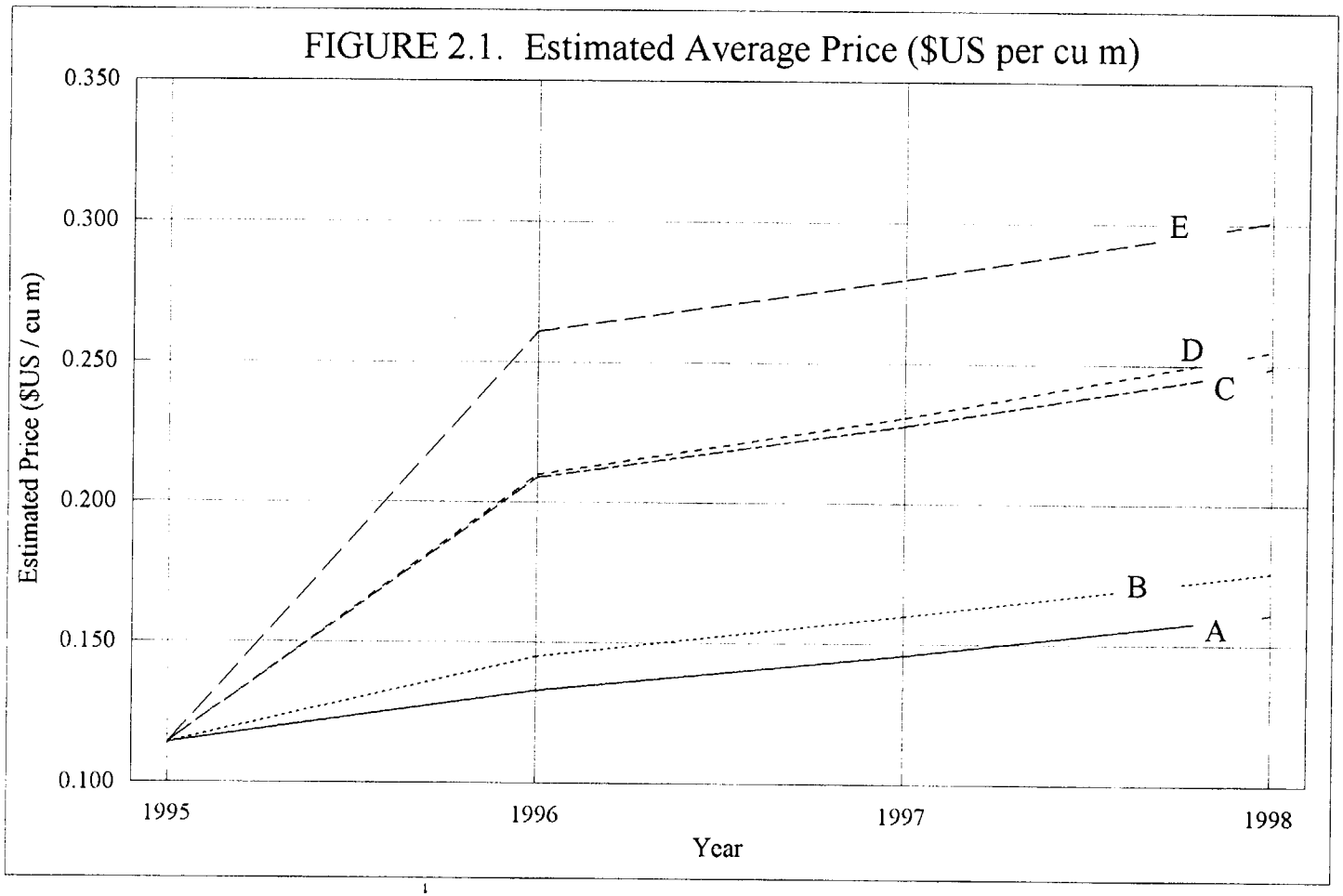
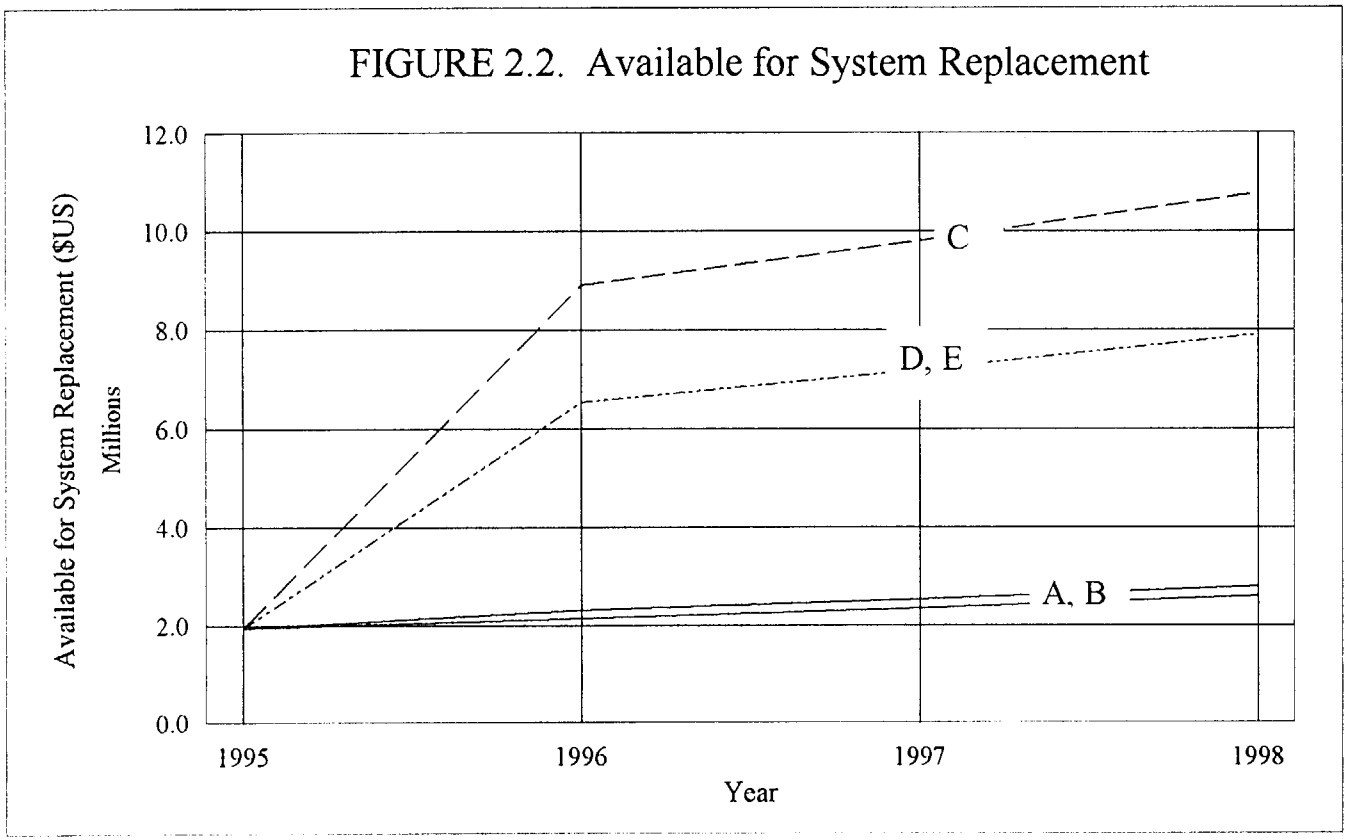


FIGURE 2.1. Estimated Average Price ($US per cu m)
0.350
0.300
0.250
0.200
0.150
0.100
Estimated Price ($US / cu m)
E
D
C
B
A
1995
1996
1997
1998
Year

FIGURE 2.2. Available for System Replacement



Comparison of Scenarios C and D shows the impact of changing the pricing methodology from the current one to the model alternate described previously. But Scenario D also includes repayment of a $20 million loan to be used for system improvements. While there is little difference in the average unit price determined under either scenario, there is a difference in the funds available for replacement investment. The reduction in these funds results from repayment of the referenced loan. Since this annual payment is approximately equal to the net "profit" available under the current pricing methodology, the resulting unit price for water is nearly the same. This is an unintended coincidence, but does indicate that a "transparent" transition could be made to the model alternate pricing methodology in the future.

Finally, Scenario E shows the impact of increasing the loan amount from $20 million to $75 million. Funds available for replacement investment remain the same as the increased revenue is used to pay the additional debt service requirement. The impact on the customer is an additional $0.052 per cubic meter in average user charge (beyond Scenario D). But the end-user also benefits from the one-time capital investment of $75 million and a continuing annual replacement investment of nearly $6.5 million.

It should be noted that these results are estimates only. Differences between actual and projected expenses, rate of inflation, and water sales will yield different results. However, these estimates are probably conservative in that no projected increase in water sales are anticipated, nor have any potential production savings been factored into the analysis. If system renewal and replacement investments are increased, and if additional one-time capital investments are made, savings in electro-energy costs may be quite likely. Over the short term, however, any such savings should be invested in further system improvements and upgrading of service.

2.5 ALLOCATION OF COSTS

The tariff development process begins with the identification of O&M and capital-related expenditures. When considered together, these are the gross revenue requirements of the water service provider. For this analysis of the Vodokanal, this was accomplished in the previous section. Next, these revenue requirements are allocated and distributed to the specific customer categories that either cause the service cost (and revenue requirement) or benefit from it.

2.5.1 Current Method

As noted in Volume I, the tariff-setting procedure currently in use does not allocate and distribute costs to customer categories. Instead, the pricing method designates a tariff for each customer category as a fraction or multiple of the average price. While this procedure is simple, the resulting tariff schedule does not reflect the actual cost of service for any particular customer category, nor does the pricing method result in economic efficiency with respect to use of water resources. For example, the tariff for the residential category (including private sector) is set as a fraction of the average price for water. Other categories, with the exception of the enterprise/industry category, are set in a similar fashion. An estimate of revenues to be collected from these categories is made, and the unit price for the

enterprise/industry category is set so as to collect the remaining revenue requirement. The result of this procedure is that the enterprise/industry category is charged with providing more than 75 percent of revenue while accounting for only 10 percent of the customer base and 8 percent of water use. Clearly, other customer categories are being subsidized.

Table 2.12
Current Tariff Schedule (July 1995)

Customer Category	Price, US$/cu m	Comment
Residential General War Veterans Persecuted	 0.03 0.02 0.01	Gradually being increased to average price
Budget Organizations	0.04	
Communal Services	0.11	Charged at average price
Enterprise/Industry	1.00	Price based on residual of revenue required

2.5.2 Model Functional Allocation of Revenue Requirements

As noted previously, one goal of effective tariff-setting is recovery of revenues from customers based on the costs that the water provider incurs in providing water service to those customers. Customers with similar water use and demand characteristics are placed in a class or category and a tariff developed for that category reflecting those use and demand characteristics. Characteristics might include hourly, daily, and average demand, location within the water system, or use of facilities constructed to serve a specific customer or group of customers. The first step in this process is allocation into functional categories. The **base-extra capacity approach** allocates costs to various customer classes. Use of this approach results in a rate structure generally comprised of a monthly service (or minimum) charge and a quantity (or volume) charge per unit of service.

The service charge component is designed to recover those costs associated with billing, customer service, and metering activities. Some of these costs are recovered on a""per account" basis. Other costs are assessed by meter size to reflect the added cost of maintaining and servicing larger-sized meters. The service charge also may include part or all of other fixed costs, such as debt service or some capital costs. These costs are also distributed according to meter size reflecting the potential demand that these customers can place on the system and the need to provide system availability regardless of volume usage.

The functional allocation process also segregates volume-related costs from other cost categories. Use of the base-extra capacity approach further distributes the volume-related cost pool into base and extra-capacity components. Base costs are defined as those that are associated with providing an average level of service. Extra-capacity costs are related to meeting maximum day and maximum hour service demands.

Some typical components for these categories of cost may include:

Fixed Charge Components	Volume Charge Components
Billing and Collection	Supply
Customer Service	Treatment
Meter Reading	Water Distribution
Administration	Balance of Capital Costs
Some Capital Costs	

For the Vodokanal, the current accounting scheme allows allocation to only some of these functional groups. Using actual recorded expenses for 1995, allocation factors were developed for supply and pumping, treatment, system maintenance, and administration. Development of these factors is presented in Appendix A, Table A-10. These allocation factors were then applied to projected 1996 revenue requirements under Scenario A developed using the current pricing methodology. This functional allocation is presented in Table 2.13. As can be seen, nearly 90 percent of projected 1996 revenue requirements are related to supply and pumping. These are volume-related expenses. Conversely, only about 10 percent of these projected cost are administrative and, hence, fixed. But, as noted below, current cost accounting sometimes mingles clearly fixed costs with some that are volume-related. Additional refinement in accounting by the Vodokanal may change these allocations somewhat.

At this point, these functionally allocated costs would be reallocated based on operating and design characteristics of the water system. Characteristics such as average day use, peak day and peak hour demand, and fire flow demands are used in combination to develop this reallocation. For the Lviv Vodokanal, information of this type is largely unavailable or severely skewed by the special operating procedures required for the three-hour general service blocks. Further, system and customer category peak day and peak hour usage is obscured by both the three-hour general service blocks and the use of individual cisterns, storage facilities, and private wells. Consequently, further reallocation of the revenue requirements is not possible.

2.6 Preparing for Future Tariff Analyses

2.6.1 Pricing Objectives

Because of changes in system operations, capital improvements, and the costs of providing water services, it is important to periodically reexamine the methodology used to charge customers for services. A complete analysis similar to this one examines the costs incurred and, having established those costs, develops a structure of rates and charges based on demands for service.

TABLE 2.13. Current Method--Functional Allocation of Example Year Expense ($US)

Scenario A

Expenditure Category	Example Year 1996	Supply & Pumping %	Collection Cost 1996-98 Repair Fund 1996-98 Maintenance	Treatment %	no based on 1995 level	System Maintenance %	Replacement Investment Resource Component	Administration & Fixed %	Depreciation Only no
ry (direct water production only)	143,572	41.3%	59,295	25.7%	36,826	33.1%	47,451		
es on salary + bonuses	74,379	35.5%	26,434	24.8%	18,427	39.7%	29,518		
velopment fund									
ernobyl fund									
cial security fund									
nsion fund									
troenergy	6,810,016	100.0%	6,810,016						
materials	32,580	66.4%	21,617	33.7%	10,963				
el for Emergency Repairs									
pping and Transport Costs									
emicals									
s for Central Water Heating									
eral Expenditures	283,517							100.0%	283,517
air Fund	332,708	91.8%	305,459			8.2%	27,249		
Pumping to the upper floors	674,548	100.0%	674,548						
Maintenance Workshop	299,565	63.3%	189,535	0.7%	2,037	36.1%	107,993		
Distribution Repair / Flushing Water	0								
Purchased Water	350,749	100.0%	350,749						
Misc.	100,500							100.0%	100,500
Waste disposal	0								
Outside Laboratory Analysis	0								
Interest	0								
Fines	53,971							100.0%	53,971
Pest Control	1,249							100.0%	1,249
Geological / Water Source Tax	43,754	100.0%	43,754						
Tanker Transport	37,509							100.0%	37,509
Cafeteria	8,673							100.0%	8,673
Outside Consulting	0								
Support Maintenance	0								
	0							100.0%	0
SUBTOTAL--DIRECT PRODUCTION CO	9,247,291	91.7%	8,481,408	0.7%	68,253	2.3%	212,211	5.2%	485,419
Depreciation	395,771	65.5%	259,349	0.0%	158	34.4%	136,264		
		100.0%	0						
SUBTOTAL--NON-PRODUCTION COST	395,771	65.5%	259,349	0.0%	158	34.4%	136,264	0.0%	0
Profit (25 percent)	2,410,765	91.7%	2,211,100	0.7%	17,794	2.3%	55,323	5.2%	126,549
Value Added Tax (To State)	2,410,765	91.7%	2,211,100	0.7%	17,794	2.3%	55,323	5.2%	126,549
Labor protection tax	120,538							100.0%	120,538
Innovation tax	120,538							100.0%	120,538
Retained (70 percent)	84,377								
To State (30 percent)	36,161								
Road Tax	124,699							100.0%	124,699
Natural Resources Tax (10 percent)	924,729	100.0%	924,729						
Revenue Required from User Charges	15,755,097		14,087,686		103,999		459,121		1,104,291

A variety of recognized and accepted rate structures are in use today — increasing block, life line, decreasing block, uniform, etc. The selection of the "best" pricing methodology and structure for a community depends on the objectives that are set by that community. Review of customer data, operating expenses, and revenue projections for the utility system can assist in identification of a set of priorities for the pricing methodology. Typically, these priorities may include the following:

- revenues from tariffs, when combined with available funds and other sources of revenue, must permit financially sustainable operation;
- tariffs should remain relatively stable over time, not go down one year only to be increased the following year; and
- costs should be allocated to users according to the demands they place on the system.

Subsequent analysis are made to develop preliminary rates using these objectives for guidance.

In July, a workshop was held with representatives of the City and Vodokanal. During the course of that session, possible objectives were discussed. Two objectives were clear. First, revenues must be sufficient to allow sustainable operation of the Vodokanal. This is a reasonable objective and is, in fact, one of the key objectives generally stated by managers of water utilities. The second, related objective stated by seminar participants was financial stability. This, too, is an objective often stated by water managers in describing their desires for a tariff schedule. Finally, the workshop participants indicated that, while equity, in the form of recovering costs from those who place demands on the water system, is an interesting idea, the most pressing problem is generating sufficient revenues — equity is currently a secondary consideration.

Given these limited objectives and the need for additional data to support a more refined approach to tariff development, it is perhaps more helpful to focus on preparing for future tariff analyses.

2.6.2 Cost Accounting and Customer Information

Ideally, O&M costs and asset information should be classified so as to:

- provide information to management for operating in a cost-effective manner,
- support tariff-setting calculations, and
- provide monitoring and reporting of operations costs.

Generally, operation expenses should include those incurred in operating the source of supply, pumping facilities, water treatment, and transmission and distribution facilities. Operations expenses should also include customer account information, such as meter reading and maintenance, maintaining customer records and collections, and uncollectible accounts. Finally, operations expenses include administrative and general expenses not charged directly to a particular operating function.

Maintenance expenses should include costs incurred in maintaining the source of supply, pumping facilities, water treatment, and transmission and distribution facilities. Expenses for repairing a water utility plant, or for replacing parts of structures and equipment for the purpose of maintaining the utility, are also maintenance costs. The cost of replacing significant structures and equipment that prolong the useful life of the asset should not be charged as maintenance, but capitalized as plant investment.

Cost accounting dat and information provided by Vodokanal for this investigation generally did not contain sufficient detail to allow accurate disaggregation of costs by function. In particular, the Maintenance Workshop line item includes salary, materials, and other costs for several Vodokanal departments as varied as Water Sales and Laboratory. The expense details for these and other departments need to be separated for analytical purposes.

A chart of accounts is a means of classifying all assets, liabilities, costs, and revenues on a consistent basis with sufficient detail to meet these objectives. The larger and more complex the utility, the greater the need for a more detailed chart of accounts. Table 2.14 presents a sample chart of accounts for a large water utility. This chart was developed by identifying categories of O&M costs commonly incurred in vodokanal operation and management. Many of these categories are found in the current Vodokanal accounting reports. In this chart, however, the cost categories are related to functional components of water service delivery. Clearly, not all cost categories are relevant to each functional component and, hence, are unnecessary. These are left blank in Table 2.14. A major benefit of this chart of accounts is that it classifies costs in a manner that allows efficient calculation of costs of service provision. This will become more important in the future, when movement toward more efficient and equitable pricing begins.

Capture and organization of customer information is also important. Information should include:

- number of accounts by customer category (at present, the number of private sector accounts is estimated);
- distribution of accounts by customer category and diameter of meter or service line; and
- distribution of fire lines by diameter.

Finally, additional information regarding actual water use is needed. As noted earlier, water use generally is estimated on the basis of norms for water service. This information could be improved through installation of meters in a random representative sampling of private sector homes, and through consistent capture of meter data from apartment buildings and industries. Data should be gathered over several years and correlated to season, drought, and wet years.

TABLE 2.14. Water Operations and Maintenance Expense Accounts (1)

Example Account No	Description	Functional Component								
		Source of Supply & Pumpin		Treatment		Transmission & Distributio		Customer Account	Meter Maintenance	Administration and General
		Operation	Maintenance	Operation	Maintenance	Operation	Maintenance			
601	Salary	601.1	601.2	601.3	601.4	601.5	601.6	601.7	601.8	601.9
604	Benefits and pension	604.1	604.2	604.3	604.4	604.5	604.6	604.7	604.8	604.9
610	Purchased water	610.1	--	--	--	--	--	--	--	--
615	Purchased electricity	615.1	--	615.3	--	615.5	--	--	--	--
616	Purchased natural gas	616.1	--	616.3	--	616.5	--	--	--	--
618	Chemicals	618.1	618.2	618.3	618.4	618.5	618.6	--	--	--
620	Materials & supplies	620.1	620.2	620.3	620.4	620.5	620.6	620.7	620.8	620.9
631	Outside services--Engineering	631.1	631.2	631.3	631.4	631.5	631.6	631.7	631.8	631.9
632	Outside services--Legal	632.1	632.2	632.3	632.4	632.5	632.6	632.7	632.8	632.9
633	Outside services-- Accounting	633.1	633.2	633.3	633.4	633.5	633.6	633.7	633.8	633.9
635	Outside services--Other	635.1	635.2	635.3	635.4	635.5	635.6	635.7	635.8	635.9
641	Rental of building / property	641.1	641.2	641.3	641.4	641.5	641.6	641.7	641.8	641.9
642	Rental of equipment	642.1	642.2	642.3	642.4	642.5	642.6	642.7	642.8	642.9
650	Transportation expense	650.1	650.2	650.3	650.4	650.5	650.6	650.7	650.8	650.9
656	Insurance--Equipment	656.1	656.2	656.3	656.4	656.5	656.6	656.7	656.8	656.9
658	Insurance--Employee	658.1	658.2	658.3	658.4	658.5	658.6	658.7	658.8	658.9
670	Insurance--Other	670.1	670.2	670.3	670.4	670.5	670.6	670.7	670.8	670.9
670	Bad debt	--	--	--	--	--	--	670.1	--	--
675	Miscellaneous	675.1	675.2	675.3	675.4	675.5	675.6	675.7	675.8	675.9

(1) From the National Association of Regulatory Utility Commissioners.

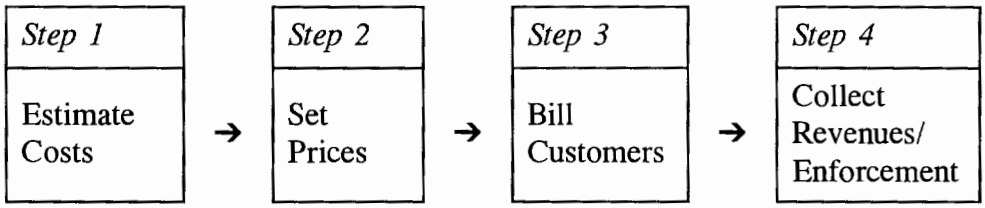
CHAPTER 3
ANALYSIS OF COST RECOVERY

While the previous Chapter developed average water tariffs under different future scenarios, all the scenarios shown assumed fully effective billing and collection. As presented below, this assumption does not hold in reality. The Vodokanal does not recover 100 percent of its costs from the revenues it collects. Thus, unless the Vodokanal greatly strengthened its billing and collection, the prices derived in the last Chapter would be too low to meet the corresponding revenue requirements shown.

The present Chapter takes the analysis one step further by examining cost recovery. Below we: (1) describe how Lviv Vodokanal currently recovers costs, (2) present a way to analyze cost recovery, and (3) assess performance in recovery costs.

3.1 DESCRIPTION OF COST RECOVERY SYSTEM FOR LVIV VODOKANAL

Recovering costs from monthly user charges is a process involving several steps. The major steps are:

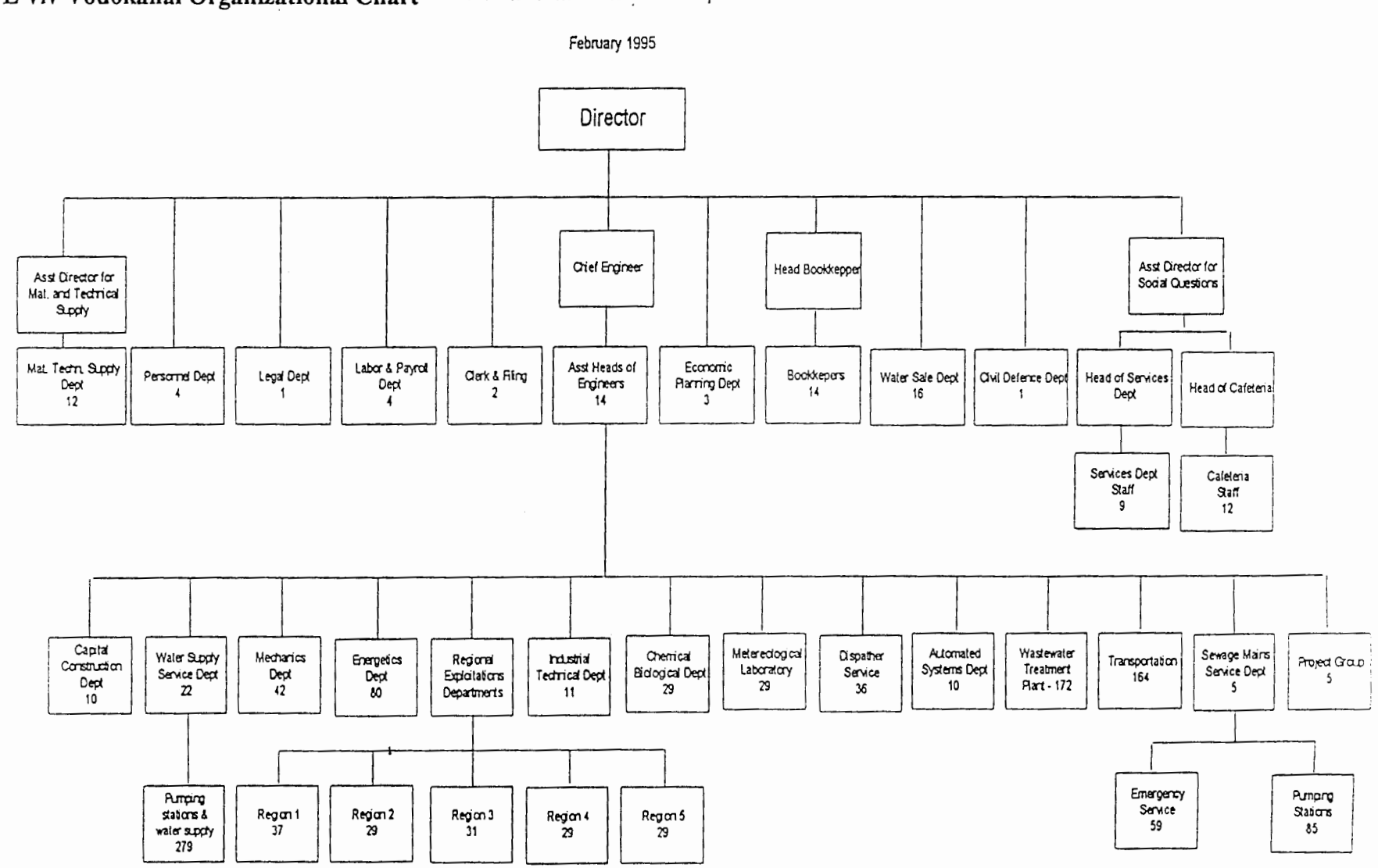


Those steps correspond to a *monthly user charge cost recovery system*. We described elsewhere[18] the current process in Lviv for estimating costs (Step 1) and setting prices (Step 2). Billing (Step 3) is the responsibility of the Vodokanal's Water Sales Department (see Figure 3.1), while collection (Step 4) is administered largely through the banking system. Zheks, however, play a major role in billing, and may also collect revenues in some cases. Billing proceeds as follows. The Vodokanal's Water Sales Department first prepares preliminary monthly bills for each end-user. Each preliminary bill is based on the rate applied to that particular end-user times monthly water use. Monthly water use is usually estimated according to State norms.

After preliminary bills are prepared, billings becomes the responsibility of the Water Sales Department's controller/inspectors. The Department employs about 25 controllers, each of which is responsible for one geographic district of Lviv. All major customer classes may be represented in one district.

[18] See *Volume I: Lviv Vodokanal: Pricing Process*, Appendix B.

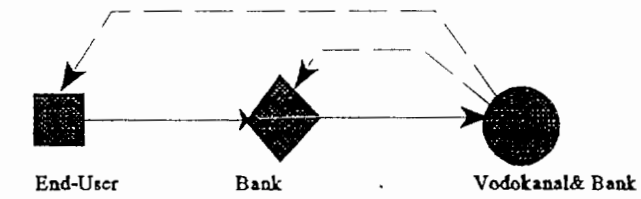
Figure 3.1. **L'viv Vodokanal Organizational Chart**



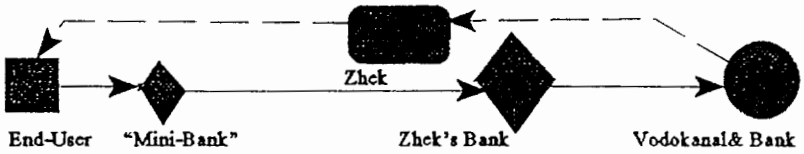
From this point on, as shown in Figure 3.2, the procedure for billing and collection varies depending on the category of end-user and other characteristics. For *enterprise/industry* customers, about 3,300 accounts, the Vodokanal enjoys the right to collect directly from their bank accounts without their authorization. Vodokanal controller/inspectors first bill individual end-users directly. They read meters where possible and adjust preliminary bills accordingly. After the controllers submit their reports, the Water Sales Department compiles all bills for a given enterprise/industry and submits the compiled statement to the enterprise's bank. As that enterprise deposits money in its account, the banks discharge their clients' various obligations according to a set of priorities established nationally. Water payments are a relatively low priority: water bills are paid only after first discharging obligations to the State, electro-energy and gas providers, creditors, and employees.

For most *communal service providers* and *budget organizations*, about 1,980 and 1,330 accounts, respectively, the billing collection process is similar to that described above, except no automatic collections are made. Instead, those customers must authorize payments from their banks to the Vodokanal.

Figure 3.2 Billing and Collection Processes



Enterprise/Industry (Automatic Payments)



General Population (with Zheks)

General Population/Private Sector (without Zheks)

For most of the *general population* (excluding private sector[19]), about 10,340 accounts, the controllers present bills to intermediaries — the zheks — rather than directly to end-users. Zheks then bill individual households. One zhek typically may be responsible for 10 or

[19] The Water Sales Department describes "private sector" end-users as residents who do not rely on zheks and generally occupy single-family houses. See Chapter 2 for more discussion.

12 buildings, or about 3,000 residents. During monthly billings, zheks provide controllers with updated information on specific households. Controllers may then adjust the amounts billed. Customers generally pay bills to their accumulating banks ("mini-banks"),[20] which retain a 3 percent processing fee. The mini-banks transfer the monies to the zheks' banks. Zheks retain 10 percent of the monies that pass through their bank accounts. The zheks' banks then pass the monies to the Vodokanal's bank.

For the *private sector*, about 15,000 accounts, zheks and their banks are not involved in billing and collection. Instead, controller/inspectors bill household end-users directly. If meters are available, they will read them and adjust bills accordingly. Those end-users should then authorize payments from their mini-bank to the Vodokanal bank. Those mini-banks retain a 3 percent processing fee for this service.

While the above describes typical billing and collection processes, some exceptions exist. Early in 1995, the Vodokanal tested an initiative whereby State tax inspectors collected funds due to the Vodokanal from enterprise/industry bank accounts, and transferred those revenues to the Vodokanal. Because the State inspectors review bank accounts more frequently than Vodokanal officials, it was hoped this innovation would lead to improved cost recovery. Reportedly, however, because of difficulties of coordinating collections between State and Vodokanal controller/inspectors, this initiative was discontinued.

A special procedure also applies to in-kind (i.e., bartered) payments. Enterprise/industry customers may apply to the Vodokanal Supply Department for permission to make in-kind payments rather than cash payments. The Supply Department informs the Water Sales Department whenever such a transaction occurs, and the Sales Department adjusts its records accordingly. As a final special procedure: collective farms may make payments yearly rather than monthly.

Regarding customer metering, both national and local legislation promotes the metering of water use. The City of Lviv in particular requires meter installation for all new customers.[21] This requirement, however, is not usually enforced. One reason offered for non-enforcement is that large flow meters of sufficient capacity for apartment buildings cannot be bought locally. Smaller flow meters suitable for individual residences are manufactured locally; they sell for around US$25. Some households install meters on their own initiative and retain ownership of the meter. Controller/inspectors or zhek personnel will then base charges on meter readings.

At least on paper, the Vodokanal has a couple of legal options for enforcing or at least encouraging timely payments. These options, however, have been rarely, if ever, used. First, the Vodokanal may impose a fine for late payment (0.5 percent of total charge for every day

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[20] In some cases, customers will pay amounts owed directly to zhek employees.

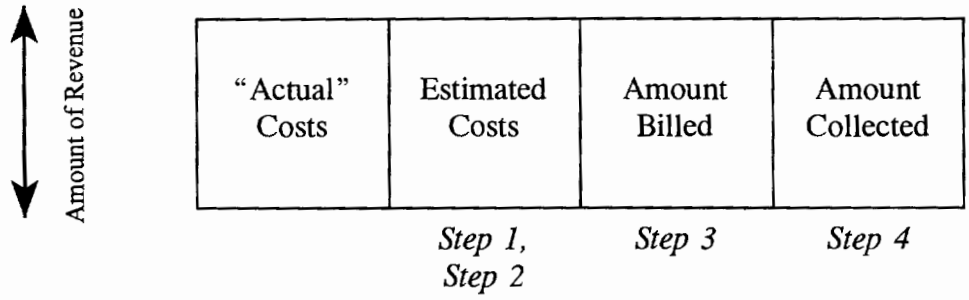
[21] See Lviv City Council, *Temporary Rules of Water Use in Lviv*, 9 April 1993, Sec. 9.4; and Cabinet of Ministers Resolution No. 483, 3 July 1995.

that a bill is overdue). Of that fine, the Vodokanal retains one-fourth, with three-fourths to be remitted to the City to finance capital investment in the water system.[22] However, the rights of vodokanals to fine customers for late payments have been somewhat limited recently by the national government.[23] In any event, this option has rarely, if ever, been exercised.

Second, Lviv Vodokanal has the right to cut off service for non-payment. This measure as well has been rarely, if ever, used. In one or two instances, local officials have shut off water service, but for noncompliance with other City requirements, not necessarily for non-payment of a water bill. Officials give various explanations for this lack of enforcement: a lack of political will given the importance of water as a basic necessity, widespread economic hardship and low service levels, a lack of reliable information on actual water use via metering, a lack of effective shut-off valves, a legal system that does not favor suits against those who do not pay for service, a lack of examples of successful enforcement programs, etc.

3.2 Analyzing Cost Recovery

For each step in the user charge cost recovery system, we can calculate a corresponding level of revenues. This is shown as follows.



The height of each cell indicates the amount of revenue associated with each step.

In Step 1, the Vodokanal estimates the total costs associated with one month of service provision. The Vodokanal uses those estimates to set price levels (Step 2). For Step 3, we add up the total amount billed in one month. And for Step 4, we show the total amount collected per month. We can also show one other amount — an independent estimate of "actual" costs for one month.

If the process is completely successful in recovering costs:

"actual" costs = estimated costs = amount billed = amount collected

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[22] Lviv City Council of People's Deputies Executive Committee, Resolution dated 15 February 1995.

[23] See, for example, the Cabinet of Ministers Resolution No. 387 (11 June 1994); and Decree No. 417 (13 June 1995). Both acts canceled fines for late payments imposed during certain periods of time for certain categories of water customers.

Shown graphically, this occurrence would look like the figure above. All the cells shown are of equal height, suggesting full cost recovery.

Unfortunately, few water authorities fully meet this goal. Instead, cost estimates may not completely reflect actual costs. Customers may not be billed at full prices. Or customers may not pay for the full amount billed. As a result, the graph of such a situation would look more like descending stairs. Applying this model to a water authority helps us *diagnose* where any specific problems lie in the system.

3.3 REVENUE PERFORMANCE

Applying the above approach to the Lviv Vodokanal, we first refine our definitions as follows.

- *"Actual" cost:* This is a rough estimate of the total monthly costs involved in providing sustainable service, given the Vodokanal's current areas of responsibility. It represents, first, the Vodokanal's current internal estimate of total costs, calculated for purposes of rate-setting. (This was described in the previous Chapter as *Scenario A*.) We then add the new *Scenario C* costs associated with adequately providing for renewal and replacement of the existing infrastructure system.[24]
- *Estimated cost:* Estimated cost represents, as mentioned above, the Vodokanal's current internal estimate of total cost, calculated for purposes of rate-setting by the Economic Planning Department.
- *Billed amount:* Billed amount is the total amount billed by the Water Sales Department.
- *Collected amount:* This amount represents the total amount collected by the Vodokanal, according to records maintained by the Water Sales Department. This amount is further divided in *cash* payments, which are payments received by the Vodokanal's bank account and *in-kind* payments, which are goods received or bartered for water service.

3.3.1 Overview

Figure 3.3 shows performance of the Vodokanal monthly user charge cost recovery system for April 1995.[25] Overall, the Figure shows that total revenues collected are only 37 percent of "actual" costs. This means that the Vodokanal is not able to provide sustainable service. In practical terms, this means that the Vodokanal will find it difficult to pay for operating costs, such as electro-energy, will need to defer routine O&M procedures, and will find it difficult to renew and replace the existing system.

Figure 3.3 also illustrates that one weak link in the cost recovery system is collections. Total amount collected represents only 65 percent of total amount billed. This collection-to-billing ratio drops to 41 percent if we exclude in-kind payments. One attributes much of this low collection rate to the lack of an effective system of enforcement. This important link in the

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[24] Scenarios D and E are not shown because they would involve major changes in Vodokanal responsibilities and other assumptions, as discussed in Chapter 2.

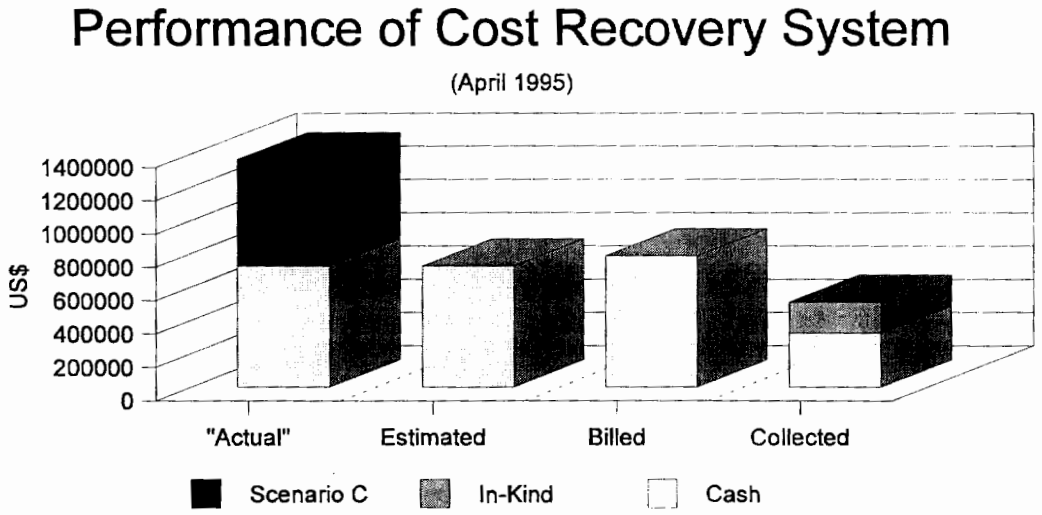
[25] See Appendix B for a breakdown of some of the items shown in this Figure.

cost recovery system is discussed in more detail below. Another case of lost revenues is losses due to inflation, caused by delays brought about by the at-times-cumbersome collection process.

The Figure also demonstrates the large difference between the Vodokanal's current calculation of total cost versus "actual" costs. This difference means that the Vodokanal is not accounting for all costs involved in providing sustainable service. As presented in Chapter 2, various costs, including those associated with renewal and replacement, are not fully accounted for in current cost estimates.

Figure 3.3 also points up an anomaly: total billed is more than the total cost estimated by the Vodokanal. This is because of slightly different calculation procedures followed by the Economic Planning Department and the Water Sales Department.

Figure 3.3



$1,366,286 Total= 641,874 ScenC + 724,412 Cash	US$724,412[26] Cash	US$785,602 Cash	$508,735 Total= 186,609 In-Kind + 322,126 Cash
"Actual"	Estimated	Billed	Collected[27]

[26] To derive "estimated costs" for April 1995, we began with the average cost per cubic meter used for rate-setting at that time. Estimated total water use was reconstructed from a May 1995 Vodokanal document, and represents the average of two figures: average monthly water ruse in January-March 1995, and projected average monthly use for May-June 1995.

[27] "Collected" column represents May 1995 collections. May 1995 is assumed to be the collection period that corresponds most closely to April 1995 billing, i.e., a one-month lag.

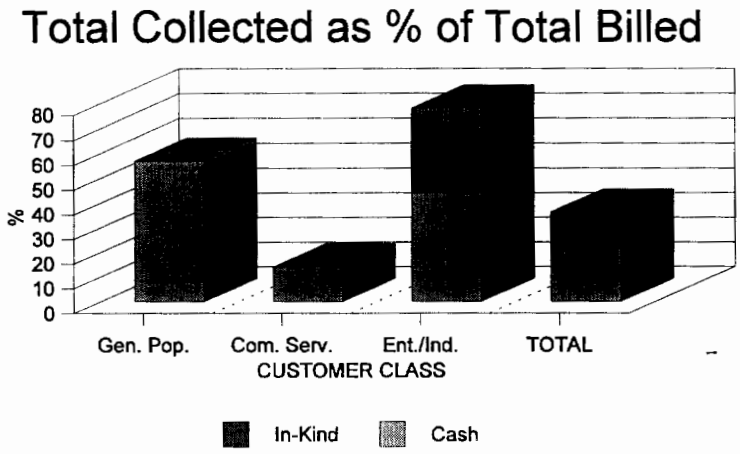
3.3.2 Collections

As noted above, in the sample month, total collected represented only 65 percent of total billed. As shown in Figure 3.4, that overall collection rate was unevenly spread among the three major customer classes. The collection rate was 78 percent for enterprise/industry, for example, but only 14 percent for communal service providers. The superior rate for enterprise/industry customers is due in large part to the automatic collections that are possible from their accounts.

Figure 3.4 also shows the high proportion of in-kind payments received from enterprise/ industry. For the sample month, these payments represent close to half (44%) of all payments made by that customer class. This represented a total loss in operating capital for the Vodokanal of about US$186,600 for one month.

The collection rate for the general population in the sample month was 57 percent. Of the total billed to the general population, some 13 percent ($16,726) was retained by mini-banks and zheks' banks for administrative costs. Preliminary analysis suggests that the general population collection rate varies substantially from month to month, even more so than the rates for other customer classes. Whereas collection rates for other customer classes remained stable from April to May of 1995, collection levels for the general population were much lower in April ($19,500) than in May, the sample month ($67,500). Ongoing trend analysis of collection rates by the Vodokanal is recommended in the next Chapter.

Figure 3.4



Billed	US$118,005	US$127,466	US$540,131	US$785,602
Collected	67,558 Cash	17,286 Cash	237,282 Cash 186,609 In-Kind	322,126 Cash 186,609 In-Kind
Billed % Collected	57	14	78 = 44 + 34 (cash)(in-kind)	65 = 41 + 24 (cash)(in-kind)
	Gen. Pop.	**Comm. Serv.**	**Ent./Ind.**	**TOTAL**

CHAPTER 4
RECOMMENDED STRATEGY

This study (Volume II) and its companion (Volume I) examined the recovery of costs by the Lviv Vodokanal within the broader context of financing water service in Lviv. The studies clarified financial reasons why water service is inadequate. Concerning the Vodokanal, those reasons include low collection levels due to lack of enforcement, and inadequate accounting for costs. On the side of the City, we noted that charges related to water use are not integrated into a coherent approach for financing water system improvements. The studies also identified other concerns, such as equity issues related to the current rate structure.

The task of the present Chapter is to transform those findings into useful recommendations and to rank and sequence them by urgency. In line with the nature of our assignment, our focus is on local-level recommendations. However, we do provide national-level recommendations in the area of cost recovery.

Local-level recommendations must bear in mind certain realities. Local autonomy is limited. Economic hardship is widespread. Vodokanal officials must devote precious time to managing daily crises associated with an aging plant. A vicious circle current exists: customers balk at paying full prices for water because of poor service levels; service levels will continue to plummet unless customers begin to shoulder the true costs of service. There is no magic solution. The only way to break this vicious circle is through the hard work of improving cost recovery.

Officials should focus scarce resources on solving top priorities before moving on to less urgent issues. Below we develop and rank recommendations at the local level and then the national level.[28]

4.1 LVIV

The goal of the proposed strategy is to make water service provision in Lviv more financially sustainable. Because of the urgency of the problem, we place top priority on meeting revenue needs, followed by fine-tuning the system to make it more efficient and equitable.

We group Vodokanal and City priorities for making water service provision more sustainable into three phases. Table 4.1 shows the major elements of those phases. After a brief overview (Section 4.1.1), recommendations for the Vodokanal (Section 4.1.2) and the City (Section 4.1.3) are presented in more detail, with Oblast roles discussed as appropriate.

[28] Unless otherwise noted, local-level recommendations appear to be achievable within the existing State legal framework. (They may, however, involve changes to the sub-national legal regimen.) Modifications to the State legal framework are addressed under national-level recommendations.

4.1.1 Overview of Strategy

Vodokanal. The top priority for the Vodokanal should be to improve collection **(Phase 1)**. As part of this effort the VKL should put in place and then implement enforcement procedures. As collections improve, for equity reasons, the VKL should bring the tariffs charged to different customer classes to a common level by gradually increasing prices for communal service providers and the general population. (This is the general direction prompted by recent Cabinet of Ministers' decrees, e.g., No. 733.)

Phase 2 should only begin after the VKL has strengthened its collection and enforcement system, and after tariffs are generally equalized. The VKL should then begin, as permitted, to increase its estimate of total costs until its prices reflect full cost. These cost increases should occur as the collection/enforcement system is strengthened, to avoid massive increases in defaults on payments.

After Phases 1 and 2 have improved cost recovery to allow for sustainable service provision, the VKL should begin as permitted to change the way it sets prices so as to develop more equitable and efficient rate structures **(Phase 3)**.

Table 4.1
Strategy for Making Water Service Provision More Financially Sustainable

Phase	Lviv Vodokanal	City of Lviv
1	• Improve collection/enforcement • Increase tariffs charged to the general population and communal service providers • Improve data collection and analysis to prepare for later phases, etc.	•Modify system of user charges and dedicate revenues to provide for sustainable service provision •Rationalize use of dedicated revenues by coordinating capital investment programming between City and Vodokanal
2	• Increase calculation of total cost used as basis for setting monthly user charges	
3	• Make pricing process more efficient and equitable	

City. The City of Lviv should modify and rationalize its system of user charges so as to provide for effective system expansion and extension. This involves dedicating revenues from certain user charges exclusively to improving the water system, budgeting capital investments, and otherwise rationalizing its financial system. Capital investments should be coordinated with the Vodokanal.

We present recommendations below by actor and by phase, with earlier phases presented in the most detail.

4.1.2 Lviv Vodokanal

While the VKL is not the only actor in the following recommendations, it should take the initiative in all of the following proposed actions. Most of the recommendations point in the direction of improved commercial practices, which involves treating water as a commercial good.

Phase 1

Improve Collection and Enforcement[29]

We note that the VKL is concerned with improving collection and enforcement and has launched initiatives in the past with this goal in mind. To further improve cost recovery, the VKL should:

1. **Organize for the task.** Improving collection and enforcement should be a top institutional priority. The effort should logically be spearheaded by the Director of the Water Sales Department. He should report every two weeks to a "task force on improving cost recovery" chaired by the VKL Director, with the Director of Economics and Planning and others participating as named by the VKL Director.[30] The first meeting could be devoted to reviewing, adopting as appropriate, and prioritizing the recommendations presented below. At subsequent meetings, the Economics Director could report on, among other things, the current status of the billing-to-collection ratio (see below). Improving that ratio should be a major focus of the task force. The Water Sales Director can report on success in implementing the task force's directives. Actions to accomplish within the upcoming two-week period should then be agreed to.

2. **Prepare draft policy and plan for selectively shutting off service for delinquent customers. After consulting with local officials, implement policy.** While national and local legislation permit service shut-offs, given current conditions, some consultation with Oblast and City officials as to policies appears to prudent before attempting service cut-offs. VKL officials should spearhead this effort. They should first analyze data to determine which customers owe the most money and whose service can be most effectively shut off. They should develop a brief draft policy and plan describing: (a) the circumstances under which they would and would not cut off service, (b) the procedure they would following in shutting off service,[31] and (c) the economic benefits the VKL would expect to reap from implementing such a plan. VKL officials should then consult with City and Oblast officials and revise plan. The VKL should then implement that plan. Cut-offs should be broad-based

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[29] Most of the following recommendations were discussed and refined during a workshop held by USAID/PADCO on 2 October 1995 at the Lviv Vodokanal, with Vodokanal, City, and Oblast officials participating.

[30] Michael Sinclair, USAID/PADCO Resident Advisor in Lviv, has indicated that Yuri Havryluk would be available to attend those bi-weekly meetings. The Resident Advisor is open to discussion with the VKL about other opportunities for collaborating to help improve cost recovery.

[31] For ideas on procedure, etc., see USAID/PADCO, *Case Study: Collecting Delinquent Payments for Water in Pittsburgh*, presented at 2 October 1995 workshop mentioned above, and included in the *Volume III* report.

enough to avoid the appearance of favoritism, and yet cost-effective. Procedures should given clear warning to customers about upcoming service shut-offs, so as to "shift the moral burden" clearly to the customer.

3. Revise policies and procedures, and enforce requirement that meters be installed in all new buildings. The VKL should connect new customers *only after* meters have been installed according to VKL specifications. The procedure should not put the VKL at financial risk. A procedure should be established so that: (a) potential customers deposit the estimated connection cost into a new VKL bank account established for that purpose; (b) the VKL draws from that account to install meters and cut-off valves and to provide service connections; (c) any money left is returned to the customer. The VKL should request the City Executive Committee approve the opening of this second bank account, to be used exclusively for use related to connection charges. The fees charged should cover *all* associated costs. The VKL should retain ownership of the meter and be guaranteed access. The meter housings as well as the meters themselves should conform to VKL specifications. VKL officials should take the initiative in establishing this procedure, involving the City as appropriate, and then implement the procedure consistently.

4. Seek to establish an automatic payment procedure from the bank accounts of off-budget communal service providers. Currently, such a procedure only exists for the enterprise/industry customer class. With State permission, the Kiev Vodokanal, however, has reportedly established such a collection procedure with its communal service customers. The VKL should investigate precisely what permission was granted in the case of the Kiev Vodokanal. The VKL should then request that the Mayor assist in lobbying for such permission in Lviv.

5. Reduce in-kind payments from enterprise/industry, while increasing cash payments. Accepting in-kind payments inappropriately transfers the burden of marketing products from the enterprise/industry to the VKL. This costs the VKL resources in scarce time and money. Implementing this proposal to reduce in-kind payments must be linked to Recommendation No. 2, above. To shift the burden of product marketing back from the VKL to the producer/customer, a shut-off of service should be available to the VKL as a credible last resort. A gradual phase-out of in-kind payments may be appropriate in some circumstances.

6. Establish a new incentive system for zheks to improve collection rates. As suggested by the Water Sales Department, the percent of collections retained by zheks' banks, currently a flat 10 percent, should be varied depending on zhek collection performance. This should encourage zheks to see that delinquent bills are paid. For example:

Collection Rate	% of Collection That Zheks Are Allowed to Retain
100-90%	20%
95-65%	15%
65-40%	10%
< 40%	05%

These rates are illustrative. Before approving such a schedule, the Economic and Planning Department should make some projections as to its probable impact on collection rates and the income generated, and develop the schedule that appears most attractive.

7. Collect directly from mini-banks for general population where possible. By collecting directly from mini-banks, the VKL would avoid needing to pay zheks through their banks altogether, thereby increasing revenue generation. This arrangement should be adopted where possible and where most cost-effective.

8. Establish incentive for controller/inspectors to improve collection rates. Currently, controller/inspectors are not rewarded for improvements in collection rates. The VKL had reportedly applied such an incentive system in the past. An incentive system should be reestablished (i.e., through the VKL "fund for job stimulation") so as to reward improvements in rates and overall top collection rates. As in Recommendation No. 6, above, an official should project the impact(s) of any proposed change on revenue generation before the modification is adopted.

9. Design and implement system of fines. As established earlier, the VKL has the right to levy fines in certain circumstances (e.g., for late payment, for over-use of water), but rarely, if ever, does so. While fines for over-use of water are not recommended at this time, fining customers for late payment could result in higher levels of collection. Because establishing a system of fines would complicate billing, the Water Sales Department should propose policies and procedures for fining customers for late payments. To be cost-effective, enforcement could focus on particular customers classes or on extremely late payments. Customers should be clearly informed (e.g., via their bills) regarding new fine policies and procedures.

10. Establish new collection procedures with private sector customers. As suggested in the report, these 15,000 customers consume a disproportionate amount of the controller/inspectors' time. Collection procedures could be streamlined in several ways. The VKL could seek permission as necessary and then open a payment window in the VKL for private sector customers. Customers would be granted a rebate for paying at the VKL window. (Expressed another way: customers who do not pay at the VKL should be charged for the additional expenses associated with billing them and collecting from them directly.) If cost-effective, these customers should also be billed quarterly rather than monthly.

11. Collect quarterly, rather than yearly, from farm cooperatives. Under current inflation conditions, yearly payments for water for farm cooperatives represent token payments at best. Collection should be made quarterly, not yearly. Charges should include a premium to offset losses due to inflation.

12. Establish new billing, collection, and enforcement procedures for condominium associations. Following a Presidential directive, USAID/PADCO/Lviv is currently assisting the City of Lviv and Lviv Oblast in establishing condominium associations in Lviv. The VKL should establish new procedures with those associations as they are formed. Collection

and enforcement procedures should be stricter than current procedures involving zheks as middlemen.

13. **Encourage and reward VKL staff for developing other practical suggestion for improving cost recovery.** Staff members who work with billing and collection on a routine basis are a good source for future ideas for improving cost recovery. Their ideas should be solicited; ideas that lead to improvements in cost recovery should be modestly rewarded.

14. **Adjust all water tariffs to offset losses due to inflation.** Currently, lag times between water service and revenue collection lead to unrecovered costs.

Gradually Bring Tariffs Charged to Different Customer Classes to a Common Level

As presented earlier, the tariff for enterprise/industry customers is currently 30 times that for the general population; this is not due to differences in service costs, but to factors such as ease of collection, etc. A good first step to improve equity and efficiency in water pricing would be to gradually bring different tariffs closer to a common level by increasing prices for communal service providers and the general population. This is the direction promoted by the Cabinet of Ministers in recent resolutions and decrees (e.g., No. 733). These policy statements are invariably expressed in terms of a *minimum* percentage of costs that should be recovered from the general population. As the VKL put in place improved collection and enforcement procedures, it could propose to the Oblast that the pace of equalizing tariffs be accelerated, i.e., that the tariff for the general population be set at levels higher than the minimum.

Improve Data Collection and Analysis to Prepare for Later Phase, etc.

1. **Improve data collection and analysis.** In later phase, we propose ways to make the price-setting process more efficient and equitable. The VKL can begin to prepare for that now by improving data collection and analysis. The VKL Department of Economics and Planning can:

- reorganize expenditure categories, and continue to allocate expenditures into major functional categories as was shown in Table 2.13 and discussed in Chapter 2;
- prepare and update a chart of accounts based on the model provided in Table 2.14 and as discussed in Chapter 2; and
- capture and organize additional customer information as described in Chapter 2.

These points were discussed with the Director of the VKL Economics and Planning Department on 3 October 1995.

As noted above, this Department should also track, on a monthly basis, trends in the billing-to-collection ratio. (This ratio is expressed graphically in Figure 3.3.) The Department should track this ratio for all customers as a whole, as well as for the three major customer classes.

2. Seek Oblast permission to index tariffs due to (a) inflation and (b) increases in cost of electro-energy. As established earlier, the VKL currently must seek Oblast permission to increase prices due to inflation and increases in the cost of electro-energy on an almost continual basis. The VKL should be allowed to automatically increase prices, according to an agreed-on formula, as changes in the exchange rate and the price of energy occur. Preliminary discussions with an Oblast official indicated that this indexing would be permitted. At the same time, the cumbersome Oblast price approval procedure, now involving some 14 administrative departments, should be streamlined.

3. Clarify and improve the system of payments of value-added tax (VAT). The VKL must pay more for the VAT than for any other tax; this adds to the customer price of water. The VKL further must pay this tax on the fifth and the twenty-fifth of each month, with an adjustment made in amount owed on the fifteenth of each month. This complicates VKL cash flow and operations.

The VKL should first confirm that they must indeed pay this tax. While the current VAT law was not available for review, the law that was in effect in 1993 exempted providers of water/wastewater services from paying this tax.[32] The VKL should obtain a copy of the current VAT law, including the current list of exemptions from the VAT, to determine whether or not they must currently pay this tax. If the VKL must indeed pay this tax, it should propose to tax authorities a schedule for VAT payments and adjustments that creates fewer administrative and cash-flow difficulties.

Phase 2

Increase Calculation of Total Cost Used as Basis for Setting Monthly User Charges

Once the VKL has strengthened its collection and enforcement procedures and equalized prices among customer classes, it should begin to increase its calculation of total costs so as to more completely reflect full costs. Under current law, it can do this in two ways. First, it can increase budgeted line items for the "repair fund" to 1992 levels (highest during last four years) and "maintenance workshop" to 1994 levels (highest during last four years). These increases were reflected in Scenario B in Chapter 2. This change would appear to require no changes in the regulatory framework. Next, the VKL could budget monies for system renewal and for resource capital cost as described under Scenario C in Chapter 2. National law appears to permit the VKL to establish a line item (in addition to "depreciation") for the renewal and replacement of the main production assets,[33] which would cover much of these items. This proposal should be reviewed with Oblast officials.

While increasing the calculation of total costs, VKL officials should continue to monitor the billing-to-collection ratio as discussed above to see if the resulting price increases have any negative effect on collection levels.

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[32] Government of Ukraine, *Law of Ukraine on Value-Added Taxes*, Art. 5, Sec. T.

[33] See Cabinet of Ministers, Ukraine, *Main Statements on the Production Costs Estimations for Enterprises and Organizations*, Sec. 6, approved 10 November 1994, No. 759.

Phase 3

Make Pricing Process More Efficient and Equitable

At the conclusion of Phase 2, the VKL should be collecting revenues that are roughly adequate for fulfilling responsibilities. The VKL can then turn its attention to making the pricing process more efficient and equitable. To do so, in addition to data currently gathered and new data collected as per our Phase 1 recommendations above, the VKL will need additional data on actual water use (see Chapter 2 for discussion).

Once this data is collected, the VKL should review its customer classes and regroup customers according to their water demand characteristics. (As discussed below, this and the following suggestions may first involve legal change at the State level.) The VKL can then allocate costs to customers (see Volume I report for discussion). The VKL will be able to divide the current monthly charge into a flat service change and a volume-based charge. The VKL can then set a rate structure to meet local objectives, for example, an increasing block rate to encourage water conservation (see Volume I report).

If and when a capital investment program is prepared whose costs should be borne by monthly user charges, with Oblast permission, the VKL could move to a final refinement in economic efficiency — AIC pricing. This would involve discounting all incremental costs, including operating and capital costs, necessary to meet future water demand (see Volume I report for discussion).

4.1.3 City of Lviv

As shown earlier, the City is responsible for system extension and expansion. To better meet this responsibility, the following recommendations are made to the City Finance Task Force.

Modify System of User Charges and Dedicate Revenues to Provide for Sustainable Service Provision

Revenues from water use-related charges should be dedicated exclusively to improving the water system.

The legal base of the "expenses for infrastructure development" charge should be investigated. If this charge is indeed permitted, a substantial portion of revenues generated by this charge, in particular, should be dedicated to water infrastructure.

City charges that duplicate VKL charges (e.g., connection charges) should be unified and implemented in a coordinated manner with the VKL charge or else eliminated. The adequacy of the geologic inspection charge and the necessity for the annual inspection charge should be reviewed.

Rationalize Use of Dedicated Revenues by Coordinating Capital Investment Programming between City and Vodokanal

With capital responsibilities divided between the City (extension and expansion) and the VKL (renewal and replacement), the City should promote integrated City/VKL capital investment

programming and budgeting. A capital investment program includes not only a list of priority projects, but should also indicate, realistically, funding sources, construction beginning and end dates, and other information. For improved price-setting, information about the impacts of each project on water production are desirable.

We finally comment briefly on two potential City initiatives under discussion. One proposal calls for investing a large sum of money in metering existing customers. We point out that system extension and expansion should be a higher City priority than gathering excessive new data on water use characteristics. The objectives of any data collection effort should be first clearly defined; results should directly relate to decision-making related to improving water service in Lviv. If new data are necessary, one should first review the existing metering data collected by the VKL to see if that will offer an adequate sample for decision-making purposes. Any additional data collection should then build on, and be integrated into, the VKL's existing database.

A second City initiative under discussion calls for improving water service in a defined area of the City as a demonstration project. A first step would be to determine the engineering feasibility of such a project. If in fact feasible, we note that several different systems should be put in place as a part of such a demonstration project: system improvements, procedures for communicating with customers who are affected, customer metering, prices that reflect full costs, effective collection and enforcement procedures, including selective service shut-offs, etc. Given the realities of the situation, the City would need to fund all system improvements in this demonstration area. Finally, such a project would require extension coordination and cooperation between the City and the VKL. Before undertaking such an endeavor, the City and the VKL should first build trust by undertaking other, more modest activities, such as many of the recommendations provided above, e.g., coordinated capital investment programming, etc.

4.2 National-Level Recommendations

Changes can be made in the national legal framework that would enable local and regional water authorities to better provide water service. Following the scope of our assignment, we confine ourselves here to issues related to improving cost recovery and the pricing process. For the most comprehensive set of recommendations prepared to date, we refer the reader to the World Bank's *Ukraine Municipal Water and Wastewater Sector Study*.[34]

Along the lines of that report's recommendations, we assume that, in the medium term, the State will strengthen the institution of the vodokanal: transfer to it responsibility for extension and expansion of water service, define it as a water and wastewater utility with activities confined to those areas, see that it is regulated effectively, furnish it with an effective system of user charges and other sources of revenue as appropriate, etc. Strengthening the vodokanals will at the same time involve taking local governments out of the role of directly providing water service. For this reason, we do not recommend national-level measures that would consolidate local governments' position as a direct service provider (e.g., improve-

[34] Stottman, Walter, *Ukraine Municipal Water and Wastewater Sector Study*, World Bank, draft 15 May 1995.

ments to a city's system of water use charges). We merely note the following: if other cities are like Lviv, water system expansion and extension will not be adequately integrated into water service provision and will not be effectively funded until this fundamental strengthening of the vodokanal occurs.

In ranking the following national-level recommendations, we generally followed the set of priorities developed in Lviv.

Immediate Priorities

Encourage Vodokanals to Improve Collections and Enforcement

Effective enforcement procedures are fundamental to treating water as a commercial good. While existing laws would seem sufficient to allow vodokanals to enforce collections, in reality vodokanal officials (at least in Lviv) are currently reluctant to risk measures such as shutting off service to delinquent customers.

The national government could encourage vodokanals to collect revenues more effectively by defining broad areas where service shut-offs are and are not appropriate. For example, shut-offs may be appropriate during spring, summer, and fall, but not during winter. Or service shut-offs may be appropriate to all customers, except hospitals, schools, etc. Vodokanals may have to follow certain procedures, e.g., issue notification notices followed by termination notices, etc. Within these broad outlines, national regulations should also explicitly permit Oblasts, municipalities, and vodokanals to further define cut-off policies and procedures to meet local conditions.

Establish Automatic Collection Mechanism for Communal Service Providers

As discussed above, the automatic collection mechanism now in place for enterprise/industry customers greatly aids vodokanals in collecting from this customer class. As is reportedly now being tested by the Kiev Vodokanal, all vodokanals should be similarly allowed to collect water/wastewater bills directly from the bank accounts of off-budget communal service providers.

Allow Vodokanals to Account for Full Costs in Monthly Volume Charges

When preparing, approving, and reviewing vodokanal cost estimates used to set tariffs, vodokanal and oblast officials rely on the Cabinet of Ministers' *Main Statements on Production Costs Estimations for Enterprises and Organizations*, approved 10 November 1994, No. 759, and related regulations. At least in Lviv, the wording of this document leads to a restrictive view of the costs that should be reflected in monthly volume charges. As a result, renewal and replacement of the water system, a vodokanal responsibility, is underfunded, leading to unsustainable service provision. While the vodokanal is allowed to include depreciation in their estimates of "production costs," depreciation is rarely sufficient to allow for system renewal and replacement. Regulations should be amended so as to explicitly allow vodokanals to include costs associated with a program of capital renewal and replacement in their price-setting calculations.

By treating the vodokanal like any other enterprise or public organization, subject to the *Statements on Production Cost Estimates* and other laws, the State also fails to recognize certain peculiarities of the Vodokanal's position. In particular, the VKL has to deal with a cumbersome payment procedure that may result in low collection rates. To provide sustainable service in a situation where some customers do not pay, those consumers who do pay must unfortunately shoulder additional costs. Adjusting prices to reflect such a reality is not, however, contemplated in the *Statements on Production Cost Estimations* or in other regulations. To provide sustainable service, regulations should be amended to allow vodokanals to factor in unpaid bills into their tariff rate proposals.

Allow Vodokanals to Improve Service Connection Procedures

At least in Lviv, new buildings are not being metered because the Vodokanal does not want to risk assuming financial burdens associated with metering. Changes in State law could reverse this situation. The vodokanals should be allowed to open a second bank account, to be used exclusively for connection charges. Vodokanals should be allowed to institute a connection procedure whereby: (a) a potential customer pays a charge that is equivalent to the full costs of connection into a vodokanal bank account dedicated to that purpose, (b) vodokanals then draw on that money to perform the connection, and (c) the vodokanal returns leftover money to the customer.

Medium-to-Long-Term Priorities

Allow the Price-Setting Process to Become More Efficient and Equitable

In the medium-to-long term, the State can enable water price-setting to become more efficient and equitable in several ways. First vodokanals should be allowed more freedom to group customers into categories that reflect water use patterns. Current customer classes do not always reflect those patterns. Second, vodokanals should be allowed to divide their monthly user charges into two parts: a volume charge and a fixed service charge. Third, vodokanals should be allowed to divide their volume charge into block rates, and set those rates according to local objectives. An appropriate block rate structure may allow all customers to pay a low price per cubic meter for a minimum level of water use, with higher tariffs charged for additional water consumption. As a final refinement of economic efficiency, vodokanals that have developed capital investment programs should be allowed to set prices based on AIC principles (see Volume I discussion). These changes should occur as vodokanals become autonomous, self-financing, commercially oriented manager/operators of water and wastewater systems.

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APPENDIX

TABLE A.1. SERIES 1996 BOND $20M ISSUE
EVEN DEBT SERVICE

USER INPUT

PRINCIPAL	$20,000,000	DISCOUNT	6.00%
INTEREST RATE	9.00%		
YEAR ISSUED	1996		
PRINCIPAL DEFERRED	5		
TERM	15		

BOND YEAR	CALENDAR YEAR	PRINCIPAL PAYMENT	INTEREST EXPENSE	ANNUAL DEBT SERVICE	PRINCIPAL BALANCE	ANNUAL PAYMENT FUND BALANCE including interest (2)
					$20,000,000	
1	1996	$0	$1,800,000	$1,800,000	$20,000,000	456,874
2	1997	$0	$1,800,000	$1,800,000	$20,000,000	941,160
3	1998	$0	$1,800,000	$1,800,000	$20,000,000	1,454,504
4	1999	$0	$1,800,000	$1,800,000	$20,000,000	1,998,648
5	2000	$0	$1,800,000	$1,800,000	$20,000,000	2,575,440
6	2001	$681,178	$1,800,000	$2,481,178	$19,318,822	2,464,792
7	2002	$742,484	$1,738,694	$2,481,178	$18,576,339	2,347,505
8	2003	$809,307	$1,671,870	$2,481,178	$17,767,032	2,223,181
9	2004	$882,145	$1,599,033	$2,481,178	$16,884,887	2,091,398
10	2005	$961,538	$1,519,640	$2,481,178	$15,923,349	1,951,707
11	2006	$1,048,076	$1,433,101	$2,481,178	$14,875,273	1,803,635
12	2007	$1,142,403	$1,338,775	$2,481,178	$13,732,870	1,646,679
13	2008	$1,245,219	$1,235,958	$2,481,178	$12,487,650	1,480,305
14	2009	$1,357,289	$1,123,889	$2,481,178	$11,130,361	1,303,949
15	2010	$1,479,445	$1,001,732	$2,481,178	$9,650,916	1,117,011
16	2011	$1,612,595	$868,582	$2,481,178	$8,038,321	918,858
17	2012	$1,757,729	$723,449	$2,481,178	$6,280,592	708,814
18	2013	$1,915,924	$565,253	$2,481,178	$4,364,667	486,169
19	2014	$2,088,358	$392,820	$2,481,178	$2,276,310	250,165
20	2015	$2,276,310	$204,868	$2,481,178	$0	0
Totals		$20,000,000	$26,217,665	$46,217,665		
Net Present Value		$8,820,912	$16,768,632			

NPV of Principal and Interest	$25,589,544
Annual Payment Req'd (1)	$2,231,013

(1) The Annual Payment Required recovers the total NPV of principal plus interest over the the 20 year term at 6 percent interest. This approach recognizes that interest may be earned on funds collected in excess of the annual loan payment during the first 5 years of th loan repayment schedule.

(2) This column shows the projected flow of funds in a loan repayment account over the 20-year Interest earned on repayment account balance in Year 1 through Year 5 is used to help defra annual loan repayment requirements in subsequent years. Interest is assumed to be earned at 6 perent per year.

TABLE A.2. SERIES 1996 BOND $75M ISSUE
EVEN DEBT SERVICE

USER INPUT

PRINCIPAL	$75,000,000	DISCOUNT	6.00%
INTEREST RATE	9.00%		
YEAR ISSUED	1996		
PRINCIPAL DEFERRED	5		
TERM	15		

BOND YEAR	CALENDAR YEAR	PRINCIPAL PAYMENT	INTEREST EXPENSE	ANNUAL DEBT SERVICE	PRINCIPAL BALANCE	ANNUAL PAYMENT FUND BALANCE including interest (2)
					$75,000,000	
1	1996	$0	$6,750,000	$6,750,000	$75,000,000	1,713,277
2	1997	$0	$6,750,000	$6,750,000	$75,000,000	3,529,351
3	1998	$0	$6,750,000	$6,750,000	$75,000,000	5,454,388
4	1999	$0	$6,750,000	$6,750,000	$75,000,000	7,494,929
5	2000	$0	$6,750,000	$6,750,000	$75,000,000	9,657,901
6	2001	$2,554,416	$6,750,000	$9,304,416	$72,445,584	9,242,971
7	2002	$2,784,314	$6,520,103	$9,304,416	$69,661,270	8,803,145
8	2003	$3,034,902	$6,269,514	$9,304,416	$66,626,368	8,336,930
9	2004	$3,308,043	$5,996,373	$9,304,416	$63,318,325	7,842,741
10	2005	$3,605,767	$5,698,649	$9,304,416	$59,712,558	7,318,902
11	2006	$3,930,286	$5,374,130	$9,304,416	$55,782,272	6,763,632
12	2007	$4,284,012	$5,020,405	$9,304,416	$51,498,261	6,175,045
13	2008	$4,669,573	$4,634,843	$9,304,416	$46,828,688	5,551,144
14	2009	$5,089,834	$4,214,582	$9,304,416	$41,738,854	4,889,808
15	2010	$5,547,919	$3,756,497	$9,304,416	$36,190,934	4,188,792
16	2011	$6,047,232	$3,257,184	$9,304,416	$30,143,702	3,445,716
17	2012	$6,591,483	$2,712,933	$9,304,416	$23,552,219	2,658,054
18	2013	$7,184,716	$2,119,700	$9,304,416	$16,367,503	1,823,133
19	2014	$7,831,341	$1,473,075	$9,304,416	$8,536,162	938,117
20	2015	$8,536,162	$768,255	$9,304,416	$0	0
Totals		$75,000,000	$98,316,243	$173,316,243		
Net Present Value		$33,078,419	$62,882,371			

NPV of Principal and Interest	$95,960,790
Annual Payment Req'd (1)	$8,366,299

(1) The Annual Payment Required recovers the total NPV of principal plus interest over the the 20 year term at 6 percent interest. This approach recognizes that interest may be earned on funds collected in excess of the annual loan payment during the first 5 years of the loan repayment schedule.

(2) This column shows the projected flow of funds in a loan repayment account over the 20-year t Interest earned on repayment account balance in Year 1 through Year 5 is used to help defra annual loan repayment requirements in subsequent years. Interest is assumed to be earned at 6 perent per year.

TABLE A.3. Resource AIC Determination (Capital Component)

Project Description	Capacity (1,000 cu m/day)	Cost (1,000 $US)
Verkhnyobuzhsky Water Intake	90.0	34,381

40 year life for source

Discount Rate = 6.00%

Year	Annual Production at customer (1,000 cu m)	Replacement Cost	Balance of Capital Investment	Capital Cost @ 6.00%	Total Annual Capital Cost
			34,381,150		
1	26,280	859,529	33,521,621	2,011,297	2,870,826
2	26,280	859,529	32,662,092	1,959,726	2,819,254
3	26,280	859,529	31,802,563	1,908,154	2,767,683
4	26,280	859,529	30,943,035	1,856,582	2,716,111
5	26,280	859,529	30,083,506	1,805,010	2,664,539
6	26,280	859,529	29,223,977	1,753,439	2,612,967
7	26,280	859,529	28,364,448	1,701,867	2,561,396
8	26,280	859,529	27,504,919	1,650,295	2,509,824
9	26,280	859,529	26,645,390	1,598,723	2,458,252
10	26,280	859,529	25,785,861	1,547,152	2,406,681
11	26,280	859,529	24,926,333	1,495,580	2,355,109
12	26,280	859,529	24,066,804	1,444,008	2,303,537
13	26,280	859,529	23,207,275	1,392,436	2,251,965
14	26,280	859,529	22,347,746	1,340,865	2,200,394
15	26,280	859,529	21,488,217	1,289,293	2,148,822
16	26,280	859,529	20,628,688	1,237,721	2,097,250
17	26,280	859,529	19,769,159	1,186,150	2,045,678
18	26,280	859,529	18,909,631	1,134,578	1,994,107
19	26,280	859,529	18,050,102	1,083,006	1,942,535
20	26,280	859,529	17,190,573	1,031,434	1,890,963
21	26,280	859,529	16,331,044	979,863	1,839,391
22	26,280	859,529	15,471,515	928,291	1,787,820
23	26,280	859,529	14,611,986	876,719	1,736,248
24	26,280	859,529	13,752,457	825,147	1,684,676
25	26,280	859,529	12,892,929	773,576	1,633,105
26	26,280	859,529	12,033,400	722,004	1,581,533
27	26,280	859,529	11,173,871	670,432	1,529,961
28	26,280	859,529	10,314,342	618,861	1,478,389
29	26,280	859,529	9,454,813	567,289	1,426,818
30	26,280	859,529	8,595,284	515,717	1,375,246
31	26,280	859,529	7,735,755	464,145	1,323,674
32	26,280	859,529	6,876,227	412,574	1,272,102
33	26,280	859,529	6,016,698	361,002	1,220,531
34	26,280	859,529	5,157,169	309,430	1,168,959
35	26,280	859,529	4,297,640	257,858	1,117,387
36	26,280	859,529	3,438,111	206,287	1,065,816
37	26,280	859,529	2,578,582	154,715	1,014,244
38	26,280	859,529	1,719,053	103,143	962,672
39	26,280	859,529	859,525	51,571	911,100
40	26,280	859,529	(4)	(0)	859,529
			NPV		33,605,187
			Unit AIC ($US/cu m)		$0.032

TABLE A.4. Usage Information

User Class	1992 Accounts	1992 Class Annual Usage (1,000 cu m)	1992 Daily Usage per Account (cu m)	1993 Accounts	1993 Class Annual Usage (1,000 cu m)	1993 Daily Usage per Account (cu m)	1994 Accounts	1994 Class Annual Usage (1,000 cu m)	1994 Daily Usage per Account (cu m)	1995 Accounts	1995 Projected Annual Usage (1,000 cu m) (1)	1995 Daily Usage per Account (cu m)
Residential		60,640		10,812	62,147	15.7	10,677	62,558	16.1	10,338	62,887	16.7
Communal		61,438		2,336	53,340	62.6	2,267	47,428	57.3	3,315	46,219	38.2
Budget institutions				943			1,056			1,333		
Off-budget institutions				1,393			1,211			1,982		
Industrial		22,752		2,237	18,125	22.2	1,331	10,183	21.0	3,300	9,220	7.7
Total		144,830		15,385	133,612	23.8	14,275	120,169	23.1	16,953	118,326	19.1

(1) Based on Q1 actuals and 2-month projections by Vodokanal; extrapolated to 12 months.

TABLE A.5. Current Method--Projection of Expenditures (SUS)

Scenario A

Line	Expenditure Category	Collection Cost 1996-98 Repair Fund: Projected Actual 1995	no based on 1995 Replacement Investment Resource Component: Projected Future 1996	1996-98 Maintenance: Projected Future 1997	based on 1995 Depreciation Only no: Projected Future 1998
1	Salary (direct water production only)	130,520	143,572	157,929	173,722
2	Taxes on salary + bonuses	67,617	74,379	81,817	89,998
3	Development fund	0			
4	Chernobyl fund	0			
5	Social security fund	0			
6	Pension fund	0			
7	Electroenergy	6,190,924	6,810,016	7,491,018	8,240,120
8	Raw materials	29,618	32,580	35,838	39,422
9	Fuel for Emergency Repairs				
10	Shipping and Transport Costs				
11	Chemicals**				
12	Gas for Central Water Heating				
13	General Expenditures	257,743	283,517	311,869	343,056
14	Repair Fund	302,462	332,708	365,979	402,577
15	Pumping to the upper floors	613,226	674,548	742,003	816,204
16	Maintenance Workshop	272,332	299,565	329,522	362,474
17	Distribution Repair / Flushing Water	0	0	0	0
18	Purchased Water	318,863	350,749	385,824	424,406
19	Misc.	91,364	100,500	110,550	121,605
20	Waste disposal	0	0	0	0
21	Outside Laboratory Analysis	0	0	0	0
22	Interest	0	0	0	0
23	Fines	49,065	53,971	59,368	65,305
24	Pest Control	1,135	1,249	1,374	1,511
25	Geological / Water Source Tax	39,776	43,754	48,129	52,942
26	Tanker Transport	34,099	37,509	41,259	45,385
27	Cafeteria	7,884	8,673	9,540	10,494
28	Outside Consulting	0	0	0	0
29	Support Maintenance	0	0	0	0
30			0	0	0
31					
32	SUBTOTAL--DIRECT PRODUCTION	8,406,628	9,247,291	10,172,020	11,189,222
33					
34	Depreciation	359,792	395,771	435,348	478,883
35					
36					
37	SUBTOTAL--NON-PRODUCTION COST	359,792	395,771	435,348	478,883
38					
39	Profit (25 percent)	2,191,605	2,410,765	2,651,842	2,917,026
40	Value Added Tax (To State)	2,191,605	2,410,765	2,651,842	2,917,026
41	Labor protection tax	109,580	120,538	132,592	145,851
42	Innovation tax	109,580	120,538	132,592	145,851
43	Retained (70 percent)	76,706	84,377	92,814	102,096
44	To State (30 percent)	32,874	36,161	39,778	43,755
45	Road Tax	113,362	124,699	137,168	150,885
46	Natural Resources Tax (10 percent)	(Begins in 1996)	924,729	1,017,202	1,118,922
47					
48	**Revenue Required from User Charges**	13,482,153	15,755,097	17,330,607	19,063,667
49					
50	Retained Revenues				
51	Profit	2,191,605	2,410,765	2,651,842	2,917,026
52	Less				
53	Transportation Tax	5,081	5,590	6,148	6,763
54	Land Tax	31,479	34,627	38,090	41,899
55	Net Profit	2,155,044	2,370,549	2,607,604	2,868,364
56	Profit Tax (30 percent--to State)	646,513	711,165	782,281	860,509
57	Net Profit after taxes	1,508,531	1,659,384	1,825,323	2,007,855
58	Plus				
59	Innovation Tax (70 percent)	76,706	84,377	92,814	102,096
60	Net Revenues Retained	1,585,237	1,743,761	1,918,137	2,109,951
61	Depreciation	359,792	395,771	435,348	478,883
62	**Available for Replacement Investment**	1,945,029	2,139,532	2,353,485	2,588,834
63	Projected Water Sales (1,000 cu m)	118,326	118,326	118,326	118,326
64	**Average Price ($US / cu m)**	$0.114	$0.133	$0.146	$0.161

TABLE A.6. Current Method--Projection of Expenditures ($US)

Scenario B

		Collection Cost 1996-98 Repair Fund	2.5% $700,000	1996-98 Maintenance Replacement Investment Resource Component	$400,000 Depreciation Only no
Line	Expenditure Category	Projected Actual	Projected Future		
		1995	1996	1997	1998
1	Salary (direct water production only)	130,520	143,572	157,929	173,722
2	Taxes on salary + bonuses	67,617	74,379	81,817	89,998
3	Development fund	0			
4	Chernobyl fund	0			
5	Social security fund	0			
6	Pension fund	0			
7	Electroenergy	6,190,924	6,810,016	7,491,018	8,240,120
8	Raw materials	29,618	32,580	35,838	39,422
9	Fuel for Emergency Repairs				
10	Shipping and Transport Costs				
11	Chemicals**				
12	Gas for Central Water Heating				
13	General Expenditures	257,743	283,517	311,869	343,056
14	Repair Fund	302,462	700,000	770,000	847,000
15	Pumping to the upper floors	613,226	674,548	742,003	816,204
16	Maintenance Workshop	272,332	400,000	440,000	484,000
17	Distribution Repair / Flushing Water	0	0	0	0
18	Purchased Water	318,863	350,749	385,824	424,406
19	Misc.	91,364	100,500	110,550	121,605
20	Waste disposal	0	0	0	0
21	Outside Laboratory Analysis	0	0	0	0
22	Interest	0	0	0	0
23	Fines	49,065	53,971	59,368	65,305
24	Pest Control	1,135	1,249	1,374	1,511
25	Geological / Water Source Tax	39,776	43,754	48,129	52,942
26	Tanker Transport	34,099	37,509	41,259	45,385
27	Cafeteria	7,884	8,673	9,540	10,494
28	Outside Consulting	0	0	0	0
29	Support Maintenance	0	0	0	0
30	Collection Cost (begin in 1996)		430,362	473,399	520,738
31					
32	SUBTOTAL--DIRECT PRODUCTION	8,406,628	10,145,380	11,159,918	12,275,909
33					
34	Depreciation	359,792	395,771	435,348	478,883
35					
36					
37	SUBTOTAL--NON-PRODUCTION COST	359,792	395,771	435,348	478,883
38					
39	Profit (25 percent)	2,191,605	2,635,288	2,898,816	3,188,698
40	Value Added Tax (To State)	2,191,605	2,635,288	2,898,816	3,188,698
41	Labor protection tax	109,580	131,764	144,941	159,435
42	Innovation tax	109,580	131,764	144,941	159,435
43	Retained (70 percent)	76,706	92,235	101,459	111,604
44	To State (30 percent)	32,874	39,529	43,482	47,830
45	Road Tax	113,362	124,699	137,168	150,885
46	Natural Resources Tax (10 percent)	(Begins in 1996)	1,014,538	1,115,992	1,227,591
47					
48	**Revenue Required from User Charges**	13,482,153	17,214,492	18,935,941	20,829,535
49					
50	Retained Revenues				
51	Profit	2,191,605	2,635,288	2,898,816	3,188,698
52	Less				
53	Transportation Tax	5,081	5,590	6,148	6,763
54	Land Tax	31,479	34,627	38,090	41,899
55	Net Profit	2,155,044	2,595,071	2,854,578	3,140,036
56	Profit Tax (30 percent--to State)	646,513	778,521	856,373	942,011
57	Net Profit after taxes	1,508,531	1,816,550	1,998,205	2,198,025
58	Plus				
59	Innovation Tax (70 percent)	76,706	92,235	101,459	111,604
60	Net Revenues Retained	1,585,237	1,908,785	2,099,663	2,309,630
61	Depreciation	359,792	395,771	435,348	478,883
62	**Available for Replacement Investment**	1,945,029	2,304,556	2,535,012	2,788,513
63	Projected Water Sales (1,000 cu m)	118,326	118,326	118,326	118,326
64	**Average Price ($US / cu m)**	$0.114	$0.145	$0.160	$0.176

TABLE A.7. Current Method--Projection of Expenditures (SUS)

					Scenario	C
		Collection Cost		2.5%	1996-98 Maintenance	$400,000
		1996-98 Repair Fund		$700,000	Replacement Investment	yes
					Resource Component	yes
	Expenditure Category	**Projected Actual**	**Projected Future**			
Line		**1995**	**1996**	**1997**	**1998**	
1	Salary (direct water production only)	130,520	143,572	157,929	173,722	
2	Taxes on salary + bonuses	67,617	74,379	81,817	89,998	
3	Development fund	0				
4	Chernobyl fund	0				
5	Social security fund	0				
6	Pension fund	0				
7	Electroenergy	6,190,924	6,810,016	7,491,018	8,240,120	
8	Raw materials	29,618	32,580	35,838	39,422	
9	Fuel for Emergency Repairs					
10	Shipping and Transport Costs					
11	Chemicals**					
12	Gas for Central Water Heating					
13	General Expenditures	257,743	283,517	311,869	343,056	
14	Repair Fund	302,462	700,000	770,000	847,000	
15	Pumping to the upper floors	613,226	674,548	742,003	816,204	
16	Maintenance Workshop	272,332	400,000	440,000	484,000	
17	Distribution Repair / Flushing Water	0	0	0	0	
18	Purchased Water	318,863	350,749	385,824	424,406	
19	Misc.	91,364	100,500	110,550	121,605	
20	Waste disposal	0	0	0	0	
21	Outside Laboratory Analysis	0	0	0	0	
22	Interest	0	0	0	0	
23	Fines	49,065	53,971	59,368	65,305	
24	Pest Control	1,135	1,249	1,374	1,511	
25	Geological / Water Source Tax	39,776	43,754	48,129	52,942	
26	Tanker Transport	34,099	37,509	41,259	45,385	
27	Cafeteria	7,884	8,673	9,540	10,494	
28	Outside Consulting	0	0	0	0	
29	Support Maintenance	0	0	0	0	
30	Collection Cost (begin in 1996)		622,490	684,739	753,213	
31						
32	SUBTOTAL--DIRECT PRODUCTION	8,406,628	10,337,507	11,371,258	12,508,384	
33						
34	Replacement Investment (begin in 1996)	359,792	2,750,000	3,025,000	3,327,500	
35	Resource Component Recovery		3,782,693	4,160,963	4,577,059	
36						
37	SUBTOTAL--NON-PRODUCTION COST	359,792	6,532,693	7,185,963	7,904,559	
38						
39	Profit (25 percent)	2,191,605	3,271,877	3,599,064	3,958,971	
40	Value Added Tax (To State)	2,191,605	3,271,877	3,599,064	3,958,971	
41	Labor protection tax	109,580	163,594	179,953	197,949	
42	Innovation tax	109,580	163,594	179,953	197,949	
43	Retained (70 percent)	76,706	114,516	125,967	138,564	
44	To State (30 percent)	32,874	49,078	53,986	59,385	
45	Road Tax	113,362	124,699	137,168	150,885	
46	Natural Resources Tax (10 percent)	(Begins in 1996)	1,033,751	1,137,126	1,250,838	
47						
48	**Revenue Required from User Charges**	13,482,153	24,899,591	27,389,550	30,128,505	
49						
50	Retained Revenues					
51	Profit	2,191,605	3,271,877	3,599,064	3,958,971	
52	Less					
53	Transportation Tax	5,081	5,590	6,148	6,763	
54	Land Tax	31,479	34,627	38,090	41,899	
55	Net Profit	2,155,044	3,231,660	3,554,826	3,910,309	
56	Profit Tax (30 percent--to State)	646,513	969,498	1,066,448	1,173,093	
57	Net Profit after taxes	1,508,531	2,262,162	2,488,378	2,737,216	
58	Plus					
59	Innovation Tax (70 percent)	76,706	114,516	125,967	138,564	
60	Net Revenues Retained	1,585,237	2,376,678	2,614,346	2,875,780	
61	Replacement Investment (begin in 1996)	359,792	6,532,693	7,185,963	7,904,559	
62	**Available for Replacement Investment**	1,945,029	8,909,371	9,800,308	10,780,339	
63	Projected Water Sales (1,000 cu m)	118,326	118,326	118,326	118,326	
64	**Average Price ($US / cu m)**	$0.114	$0.210	$0.231	$0.255	

TABLE A.8. Alternate Method--Projection of Expenditures ($US)

				Scenario	D
		Collection Cost	2.5%	Loan Amount	$20,000,000
		1996-98 Repair Fund	$700,000	Replacement Investment	yes
		1996-98 Maintenance	$400,000	Resource Component	yes
Line	**Expenditure Category**	**Projected Actual**		**Projected Future**	
		1995	**1996**	**1997**	**1998**
1	Salary (Direct water operations only)	130,520	143,572	157,929	173,722
2	Taxes on salary + bonuses	67,617	74,379	81,817	89,998
3	Development fund				
4	Chernobyl fund				
5	Social security fund				
6	Pension fund				
7	Electroenergy	6,190,924	6,810,016	7,491,018	8,240,120
8	Raw materials	29,618	32,580	35,838	39,422
9	Fuel for Emergency Repairs				
10	Shipping and Transport Costs				
11	Chemicals**				
12	Gas for Central Water Heating				
13	General Expenditures	257,743	283,517	311,869	343,056
14	Repair Fund	302,462	700,000	770,000	847,000
15	Pumping to the upper floors	613,226	674,548	742,003	816,204
16	Maintenance Workshop	272,332	400,000	440,000	484,000
17	Distribution Repair / Flushing Water	0	0	0	0
18	Purchased Water	318,863	350,749	385,824	424,406
19	Misc.	91,364	100,500	110,550	121,605
20	Waste disposal	0	0	0	0
21	Outside Laboratory Analysis	0	0	0	0
22	Interest	0	0	0	0
23	Fines	49,065	53,971	59,368	65,305
24	Pest Control	1,135	1,249	1,374	1,511
25	Geological / Water Source Tax	39,776	43,754	48,129	52,942
26	Tanker Transport	34,099	37,509	41,259	45,385
27	Cafeteria	7,884	8,673	9,540	10,494
28	Outside Consulting	0	0	0	0
29	Support Maintenance	0	0	0	0
30	Collection Cost (begin in 1996)		617,325	673,480	735,250
31	SUBTOTAL--DIRECT PRODUCTION	8,406,628	10,332,342	11,359,999	12,490,421
32					
33	Replacement Investment (begin in 1996)	359,792	2,750,000	3,025,000	3,327,500
34	Annual Loan Payment		2,231,013	2,231,013	2,231,013
35	Resource Component Recovery		3,782,693	4,160,963	4,577,059
36	SUBTOTAL--NON-PRODUCTION COST	359,792	8,763,707	9,416,976	10,135,572
37					
38	TOTAL COSTS	8,766,420	19,096,049	20,776,975	22,625,993
39					
40	**Payments to Others**				
41	Value Added Tax	2,191,605	3,271,877	3,599,064	3,958,971
42	Labor Protection Tax	109,580	163,594	179,953	197,949
43	Innovation Tax to State	32,874	49,078	53,986	59,385
44	Road Tax	113,362	124,699	137,168	150,885
45	Natural Resources Tax	(Begins in 1996)	1,033,751	1,137,126	1,250,838
46	Transportation Tax	5,081	5,590	6,148	6,763
47	Land Tax	31,479	34,627	38,090	41,899
48	Profit Tax	646,513	969,498	1,066,448	1,173,093
49					
50	**Revenue Required from Rates**	11,896,915	24,692,986	26,939,183	29,410,000
51	**Available for Replacement Investment**	359,792	6,532,693	7,185,963	7,904,559
52	Projected Water Sales (1,000 cu m)	118,326	118,326	118,326	118,326
53	**Average Price ($US / cu m)**	$0.101	$0.209	$0.228	$0.249

TABLE A.9. Alternate Method--Projection of Expenditures (SUS)

				Scenario	E
		Collection Cost	2.5%	Loan Amount	$75,000,000
		1996-98 Repair Fund	$700,000	Replacement Investment	yes
		1996-98 Maintenance	$400,000	Resource Component	yes
	Expenditure Category	**Projected Actual**		**Projected Future**	
Line		**1995**	**1996**	**1997**	**1998**
1	Salary (Direct water operations only)	130,520	143,572	157,929	173,722
2	Taxes on salary + bonuses	67,617	74,379	81,817	89,998
3	Development fund				
4	Chernobyl fund				
5	Social security fund				
6	Pension fund				
7	Electroenergy	6,190,924	6,810,016	7,491,018	8,240,120
8	Raw materials	29,618	32,580	35,838	39,422
9	Fuel for Emergency Repairs				
10	Shipping and Transport Costs				
11	Chemicals**				
12	Gas for Central Water Heating				
13	General Expenditures	257,743	283,517	311,869	343,056
14	Repair Fund	302,462	700,000	770,000	847,000
15	Pumping to the upper floors	613,226	674,548	742,003	816,204
16	Maintenance Workshop	272,332	400,000	440,000	484,000
17	Distribution Repair / Flushing Water	0	0	0	0
18	Purchased Water	318,863	350,749	385,824	424,406
19	Misc.	91,364	100,500	110,550	121,605
20	Waste disposal	0	0	0	0
21	Outside Laboratory Analysis	0	0	0	0
22	Interest	0	0	0	0
23	Fines	49,065	53,971	59,368	65,305
24	Pest Control	1,135	1,249	1,374	1,511
25	Geological / Water Source Tax	39,776	43,754	48,129	52,942
26	Tanker Transport	34,099	37,509	41,259	45,385
27	Cafeteria	7,884	8,673	9,540	10,494
28	Outside Consulting	0	0	0	0
29	Support Maintenance	0	0	0	0
30	Collection Cost (begin in 1996)		772,137	828,292	890,062
31	SUBTOTAL--DIRECT PRODUCTION	8,406,628	10,487,154	11,514,811	12,645,233
32					
33	Replacement Investment (begin in 1996)	359,792	2,750,000	3,025,000	3,327,500
34	Annual Loan Payment		8,366,299	8,366,299	8,366,299
35	Resource Component Recovery		3,782,693	4,160,963	4,577,059
36	SUBTOTAL--NON-PRODUCTION COST	359,792	14,898,992	15,552,262	16,270,858
37					
38	TOTAL COSTS	8,766,420	25,386,147	27,067,073	28,916,091
39					
40	**Payments to Others**				
41	Value Added Tax	2,191,605	3,271,877	3,599,064	3,958,971
42	Labor Protection Tax	109,580	163,594	179,953	197,949
43	Innovation Tax to State	32,874	49,078	53,986	59,385
44	Road Tax	113,362	124,699	137,168	150,885
45	Natural Resources Tax	(Begins in 1996)	1,033,751	1,137,126	1,250,838
46	Transportation Tax	5,081	5,590	6,148	6,763
47	Land Tax	31,479	34,627	38,090	41,899
48	Profit Tax	646,513	969,498	1,066,448	1,173,093
49					
50	**Revenue Required from Rates**	11,896,915	30,885,477	33,131,675	35,602,492
51	**Available for Replacement Investment**	359,792	6,532,693	7,185,963	7,904,559
52	Projected Water Sales (1,000 cu m)	118,326	118,326	118,326	118,326
53	**Average Price ($US / cu m)**	$0.101	$0.261	$0.280	$0.301

TABLE A.10. Allocation of Expenses Based on 6-Month Totals (krb) for 1995 (adjusted for Value Added Taxes)

Line	Category	6-Month Total		Allocations based on Vodokanal accounting information							
				Supply & Pumping		Treatment		System Maintenance		Administration & Fixed	
1	Raw materials	4,337,359,677	100.00%	2,878,020,174	66.35%	1,459,339,502	33.65%	0	0.00%	0	0.00%
2	Fuel for emergency vehicles	940,001,820	100.00%	940,001,820	100.00%	0	0.00%	0	0.00%	0	0.00%
3	Transportation Costs**	566,930,264	100.00%	327,186,293	57.71%	239,743,972	42.29%	0	0.00%	0	0.00%
4	Chemicals**	1,221,927,092	100.00%	2,331,562	0.19%	1,219,595,531	99.81%	0	0.00%	0	0.00%
5	Gas used at the boiling stati	1,608,500,500	100.00%	1,608,500,500	100.00%	0	0.00%	0	0.00%	0	0.00%
6	Depreciation	25,341,580,208	100.00%	16,605,362,375	65.53%	9,605,439	0.04%	8,726,612,394	34.44%	0	0.00%
7	Repairing Fund**	17,057,839,999	100.00%	15,661,639,999	91.81%	0	0.00%	1,396,200,000	8.19%	0	0.00%
8	Pumping to the upper floors*	31,860,830,400	100.00%	31,860,830,400	100.00%	0	0.00%	0	0.00%	0	0.00%
9	Salary	4,482,990,880	100.00%	1,851,472,800	41.30%	1,150,000,000	25.65%	1,481,518,080	33.05%	0	0.00%
10	Taxes on salary + bonuses	4,319,796,303	100.00%	1,535,351,528	35.54%	1,068,695,990	24.74%	1,715,748,785	39.72%	0	0.00%
11	Development fund	150,827,546	100.00%	52,786,933	35.00%	41,400,283	27.45%	56,640,330	37.55%	0	0.00%
12	Chernobyl fund	932,941,526	100.00%	350,606,241	37.58%	207,438,315	22.23%	374,896,970	40.18%	0	0.00%
13	Social security fund	388,323,163	100.00%	137,547,666	35.42%	103,218,402	26.58%	147,557,095	38.00%	0	0.00%
14	Pension fund	2,847,703,805	100.00%	994,410,593	34.92%	716,638,946	25.17%	1,136,654,266	39.91%	0	0.00%
15	Stabilization fund	0		0		0		0		0	
16	Electroenergy	361,574,975,137	100.00%	361,574,975,137	100.00%	0	0.00%	0	0.00%	0	0.00%
17	Workshop	22,191,827,102	100.00%	14,041,553,476	63.27%	149,920,000	0.68%	8,000,353,626	36.05%	0	0.00%
18	Pipes treatment**	7,136,069,977	100.00%	7,136,069,977	100.00%	0	0.00%	0	0.00%	0	0.00%
19	General expenditures	15,602,075,396	100.00%	0	0.00%	0	0.00%	0	0.00%	15,602,075,396	100.00%
20	Bought water**	10,181,666,633	100.00%	10,181,666,633	100.00%	0	0.00%	0	0.00%	0	0.00%
21	Misc.	0	0.00%	0		0		0		0	
22	Land tax	1,112,000,000	100.00%	0	0.00%	0	0.00%	0	0.00%	1,112,000,000	100.00%
23	Labor protection tax	3,617,875,308	100.00%	0	0.00%	0	0.00%	0	0.00%	3,617,875,308	100.00%
24	Innovation tax	4,381,203,543	100.00%	0	0.00%	0	0.00%	0	0.00%	4,381,203,543	100.00%
25	Road tax	4,248,138,140	100.00%	0	0.00%	0	0.00%	0	0.00%	4,248,138,140	100.00%
26	Waste disposal**	0		0		0		0		0	
27	Water analysis**	0		0		0		0		0	
28	Interest amount	0		0		0		0		0	
29	Fines payment	3,466,422,664	100.00%	0	0.00%	0	0.00%	0	0.00%	3,466,422,664	100.00%
30	Disinfection**	80,203,319	100.00%	0	0.00%	0	0.00%	0	0.00%	80,203,319	100.00%
31	Geological tax	3,157,735,407	100.00%	0	0.00%	0	0.00%	0	0.00%	3,157,735,407	100.00%
32	Water transportation	0	0.00%	0		0		0		0	
33	Cafeteria	557,015,680	100.00%	0	0.00%	0	0.00%	0	0.00%	557,015,680	100.00%
34	Expertise**	0		0		0		0		0	
35	Refrigerator maintenance**	0		0		0		0		0	
36	TOTAL	524,707,605,511		463,326,942,406		3,837,560,886		21,320,432,762		36,222,669,457	